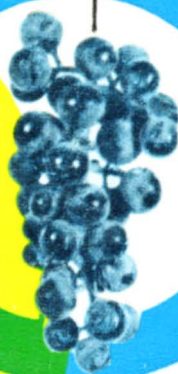


# GRAPE VARIETIES IN INDIA

DESCRIPTION AND CLASSIFICATION



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G. S. RANDHAWA





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## FOREWORD

Grape has been rapidly growing in its commercial importance in India. The interest amongst the cultivators, which started originally in and around Hyderabad, has led to viticulture becoming important in different regions, in north, west and south India. This has resulted in the introduction and testing of several exotic varieties from diverse sources at different research centres in India. Consequently, a good collection of varieties is now available in this country. A need has, therefore, arisen to catalogue and document these introductions of known and unknown origin and provide standard ampelographic descriptions, so that they can be identified and verified by research workers and horticulturists alike. Such an effort is desirable so that the varietal resources available can be put to scientific evaluation, thereby promoting the growth of scientific viticulture.

To research workers acquainted with the grape, the polymorphic condition of the *vinifera* grape is well known. The wide array of variability in different parts of the world can be profitably utilised to suit different climatic conditions of India. Also, specialised varieties need to be developed for specific end uses like wine making, raisin and vinegar production, and table use. In fact, Dr H. P. Olmo of the University of California, who visited India a few years ago, recommended that testing and evaluation of new varieties must be vigorously pursued, because of the narrow spectrum of varieties now available for commercial use. He specifically stressed the need for diversification of varieties to provide a number of grape products. This work would go a long way to meet these objectives.

The Indian Council of Agricultural Research in bringing out this publication hopes that this would promote viticulture in India on a scientific footing. Drs K. L. Chadha and G. S. Randhawa have done a commendable job in collecting the descriptions of 130 grape varieties and deserve the gratitude of all interested in this crop.

New Delhi  
February 22, 1974

M. S. SWAMINATHAN



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## CHAPTER 1

# INTRODUCTION

The description and classification of grape varieties have received considerable attention in all grape-growing countries of the world since time immemorial. The subject has assumed such an importance that a separate branch of horticulture called Ampelography has been established. As early as 1873, an International Commission was appointed for promoting the study of ampelography. The Commission (1873-80) published 15 reports in the *Bolletino Ampelographie* and also *Rivista di Viticoltura ed Enologia*. Since then, the pace of work on this aspect has been very fast till the early twentieth century and quite satisfactory even thereafter. The progress of this aspect of viticulture is now being looked after by a special sub-committee on Ampelography formed by the International Office of Vines and Wines (O.I.V.). This Committee has already recommended that each vine-growing country should publish an ampelographic plan and should describe the local and exotic varieties cultivated in each country.

### Early Description of Grape Varieties

Description of vine varieties had been taken up by several workers starting from Magon the Carthaginian about 250 B.C., and Columella in the first century A.D., to the workers like Odart (1841), Pulliat (1888) and Viala and Vermorel (1901-10) in France, Goethe in Germany, Rovasenda, Molon and Cosmo in Italy, Negrulj in Russia and Rodrigues in Portugal. Though grape descriptions had been made since long, Sachs (1661) was the first to use the word Ampelography in his *Ampelografia*, Leipzig, which deals with this subject in Latin. After Sachs, Odart (1841) published his *Essai d'ampelographie ou description des cepages les plus estimes dans les Vignobles de l'Europe de quelque renom*. Further, Stoltz (1852) published his *Ampelographie rhenane* and Rendu (1854) his *Ampelographie francaise*. Later on, Rovasenda (1877) in Italy published his *Saggio di una ampelografia Universale*, which was also published in French, in the same year under the title *Essai d'une ampelographie Universelle*. Goethe (1876) published his work *Ampelographisches worterbuch* and later during 1878 *Handbuch der Ampelographie*. Similarly, Don Simon de Rojas Clemente (1879) published an important work on ampelography under the title *Ensayo sobre las variedades de la vid comunque vegetan en Andalucia* in which he described the varieties grown in Andalucia in Spanish.

During 1874-79, Mas and Pulliat's monumental work *Le Vignoble* appeared in three volumes containing descriptions of 228 grape varieties.

Pulliat further wrote an important work *Mille varieties de vignes*. From 1879 to 1890, the *Ampelografia Italiana* of the Central Committee for Ampelography was published in Italy in seven sections. During 1876-77, the Italian Minister of Agriculture published the *Bolletino Ampelografico*.

In 1887, Nicholson described some grape varieties in English. This was probably the first such attempt in English. Foex and Viala published *Ampelographie americaine* in 1883. During 1886-89, Portes and Ruysen published *Traite de la vigne et des ses produits* and described 719 varieties. In 1891, Henri Mares published his *Description des cepages principaux de la region mediterraneenne de la France* and in 1900, J. Roy Chevrier's *Ampelographie retrospective* was published.

### Description of Varieties in the Twentieth Century

During the early twentieth century, the work on ampelography gained its momentum. Ravaz (1902) in his *les vignes americaines* listed several hundred, mostly hybrid rootstocks of several American species. Molon (1906) published an important work in the form of *Ampelografia* in two volumes in Milan, Italy. Garcia (1906) described some European varieties of grape. The monumental work in English by Hedrick (1908), appeared under the title, *The Grapes of New York* containing detailed descriptions of 204 and short notes on 1,207 less important varieties.

From 1901 to 1910, the largest work on ampelography was published by Masson et cie of Paris under the guidance of Viala and Vermorel and 84 other collaborators, out of most of the vine growing countries and is called *Traite general de viticulture-Ampelographie*. It consists of seven volumes and contains about 24,000 names or synonyms representing about 5,200 varieties derived mainly from *V. vinifera*, of which 627 are described in detail.

After this, considerable interest was aroused in all the vine growing countries and short or detailed characteristics of vine varieties found suitable in various areas of the world were released in the form of bulletins or reports.

Important works from various countries are detailed below:

**U.S.A. :** In the U.S.A. Anthony (1917), Wellington (1945, 1951) and Slate *et al.* (1962) described the varieties of New York; Duruz and Pentzer (1935) and Zielinski (1949) of Oregon; Vaile (1939) of Arkansas; Amerine and Winkler (1943), Hesse (1949) and Jacob and Winkler (1950) of California; Moore (1947) of Virginia; Loomis (1948) of Mississippi; Nelson (1951) and Hinrich (1955) of Oklahoma; Huglin (1955) of Alaska and Magoon and Snyder (1943) for different regions of the U.S.A. Barret (1956) described some French hybrid grapes promising for cultivation in the U.S.A. However, the most important work in English on this aspect was given by Hedrick (1908, 1919, 1938) and later by Perold (1927) who in his *Treatise on Viticulture*, reproduced descriptions of many important grape varieties given by earlier

workers. Olmo (1959), Brooks and Olmo (1959) described new grape varieties bred and released by the United States Department of Agriculture. Winkler (1962) also described a few important varieties of grapes of America in his book on General Viticulture.

**Germany :** The most classical work on ampelography in German has been reported by Moog (1930) who described a large number of American varieties and their hybrids grown at Geisenheim and Tefenbach. The object of the study was to purify the varietal collection of the country, a great many types having in practice become extremely mixed. In 1932, the author further described 36 American varieties including 18 Trollinger  $\times$  Riparia hybrids. During 1933, detailed descriptions of 34 varieties including various crosses of Madeleine Royale, Riesling and Rupestris with Riparia and 17 *Vitis vinifera* vines were made. In 1934, he dealt with the identification of Riparia types. Later, he described 26 French hybrids in 1935, and 53 more grape varieties in 1940. In 1939, he abundantly illustrated the confusion in the naming of vines and stressed the need for official measures. Bruni (1950, 1951) also worked on ampelography of grape varieties grown in Germany. Turkovic (1954) also published an Ampelographical Atlas in Germany.

**U.S.S.R. :** In Russia, work on this aspects has been done by Kuzmin (1934), Katz (1936), Dalmasso and Tajndalo (1958), Frolov-Bagreev (1946-58), Negrulj (1956) and Kondion (1960). Whereas, Kuzmin gave brief morphological descriptions of the hybrid grape varieties evolved by Michurin with a key to their identification, Katz reported ampelographic studies made by the Central Institute of Plant Industry in Uzbekistan, Tajikistan and Turkmenistan. Velicko (1949) also described a few Russian table grape varieties. Dalmasso and Tajndalo (1958) described the characters of many vine varieties and species used in different parts of U.S.S.R. Frolov-Bagreev (1946-58) published his work on Russian ampelography in six volumes.

**Italy :** In Italy, Cosmo (1937, 1940, 1955, 1959, 1960) published comparative ampelographic notes on *Vitis vinifera* varieties. He also described varieties recommended for various Italian provinces. Also, the Institute at Grotta Rossa near Rome described 47 crosses, for which important Italian Viticulturists like Bogni Dalmasso, Manzoni, Prosperi and Pirovano were responsible. The most classical work on Italian ampelography in recent years (titled *Ampelografia Repubblicci Popolare Romini*) is that of Constantinescu *et al.* (1960) published in three volumes.

**France :** In France, ampelographic work has been done by Galet (1951, 1952a,b; 1956). Artozoul (1953) characterised 18 commercial grape varieties of the series. Seyre Villard and Truel (1960) did those of grape varieties in Southern France in 1957-58.

**Portugal :** In Portugal, Carvalho *et al.* (1941-42) and Vasconcellos and Carvalho (1942) and Vasconcellos *et al.* (1941-42) gave a detailed botanical

description of a few hundred important grape vine varieties. Beside this, the classical work on ampelography and ampelographic principles has been done by Rodrigues (1939, 1941, 1942, 1948, 1950, 1952, 1955). Further, Almeida (1960) also studied some new grape cultivars of Portugal.

**Other Countries :** Though most of the work has been done in Russia, Germany, Italy, France and Portugal, other countries have not lagged behind in this respect. Grasovsky and Weitz (1933) described some Palestine varieties. Bouffard (1936) studied the principal grape varieties grown in Turkey and Oraman (1937) published an ampelographic monograph of varieties of Turkey. Tuneu and Guerra (1940) made studies on ampelography of Uruguay. Greek varieties have been studied by Krimbas (1938, 1941, 1943-49) who gave detailed descriptions of varieties grown in College of Agriculture, Athens and later published *Ampelographie hellenique* in three volumes. Logothetis (1953, 1955, 1957, 1958) also made an important study of Greek varieties. Similar work on Czechoslovakian varieties has been done by Blaha (1941, 1952). Berry (1952) published a bulletin containing descriptions of varieties and of hybrids between European and native American vines regarded as suitable for growing in New Zealand. Vryonides (1952) gave brief descriptions of vine grape varieties introduced to Cyprus. Francis (1949) described some South Australian grape varieties. Later in 1953, Chairman of the Phylloxera Board published descriptions of vine varieties of South Australia. Krochmal and Nawabi (1961) described fruit characters of 48 varieties of Afghanistan.

### World Varietal Wealth

In spite of the fact that enormous work is being done on this aspect, no estimate can be given of the grape varietal situation of the world, as there are a number of synonyms for the same variety in various regions. Viala and Vermorel (1901-10) were the first to give about 24,000 names of synonyms representing about 5,200 varieties. Badell (1952) made a contribution to the study of synonymy and gave an alphabetical list of over 4,000 names of European vine varieties giving the synonyms used in various countries. In Germany, Levadoux (1952) made a provisional study of synonyms in grape varieties. Bioletti (1938) considering the described varieties and taking into account the several hundred undescribed varieties of Anatolia, Syria, Armenia, Caucasia, Persia, Turkistan, Afghanistan, North Africa, etc., estimated the number of cultivated varieties to be well over 6,000 though the present position may even be above this estimate.

### Work done in India

In spite of sufficient work done on grape variety description in other countries, much attention has not been paid to this aspect in India. Though grape variety introductions started in our country as early as 1838 (Watt,

1893), Punjab was perhaps the first state to take up comprehensive introductions and trials for testing the adaptability of grape varieties. This work was started at Lyallpur (now in West Pakistan) as early as 1928, when the fruit section of the Department of Horticulture headed by Lal Singh made an effort to introduce grape varieties of merit from countries like the U.S.A., Australia, Afghanistan, Russia and within a few years, a collection of 166 varieties was made at Lyallpur (Singh and Singh, 1940, 1942). From these early collections, materials were sent to various places in the country like Aurangabad and Poona, and interest in grape introductions began in various regions. Besides the pioneering work done at Lyallpur, the work initiated by Randhawa and his co-workers during late fifties, needs mention. As a result of these efforts, over 1,000 varieties of grape now exist in varietal collections at various Experiment Stations in the country. As a result of large scale introductions made at a number of stations, a number of varieties have got mixed up and lot of confusion is now prevailing all over the country in the nomenclature of these varieties.

So far not much has been reported on grape variety descriptions and their important characters from our country. Such a work is important for the breeders as well as for the viticulturists. The only standard work in this direction was published by Singh and Singh (1940), who described 66 varieties grown at Lyallpur, West Punjab, now in Pakistan. Also Mustafa and Giani (1941) described some grape varieties of Afghanistan. However, the most systematic work on 108 grape varieties grown at IARI, New Delhi, has been carried out by Chadha (1965), and Mustafa (1967) described another 20 varieties not earlier described by Chadha (1965). Similarly, Joshi (1961) described 36 varieties grown at Ganesh Khind Garden, Poona. Besides these, brief descriptions of a few varieties of local importance have also been published by various workers from different states, i.e., Delhi (Randhawa and Singh, 1958; Chadha and Randhawa, 1965, and Mukherjee *et al.* 1965), Punjab and Haryana (Nauriyal, 1965 and Randhawa *et al.* 1967), Uttar Pradesh (Singh, 1961, 1962; Prasad and Nand, 1964; Nand, 1965) and Maharashtra (Phadnis, 1965 and Phadnis *et al.* 1968).

Besides these descriptions, performance of a number of varieties have also been reported from different places, namely, Kandaghat (Varma, 1947), Abohar (Jawanda, 1965, Nauriyal *et al.* 1967), Hissar (Daulta, 1969) and Lucknow (Kurtkoti, 1963). It is interesting to know that a large number of introduced varieties do not fully mature in the Gangetic plains due to the coincidence of fruiting with the rainy season.

In recent years, attempts have also been made to screen varieties for susceptibility or resistance to common diseases like rust (*Phakopsora ampelopsides* Diet.), downy mildew (*Plasmopara viticola* (Berk. & Curt.) Berl. & de Toni), anthracnose (*Gloeosporium ampelophagum* (de Bary) Sacc.), powdery mildew (*Uncinula necator* (Schw.) Burr.) and *Cercospora* leaf

spot (*Cercospora viticola*) at the Horticultural Research Station, Saharanpur (Prasad and Nirvan, 1965), Regional Fruit Research Station, Abohar (Jeyarajan *et al.*, 1969), and the Institute of Horticultural Research, Hessaraghatta (Sohi and Sridhar, 1970, 1971; Sridhar and Sohi, 1970).

As a result of the above listed efforts, useful information is now available. However, there is hardly any publication on grape variety description and performance available for use by viticulturists in the country. Keeping this in view and keeping into consideration the international recommendations in this respect, it was considered important to bring out in this publication uniform descriptions of all important grape varieties which have been collected from within the country or important foreign countries and have been studied so far. The performance of various varieties under different agro-climatic conditions and their disease resistance or susceptibility, wherever reported, have been given. This will prevent undue waste of time and energy in the matter of introduction of these varieties for trial in similar areas. This would also help various grape investigators in their work of breeding new varieties, purchasing varieties true to name and detecting presence of 'rogues'. Much of the confusion regarding correct nomenclature would also be avoided. Hints on classification of grape varieties with relative importance of various parts of vine responsible for giving the varieties their distinguishing characters have also been discussed. It is hoped that information compiled will prove useful to grape-breeders, viticulturists and students of viticulture in the country as also to the foreign viticulturists interested in progress of viticulture in India.

## CHAPTER 2

# CHARACTERS USED IN GRAPE DESCRIPTION AND CLASSIFICATION

In order to describe grape varieties systematically, the characters of their vegetative parts, flower, fruit and seed are required to be studied intimately. For doing so, it is necessary that the terminology used is properly understood. In the following pages, technical terms used in describing grape varieties have been explained and standard botanical definitions of various parts of the vine have been given. Various qualitative and quantitative criteria, which have been or can be used in the description of varieties, are also given to enable the reader to understand their significance fully. Liberal use of terminology from works by Perold (1927), Bioletti (1938) and Hedrick (1938) has been made.

Most of the characters of the vine used in descriptions are not discrete but continuous in their variations. It is, therefore, possible that while describing various characters cases will occur, where the varieties fall between two adjacent terms described for that character. It is often difficult to describe characters based on geometrical form, namely, form of the bunch, berry and leaf, qualitative characters like colour, flavour and characters which are influenced by climatic conditions and agro-techniques, namely, growth initiation, time of ripening, etc. In such cases, categories which suit the most can be used.

According to Perold (1927), there is difference of opinion among ampelographers as to how many divisions should be used for each character. In his opinion, the most convenient and useful method seems to be to use in the primary classification a tripartite division of all characters where this is feasible and then for supplementary keys to use intermediate classes. For the full descriptions, it is, however, best to use in each case the terms which give the clearest picture of the characters of the particular variety, taking care that these don't conflict with those used in primary classification.

Not all the characters employed in describing varieties can be utilized in classifying varieties and formulating keys. The utility of a classification depends on how critically the characters representing the key have been chosen. A number of quantitative and qualitative characters distinguish various vine cultivars from one another. The stability of such characters, however, varies from character to character. There has also been lot of variability and preferences amongst the ampelographers and taxonomists who have worked on the nomenclature and classification

of grape varieties in respect of importance and reliability given to various characters. Unfortunately, most such discussions on the subject by Carvalho and Vasconcellos (1942), Negrulj (1956), Branas (1958, 1959) and Logothetis (1959) are in languages other than English. An intimate study of this aspect would reveal that the ampelographers have used two major parts, that is, the leaf out of the vegetative and the fruit out of the reproductive parts as the basis for such work. Some workers have given preference to the former, while others have stressed the utility of the latter. The characters used in describing grape varieties and their usefulness in classification is discussed in the following pages.

## A. GENERAL CHARACTERS OF THE VINE

Though major distinguishing characters in the vine are presented by the leaf and fruit, the other parts of the vine, namely, stem, bark, cane, shoots and tendrils also present useful distinguishing characters. These are discussed below:

### 1. General Vigour

The vines can be differentiated as vigorous, medium in vigour and poor, based on average girth values of the trunk. For this purpose, measurements of the trunk should be taken at a uniform point on the stem. For comparison of stem girth and thickness, vines for comparison must be of the same age, trained and pruned in the same way and grown under similar agro-climatic conditions. Perold (1927) felt that trunk thickness is of value only where vines occur in collections. Usually slow and fast growing varieties can be separated on this basis. Besides trunk measurements, Singh and Singh (1940) used the length and thickness of the cane for categorisation of the vigour of varieties, however they found that the trunk circumference gave more valid comparison of vigour than the length and thickness of the cane.

### 2. Bark

The new bark produced each year by the vine remains on the trunk due to its persistent nature and forms an accumulation of annual layers. These layers ultimately detach from the stem in the form of strings, ribbons and patches of varying lengths and widths. Though Ravaz (1902) did not attach much importance to the nature and mode of detachment of the dead bark on the trunk, yet Bioletti (1938) considered the adherence of the bark with the stem and the nature of ribbons on removal to be an important character in varietal identification. The authors, however, do not attach much importance to this character.

(a) *Bark classification* : The bark may be classified as "adherent" or "loose"

depending on the ease with which straps detach from the stem. The ribbons or straps may be further categorised as thin or thick, narrow or broad, compact or fissured, and brittle or flexible.

(b) *Length of the ribbons*: For comparison of length of straps, the bark of the vine has to be removed carefully without giving any jerk when the vines are in dormant condition in the North and the time of pruning in other parts of the country. Two longest straps in each of four vines can be measured and the average of eight can be taken as length. Depending upon their length, the straps of ribbons were classified as:

- (i) Short —less than 20 cm
- (ii) Medium—20-40 cm
- (iii) Long —more than 40 cm

(c) *Colour of the underbark*: The colour of the underbark also differs with the varieties and can be a useful character. The underbark is usually light brown, medium brown and dark brown though many other intermediary colourations are also found.

### 3. Canes

It is a mature, one year old shoot. According to Perold (1927), this character is more useful while differentiating species than varieties within the same species. However, a number of cane characters can be useful in variety descriptions. Cane characters which usually distinguish varieties are colour, size and form. Of these, colour is, perhaps, the most specific as the form and size are greatly influenced by climatic condition and cultural practices.

(a) *Colour*: The colour of the cane varies from variety to variety. Nearly all canes have striations of a darker colour, which when wide and numerous modify the ground colour. The colour of the mature cane can be described as dark brown, brown, light straw and greyish.

(b) *Length*: For the present descriptions, the length of the cane was determined for 16 canes from 4 vines of each variety during the month of December and the canes were classified as:

- (i) Short —less than 70 cm
- (ii) Medium—between 70 to 100 cm
- (iii) Long —more than 100 cm

(c) *Thickness*: On the basis of diameter taken at the middle of an internode, the internodes were described as:

- (i) Thin—less than 0.5 cm
- (ii) Thick—more than 0.5 cm

(d) *Internode*: The average length of the internode was also calculated on the basis of length of 7th, 8th and 9th internodes of 4 canes of each variety. The internodes were classified as:

- (i) Short —less than 3 cm
- (ii) Medium—3 to 6 cm
- (iii) Long —more than 6 cm
- (e) *Branching* : The extent of branching of the cane was also taken into consideration. Branches may be few, medium or many in number.
- (f) *Pubescence* : The canes may be glabrous or pubescent.

#### 4. Buds

The vine undergoes dormancy under temperate and subtropical climate. The buds begin to sprout as soon as conditions become favourable for growth. Even in tropical conditions, buds take a few days to sprout after each pruning. The time that buds take to sprout varies with the varieties considerably under similar agro-climatic conditions. For this purpose, the vines should be considered to have put forth new flush when there are at least 5 young sprouting buds each with a clearly visible small leaf. Under Delhi conditions, growth initiation has been classified as follows :

- (i) Very early —growth initiation in third week of February
- (ii) Early —growth initiation in the last week of February
- (iii) Medium  
late —growth initiation in first week of March
- (iv) Late —growth initiation in second week of March or later

Further, at the time of their emergence, the vegetative buds present a characteristic distinction between different groups of varieties. A bud may be, with broad or pointed apex; bright tinted or brown; glabrous or pubescent.

#### 5. Growing Shoots

The current season's succulent top growth or in other words immature cane is referred to as a growing shoot. The growing shoot colour and pubescence normally offer distinctive characters. The shoots should be studied early in the growing season. In the present case, they were studied in the month of April.

(a) *Colour* : The colour of the shoot was considered important by Sousa (1938), Singh and Singh (1940) and Teodorescu (1940). Singh and Singh (1940) laid much more emphasis on this character. Durquety and Bisson (1952) gave a classification of certain French varieties of vines in the South West of France, based chiefly on stem colour. They considered colour of the sarmentum to be an important diagnostic characteristic. According to Singh and Singh (1940) the growing shoots are either green or purplish in colour. The purple colour may either be in streaks or it may be predominating on the region of the growing tips. Normally three distinct colours, namely, green, green with purple shade and purple colours have been recorded. In view of the difficulty in describing the colour correctly, only

two categories, namely non-pigmented and pigmented shoots can serve useful purpose in the descriptions.

(b) *Pubescence* : Depending on the extent of pubescence, the growing shoots have been classified in four groups by Singh and Singh (1940).

- (i) Glabrous —pubescence is wanting
- (ii) Cob-webby (slightly pubescent) —pubescence extends to the first five internodes from the tip of the shoot
- (iii) Downy (fairly pubescent) —pubescence extends over the first ten internodes
- (iv) Woolly (strongly pubescent) —pubescence extends over more than ten internodes

This character was considered important in classification by Galet (1951).

## 6. Tendrils

A tendril is an abortive or a modified shoot. Excluding a few basal nodes, the tendrils occur in a definite pattern depending upon the species of the genus *Vitis*. The nature of the tendril, whether continuous, irregular or intermittent, has been used for identifying grape varieties at the level of species. Chadha (1965), however, did not give primary importance to this character as certain inter-specific hybrids between *vinifera*  $\times$  *labrusca* were found to have intermittent tendrils as against irregular in a vast majority of these.

Tendrils can be studied in the first or second week of April under Delhi conditions, when they are fully developed and the shoots are grown considerably long. The following tendril characters are of importance :

(a) *Colour* : The tendrils may be green or purple pigmented. Sometimes on account of heavy pubescence tendrils are greyish green in colour.

(b) *Sequence* : On the basis of their sequence of occurrence, the tendrils were categorised as :

- (i) Continuous —when a tendril or bunch is present at every node of the cane against a leaf.
  - (ii) Intermittent —when there are tendrils or bunches on two consecutive nodes alternating with a vacant node.
  - (iii) Irregular —when there is no regular pattern and the vacant node may be fourth or even fifth. This condition is somewhat in between continuous and intermittent.
- (c) *Nature* : A tendril may be bi-fid, tri-fid or sometimes even tetra and penta-fid. It has been observed that tri-fid and tetra-fid may again be of two types: (i) all the arms arise from one point and (ii) the arms arise from different points. The latter situation is more common. A tendril may be glabrous or pubescent, smooth or warty, thin or thick.
- (d) *Length* : Four mature tendrils from the middle of each of the three

shoots per vine were measured and the average length of 36 tendrils was taken into account. On the basis of the length, the tendrils were classified as :

- (i) Short —less than 16 cm
- (ii) Medium—between 16 and 22 cm
- (iii) Long —more than 22 cm

## B. LEAF CHARACTERS

Some workers lay more stress on the leaf characters than on fruit characters. Kolenati (1846), Sousa (1938), Rodrigues (1939), Stoeff and Radoutchev (1944-45) Galet (1951) and Capria and Vega (1956) believed that the leaf characters were of maximum value in the classification of grapes.

Radoutchev (1944-45) was of the opinion that although some of the linear dimensions of the vine leaf were influenced by environmental conditions, other leaf characters were constant and were, therefore, of great taxonomic value.

Galet (1951) observed that the systematic study of the new and adult leaves without any examination of the fruit (wrongly considered by ampelographers to be of primary necessity) is sufficient for the classification of all varieties of *Vitis vinifera* according to their apparent genetical composition, i.e., phenotypically or according to their natural affinities with wine or dessert varieties.

Capria and Vega (1956) while studying grape varieties, suggested certain relationship between the measurements of certain vegetative characters. Among various characters, Kolenati (1846), a Russian Botanist, classified *Vitis vinifera* into two sub-species on the basis of downy and veining characters of leaf, which were found to be more constant as compared to the fruit character. Stewart (cited by Watt, 1893) used pubescence and colour of the undersurface of leaves for distinguishing vines of the Punjab.

Singh and Singh (1940) at Lyallpur classified 66 varieties into three main groups on the basis of leaf shape to which they attached maximum importance. The three leaf shapes considered by them were, orbicular, cuneiform and cordate. The next important character used by them was the nature of the pubescence on the leaf, which was described as felted, downy and glabrous.

Carvalho *et al.* (1941-42) made use of young and mature leaf characters also in the identification of 100 Portuguese grape varieties. Some important leaf characters are as follows.

### 1. Unfolding Leaves

One of the most important characters observed to be useful in classification by Chadha (1965) is the nature of unfolding leaves.

The colour and the pubescence of the unfolding leaves offer a large amount of variation and give useful indication, which can serve to characterise both the species of *vitis* as also varieties within various species.

Such leaves may be green in colour and devoid of any other pigmentation or may have varying degree of pigmentation interspersed in the veins or along with the margin or may have colour patches spread over the entire lamina surface. Further the degree of pubescence on the upper and lower surface of emerging leaves also varies greatly. The unfolding leaves may be glabrous or almost so, cob-webby, downy and wooly. Taking degree of pubescence (4 categories) and whether pigmented or not (2 categories), the unfolding leaves can be divided into eight possible categories. However, certain colour variations have been further made use of and the unfolding leaves have been classed into 11 distinct categories on the basis of observations made on over two hundred varieties by Chadha, 1965.

1. Unfolding leaves yellowish green, devoid of any other pigmentation; glabrous or almost so on both the surfaces. (Perlette, 98 and Pusa Seedles, 103.)
2. Unfolding leaves yellowish green, devoid of any other pigmentation; cob-webby above and below. (Kishmish Charni, 75 and Mukh Chilani 83.)
3. Unfolding leaves yellowish green or light green, devoid of any other pigmentation (but obscured by white pubescence); downy above and below (Saint Jeannet, 111.)
4. Unfolding leaves greyish green above and silvery white below, devoid of any pigmentation; wooly above and below (Golden Muscat, 50 and Portuguese Blue, 101).
5. Unfolding leaves greyish green above and silvery white below; wooly above and below. Some pinkish tinge along the margin of the leaves above or and below or pink patches on the lamina surface (Golden Queen, 51).
6. Unfolding leaves greyish green above and silvery white below, margin of the leaf beautifully pigmented; wooly above and below (Champanel, 30).
7. Unfolding leaves greyish green above and almost pink below, margin above is beautifully lined pink as in group six; pubescence wooly above and below (Lomanto, 78).
8. Unfolding leaves variously pigmented; glabrous or nearly so above and below (Beauty Seedless, 10).
9. Unfolding leaves variously pigmented; cob-webby above and below (Bharat Early, 11).
10. Unfolding leaves variously pigmented; downy above and below (Bhokri, 12 and Chasselas Violet, 34).
11. Unfolding leaves greyish green above and silvery white below (with

colouration other than pink) and purplish or brownish at the margins; little older leaves have more brownish colour spread throughout the lamina: woolly above and below (Bangalore Purple, 7 and Barbarossa, 9).

## 2. Full Grown Leaves

A number of characters of the full grown leaf, viz., form, size, colour, surface, texture, petiole, dentition and pubescence are of value in description. Various leaves on the same shoot are known to vary in size depending on their position. According to Singh and Singh (1940) and Berg (1959), 9th to 12th leaves from the base are quite uniform in size and shape. However, in the present studies observations were taken on leaves at 7th, 8th and 9th nodes from the base as suggested by Bioletti (1938). In Delhi the observations were taken in the last week of May or first week of June. The outline and parts of a typical vinifera leaf are given in Fig. 1 to describe important parts on which observations were taken.

(a) *Colour* : The colour of the upper and under surface of the leaf should be recorded after observation against sunlight. It can be described as dark green, light green or reddish. It can also be more or less bronzed. Colour of the upper surface is usually uniform and that of under surface can be modified by pubescence.

(b) *Form* : While the classification by Singh and Singh (1940) is based on the outline of the leaf as the primary character, in the present studies, it has been observed that this character is not very stable and reliable.

A number of leaf forms are recognised. Perold (1927) recognised five, namely, round or orbicular, cordate or heart shaped, wedge shaped or cuneiform and truncated. All these forms, which characterize the species or specific groups are linked by numerous transitional forms which can serve to distinguish the varieties. Singh and Singh (1940), however, recognised only three major classes, namely, orbicular, cordate and cuneiform, which were employed in the present studies.

The shape of the leaf shows a number of gradations within the same variety. Similar view is also held by Perold (1927) who has reported that as the leaves have developed one after the other, and hence under varying conditions, they do not precisely resemble one another. The lowest, middle and uppermost leaves on a shoot can differ appreciably. For comparative purposes, Rayaz (1902) made use of only those leaves that correspond with the period of greatest growth of the vine and are from 9th to 12th node from the base of the shoot. The general form of the leaf depends on the leaf skeleton and has, therefore, been considered a function of the relative lengths of the primary or main nerves and their angles with each other. The leaf shape has, therefore, been based on various ampelometric measurements by various workers like Rayaz (1902) and Galet (1956). As such

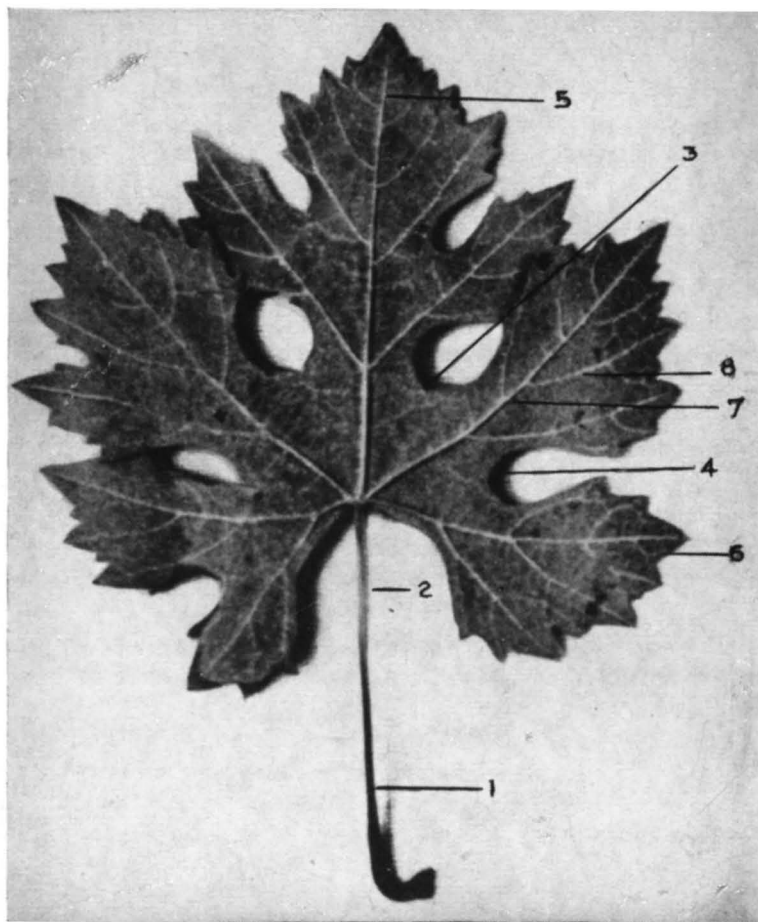


Fig. 1 Parts of a typical grape leaf : 1. Petiole 2. Petiolar Sinus 3. Superior Lateral Sinuses 4. Inferior Lateral Sinuses 5. Primary Nerve 6. Tooth 7. First Lateral Nerve 8. Second Lateral Nerve.

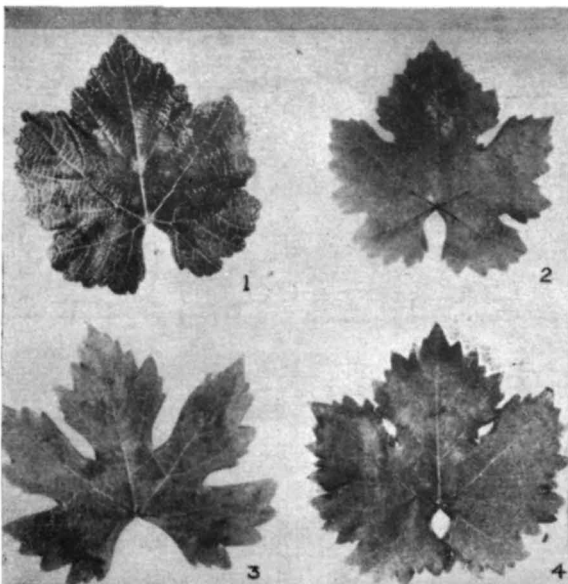


Fig. 2 Width of Lateral Sinuses : 1. Closed 2. Narrow  
3. Wide 4. Perforate

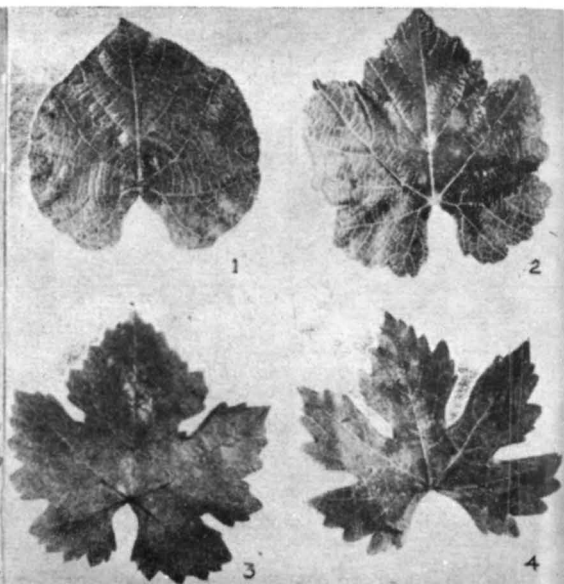


Fig. 3 Types of superior Lateral Sinus : 1. None  
2. Shallow 3. Medium 4. Deep

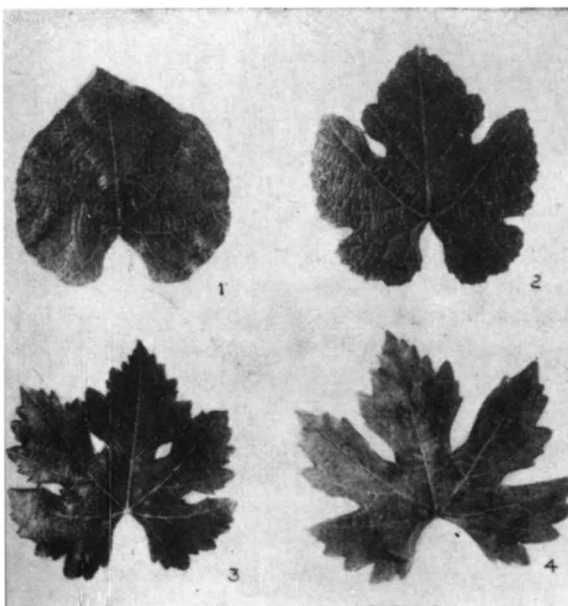


Fig. 4 Types of inferior Lateral Sinus : 1. None 2. Shallow  
3. Medium 4. Deep.

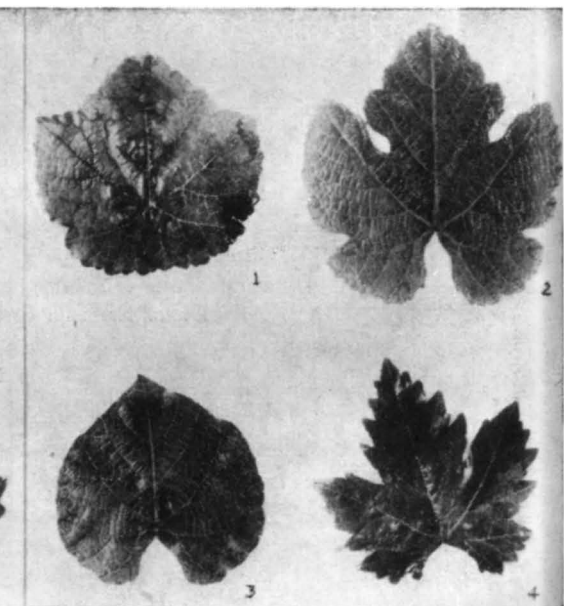


Fig. 5 Types of Petiolar Sinus : 1. Closed 2. Narrow  
3. Medium 4. Wide.

ampelometric measurements are very tedious and time consuming, this character has not been given any importance at the time of preparation of the key, in the present studies.

(c) *Sinuses* : Sinuses are the depressions between the adjoining lobes of a leaf, i.e., a space between lobes or recess or bay between lobe. There are normally five sinuses, two upper, two lower and the petiolar sinus. They vary in number, depth and form.

*Lateral sinuses* : There are two pairs of lateral sinuses i.e., superior lateral sinus more commonly called lateral sinus and inferior lateral sinus also known as basal sinus. The superior lateral sinuses are located in between the superior lateral lobes and the apical lobe, whereas, the inferior lateral sinuses are located in between the superior lateral lobes and inferior lateral lobes. This is not present in leaves with three lobes.

- (i) Width : For this, the maximum width of the sinus (Fig. 2) was taken into account, and the sinuses were categorised as :
  - (i) Closed —lobes overlapping so that the sinus is not apparent
  - (ii) Perforate—lobes are overlapping above, not near the base so that the sinus appears as a hole through the leaf
  - (iii) Narrow —width less than the depth, when the lobes are close together but not touching
  - (iv) Wide —lobes are wide apart
- (ii) Depth : The depth of the sinuses was considered from the deepest point (base) to the average perpendicular height of the two teeth on the sides. The lateral sinuses may be of the following categories on the basis of their depths. (Fig. 3 and Fig. 4)
  - (i) None —except the petiolar
  - (ii) Shallow —penetrating less than one-third of the way to the petiole
  - (iii) Medium —penetrating almost half way to the petiole
  - (iv) Deep —penetrating two-thirds of the way to the petiole
  - (v) Very deep  
or Foliate —penetrating to the petiole

*Petiolar sinus* : The sinus at the attachment of the petiole to the leaf is known as petiolar sinus, i.e., a petiolar sinus is formed and bound by the petiolar lobes. In 1879, the International Ampelographic Commission at its Congress at Budapest recognised three main classes of petiolar sinus, namely, open, closed and irregular. The authors recognised two classes each on the basis of nature of the sinus and its width and depth. These are (Fig. 5 and Fig. 6):

- (i) Closed —the lobes are overlapping
- (ii) Narrow —width less than depth
- (iii) Medium—width is about equal to depth
- (iv) Wide —width is more than depth

The superior, inferior and petiolar sinuses were further classified as :  
(i) V-shaped, and (ii) U-shaped.

Of the above listed characters, the depth and width of the sinuses have been found to be considerably stable varietal characters, provided leaves are selected from 7th to 9th nodes. Bioletti (1938) has attached lot of ampelographic value to petiolar sinus. He, however, determined the shape of the sinus by the angle formed between main, secondary and tertiary veins. In the present studies, however, the ratio between length and breadth of various sinuses has been taken into account to lend them some descriptive value.

(d) *Lobes* : A lobe refers to the main divisions of the indented leaf and it corresponds to the main veins originating at the petiole of the leaf. The vine may have either entire leaves or leaves with 3, 5 or 7 lobes (Fig. 7). The variations in the number of lobes are principally due to the differences in number, depth and shape of the sinus. The lowest, middle and uppermost leaves on a shoot differ appreciably. A typical *vinifera* leaf has 5 lobes—two inferior lateral lobes, two superior lateral lobes and the apical lobe. In *labrusca* and *vinifera* hybrids, the lobe number is usually three. The number of lobes in leaves has been determined on the following basis.

- (i) Entire (without lobes)—when upper sinus is zero, i.e., when its value is equal to the length of terminal tooth of corresponding lobe
- (ii) 3-lobed (tri-lobed) —in this case lower lateral sinus is absent. If the upper sinus, i.e., between the middle nerve and the first lateral nerve has the value of at least 2 teeth
- (iii) 5-lobed —if the lower sinus, i.e., between the two lateral nerves, is clearly marked
- (iv) 7-lobed —if other sinus occurs between branches of the main vein, the leaf becomes 7-lobed

Often, the number of lobes have been found to vary considerably on the same vine of a variety. The lowest and the uppermost leaves are sometimes entire, while, the middle leaves are lobed. Leaves from 7th to 12th internodes gave fairly uniform characters including that of lobes and were only used in the present studies. The following broad classes can be made on the basis of the number of lobes:

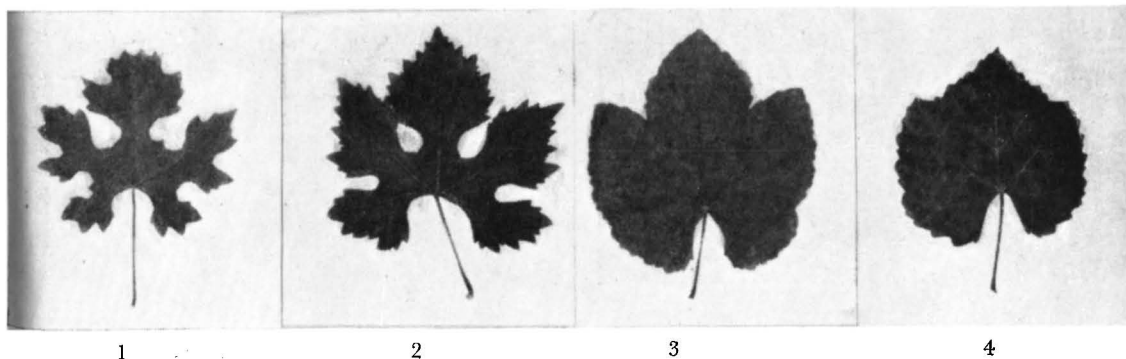
- (i) Variable : —When the leaves are entire, 3 or 5-lobed in the same variety. Such variations have been found in case of hybrids between *vinifera* and *labrusca* such as Concord (36)
- (ii) 3-lobed —Lake Emerald (76)
- (iii) 3 to 5-lobed—usually found in *labrusca*  $\times$  *vinifera* hybrids; Barbarossa (9) and Large White (77)



Fig. 6 Nature of Petiolar Sinus : 1. Perforate

2. U-Shaped

3. V-Shaped.



7. Number of Lobes : 1. 7-Lobed

2. 5-Lobed

3. 3-Lobed

4. Entire

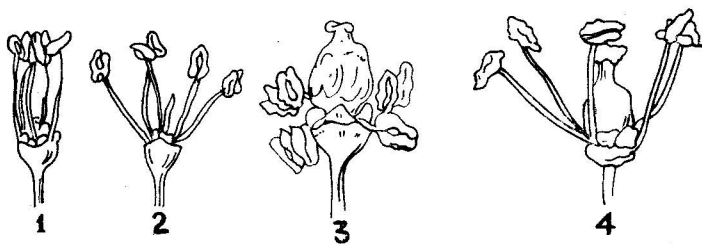


Fig. 8 Types of Flowers : 1-2. Male Flower 3. Hermaphrodite Flower (Stamens reflected)

4. Hermaphrodite Flower (Stamens Upright)

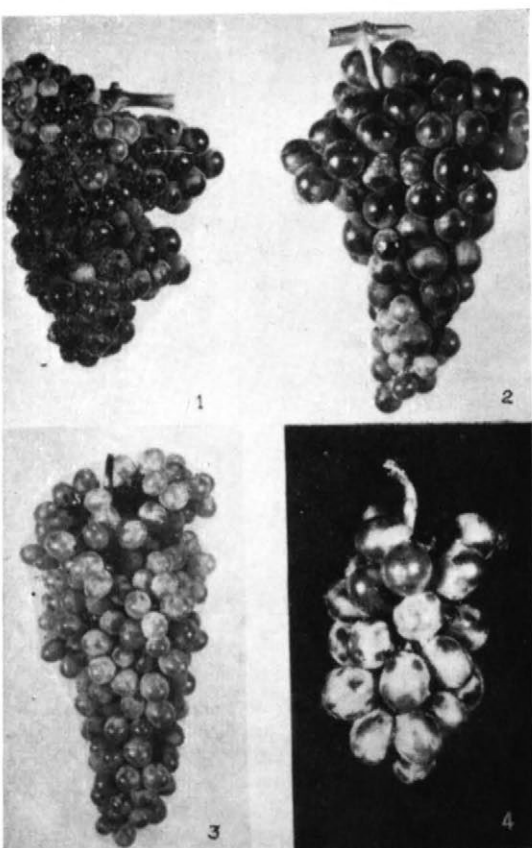


Fig. 9 Shapes of Bunches : 1. Short conical 2. Conical  
3. Cylindrical 4. Globular.

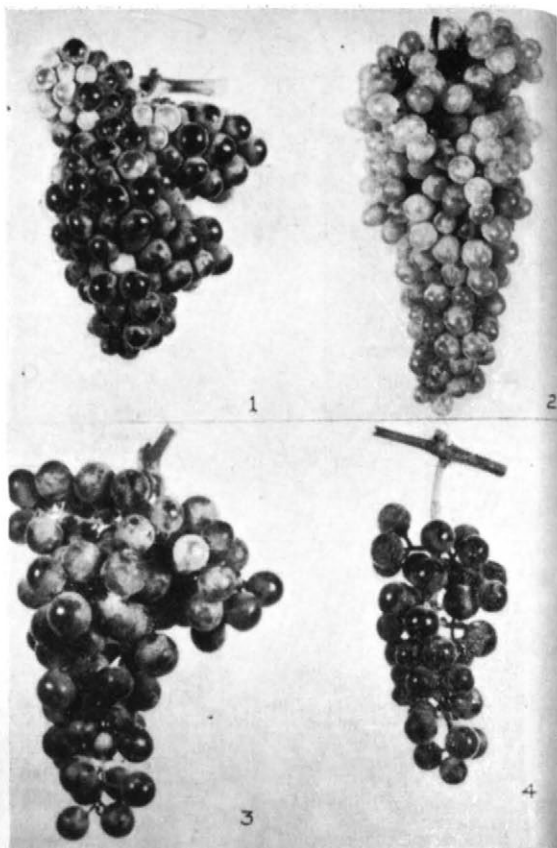
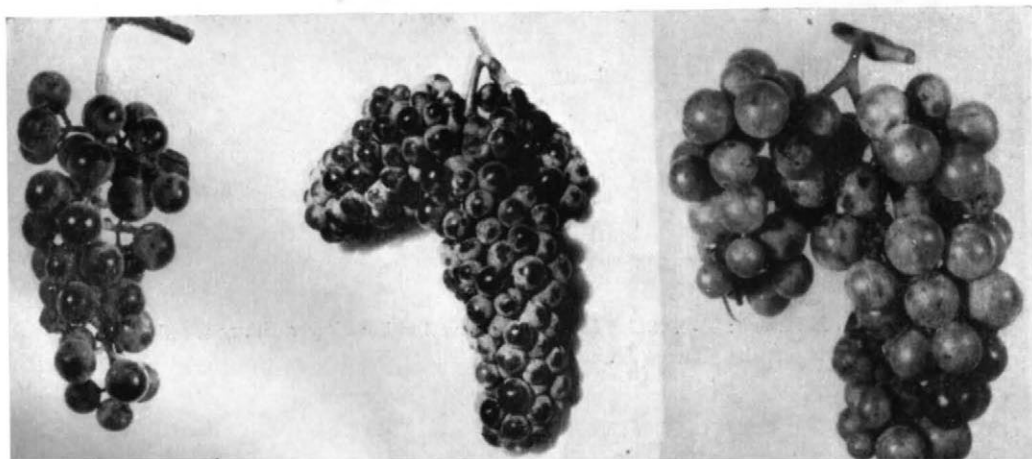


Fig. 11 Degree of compactness in Grape Bunches :  
1. Very Compact 2. Compact 3. Well filled  
4. Loose.



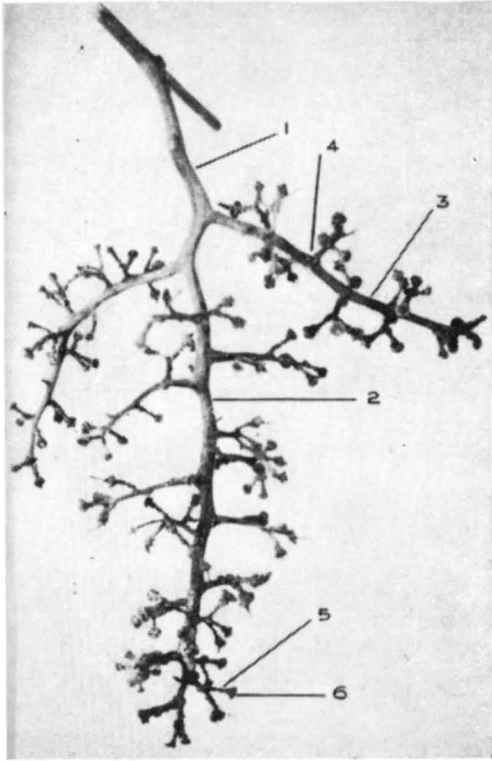


Fig. 12 Parts of a Grape Rachis : 1. Peduncle  
2. Rachis 3. Primary Branch 4. Secondary  
5. Pedicel 6. Torus

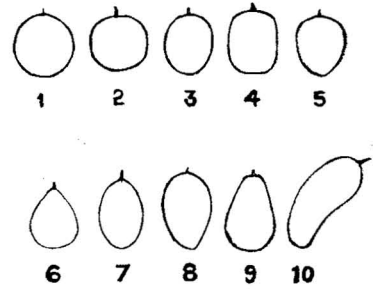


Fig. 13 Various shapes of berries :  
1. Spherical 2. Oblate 3. Ellipsoidal 4. Cylindroidal  
5. Ovoid 6. Obovoid 7. Ellipsoidal Elongated 8. Ovoid Elongated 9. Obovoid Elongated 10. Falcoid (Adapter from Bioletti, 1938).

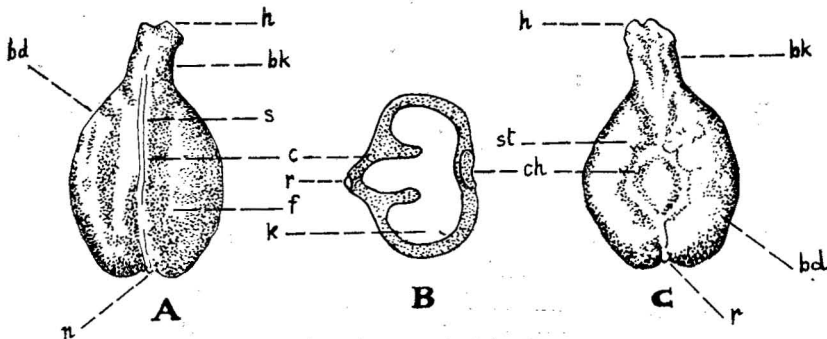


Fig. 14 Various Parts of a Grape Seed : A. Ventral surface B. Section C. Dorsal Surface bd, Body ; bk, Beak ; C, Carina (Keel) ; ch, Chalaza ; h, Hilum ; K, Kernal ; n, Notch ; r, Raphe ; S, Sulcus ; St, Striation. (Reproduced from Bioletti, 1938).

- (iv) 5-lobed —Usually found in varieties of *v. vinifera* such as Anab-e-shahi (3), Bhokri (12) and Cardinal (26)
- (v) 5 to 7-lobed—as in Bourvic (23) and Pirovano (100)
- (e) *Size* : The size should be determined on the basis of six representative leaves selected on each of the four vines as suggested by Bioletti (1938). Such leaves, i.e., those on 7th, 8th and 9th canes are considered as representative and uniform. In the present descriptions, 24 leaves of each variety were taken for such measurements. For taking measurements, ordinary millimeter graph paper can be used as suggested by Bioletti (1938).

The length of the leaf was measured from the terminal tooth of the middle nerve along the same to the top of the highest tooth of the petiolar lobe. Similarly, the width was measured on the basis of maximum distance between two opposite lateral lobes. The area was calculated by multiplying average length by average width. On this basis, the leaves were classified as :

- (i) Small —less than 100 sq. cm
- (ii) Medium —between 100-150 sq. cm
- (iii) Large —between 150-200 sq. cm
- (iv) Very large—more than 200 sq. cm
- (f) *Thickness* : On the basis of the thickness leaves may be grouped as :
  - (i) Thick—when it feels bulky between the fingers
  - (ii) Thin —when it is paper like
- (g) *Texture* : It may be :
  - (i) Leathery or tough to the touch
  - (ii) Soft or brittle—when it can be easily injured mechanically by wind or handling
- (h) *Pubescence* : On the basis of pubescence the International Ampelographic Commission adopted the following three classes at Florence during 1877 and later at Budapest during 1879; Leaves glabrous, felt like and wooly on lower surface. Singh and Singh (1940) also recognised three classes, namely, glabrous, downy and felt like. The authors, however, recognised the following five classes :

- (i) Glabrous —pubescence absent excepting a small amount of upright hair on the nerves on the under surface
- (ii) Cob-webby—only slight pubescence and hairs are interwoven with each other
- (iii) Downy —moderate amount of pubescence which can be rubbed off easily
- (iv) Wooly —when hair tend to accumulate into small groups or masses which do not rub off easily
- (v) Felted —when hair form a closely adhering cover of heavy pubescence

With the above five types of pubescence, the varieties studied can be classified into six different groups, namely, (i) glabrous above and below;

(ii) glabrous above and cob-webby or downy below; (iii) glabrous above and wooly below; (iv) downy above and downy below; (v) downy above and wooly below and (vi) cob-webby or downy above and felted below.

On the basis of degree of pubescence on the full-grown leaves, the *vinifera* varieties, fall mostly in groups 1 to 4, whereas, interspecific hybrids between *labrusca* and *vinifera* fall in groups 5 and 6. Singh and Singh (1940) and Sharma (1960) also considered pubescence of leaves as an important character, next only to the shape of the leaf, in their classification. Galet (1951) has also considered hairiness of the organs specially leaf as a basic ampelometric feature.

### 3. Dentition

The margin of the vine leaf is always more or less divided. These divisions are known as teeth. Teeth can also be defined as comparatively small, angular or rounded indentations of the margin of a leaf. Each tooth occurs at the terminus of a main, secondary or a tertiary vein. These teeth differ in size, form and number.

The size of the tooth has been observed to differ according to the order of the vein with which it is associated.

(a) *Series of teeth* : There is a tendency to an alternation of teeth of two or three series as the teeth of principal vein are largest and those of secondary and tertiary veins smaller. The average size decreases with the order of the vein. The teeth can be classified as :

- (i) One series—when the difference between the teeth of various orders is not very significant. This usually occurs in hybrids
- (ii) Two series—when the difference of size between the teeth of the main vein and of their main branches is not great. In this case, there is a fairly regular alternation of small and large teeth and they are said to be in two series
- (iii) Three series—when the teeth of various orders differ considerably, i.e., 5 larger teeth correspond to 5 main veins, about 15-25 moderately larger teeth correspond to second vein occurring between very larger teeth and somewhat larger number, i.e., 20-25 small teeth correspond to tertiary veins occurring between the moderately larger teeth. The teeth are then said to be in three series and irregular

(b) *Number of teeth* : The total number of teeth of a full-grown leaf, including all series, is fairly constant within certain limits on a normal leaf from about the 7th to the 9th node of the cane. This was indicated by the results of counting of several leaves of each of the three series. In various series it was recorded and the following categories were made :

- (i) Few —less than 50
  - (ii) Medium—from 50-65
  - (iii) Many —more than 65
- (c) *Acuteness of teeth* : The relative size of the teeth, expressed by  $h/b$  has shown distinct difference within various varieties. On the basis of ratio of height ( $h$ ) of the tooth to its breadth ( $b$ ) teeth on the main veins as also on primary and secondary veins have been classified by Singh and Singh (1940) as :
- (i) Very narrow— $h/b$  ratio is 1 or more
  - (ii) Narrow — $h/b$  ratio is 0.75 to 1
  - (iii) Broad — $h/b$  ratio is 0.50 to 0.75
  - (iv) Very broad — $h/b$  ratio is less than 0.50

#### 4. Petiole

It is the stem or leaf stalk by which the leaf is attached to the cane.

(a) *Size in relation to leaf blade* : Berg (1959) recommends the following three visual classes:

- (i) Short —noticeably shorter than the leaf
- (ii) Medium—about the same length as the leaf
- (iii) Long —noticeably longer than the leaf

The authors however, place more reliability on actual measurements.

Depending on the ratio of the petiole length ( $P$ ) to the leaf length ( $L$ ) of 24 leaves, the following three classes can be made:

- (i) Short — $P/L$  ratio less than 0.60
- (ii) Medium— $P/L$  ratio less than 0.60 to 0.90
- (iii) Long — $P/L$  ratio more than 0.90

(b) *Colour* : The colour of the petiole was differentiated into green, green mixed with purple shade and purple.

(c) *Pubescence* : The petioles may be glabrous or pubescent.

The relative length of the petiole or colour of the petiole has not been found to be of much value and varies considerably with the position of the leaf. Leaves growing rapidly in full sunlight have usually shorter petioles. The colour of the petiole varies with age and exposure to light and does not offer any stability for its use with certainty in classification and identification.

#### C. PANICLE AND FLOWER CHARACTERS

The flower buds in the early stages are surrounded by bract-like structures, which are either glabrous with purplish streaks or pubescent. The flowers may be perfect (hermaphrodite) or unisexual (imperfect) (Fig.8) and the stamens in a flower may be upright or reflexed. Moog (1934) classified grape varieties into four categories, which he called (i) female pseudo-hermaphrodite group, (ii) the male pseudo-hermaphrodite group which

occasionally produces berries, (iii) the male pseudo-hermaphrodite group which does not produce berries and (iv) the male group proper. Dix and Magness (1937) grouped 221 grape varieties developed in the United States into two groups, viz., varieties with upright stamens and those with reflexed or partially reflexed stamens. Avramov (1955) also grouped the vine varieties into two main groups on the same lines as Dix and Magness (1937).

The level of anthers in relation to stigma also offers distinct variation. On the basis of relative height of anthers and stigma, the flowers can be grouped into the following three categories (Fig.8):

- (i) Anthers slightly lower than stigma. Stamens shorter than pistil
- (ii) Anthers at the level of stigma. Equal to pistil
- (iii) Anthers higher than stigma. Longer than pistil

Bruni (1947) mentioned that in *Vitis vinifera* three distinct types of flowers can be seen. (1) Male or stamen bearing flowers in which the pistil is absent or abortive and the stamens have long erect filaments, (2) perfect hermaphrodite flowers in which the filaments are fairly long, erect and spread out, with anthers at about the same height and (3) wrongly named female flowers in which the filaments curve backwards or round the anthers being some distance below.

In the present studies, the relative anther and pistil height, though used in description, has not been made use of in classification.

## D. FRUIT CHARACTERS

The importance of fruit characters over leaf characters has been emphasised by various workers like Dix and Magness (1937), Bioletti (1938), Teodorescu (1940), Krimbas (1941, 1943-49), Blaha and Stefka (1951), Berg (1959) and Chadha (1965). All these workers considered that fruit characters, mainly colour, shape and size were of prime importance for classification, whereas, vegetative characters were only of secondary importance. Important fruit characters are detailed below.

### 1. Ripening

(a) *Period* : This is an important character for grape classification. Other things being equal, different varieties take different number of days from the date of flowering to ripening. This criterion can be used on a limited scale for distinguishing varieties from one another. However, time of ripening is known to be modified by the climate and to a limited extent with vine vigour and the amount of the crop. It has, however, been felt that even after leaving due allowance for these factors various varieties have a tendency to ripen more or less early or late.

According to Perold (1927), Pulliat in 1876 (Perold, 1927) was the first to use the time of ripening as an important criterion in grape variety

descriptions and classifications. He chose variety Chasselas Dore as a starting point and made the following groupings :

- (i) Early varieties—those ripening more than six days before Chasselas Dore
- (ii) Varieties of the first period of maturity—those ripening not more than five or six days before or after the Chasselas Dore
- (iii) Varieties of the second period of maturity—those ripening twelve to fifteen days after those of the first period
- (iv) Varieties of the third period of maturity—those ripening twelve to fifteen days after those of the second period
- (v) Varieties of the fourth period of maturity—those ripening after those of the third period

He recognised four classes each ripening 12 or 15 days after the preceding class and a fifth class which he called 'precose' or very early.

He recommended and applied his systems in his works *Le Vignoble, Mille varieties de vignes* and *Courses de viticulture et al ampelographie* (Mas et Pulliat, 1874-79; Pulliat, 1888).

Davitaja (1950), while discussing the various classifications of vines, also mentioned that the order in which some varieties ripen may change from one area to another. In recent years, Cosmo (1959, 1960), also classified the dessert varieties, grown in Italy into seven groups according to the time of maturity, the first two groups, ripening respectively 20-30 days and 10-20 days before Chasselas Dore. Chadha (1965) also used three broad categories on the basis of the time of ripening, i.e. early, medium late and late ripening and found this character useful to a certain extent.

Some workers have also attempted to classify varieties in a similar way on the basis of amount of heat necessary to bring grapes to maturity. This avoids uncertainty of dates of ripening, which differ greatly with region and location.

However, it has been felt that there are so many other factors involved that it is difficult to rely on this factor alone. According to Bioletti (1938), the amount of heat is usually calculated by adding the mean temperature above 0°C of every day from the time of bud break to the full ripeness of the fruit. But the temperature sums arrived at in this way are also misleading as it is assumed that all increments of temperature are of equal value for the development of the vine. However, Davitaja (1950) found the sum of temperature required by a variety to reach maturity as a reliable criteria. On this basis he established five main groups with an interval of 400°C between them.

Another criterion using the number of days for maturity has been used by Joshi (1961). According to him the period of maturity in different

varieties varies from 110 to 140 days after flowering. Using this, he described varieties as:

- (i) Early — Ripening within 110 days from flowering
- (ii) Medium—Ripening from 110-125 days of flowering
- (iii) Late —Ripening after 125 days of flowering

The authors used the following criterion for describing the ripening time in Delhi and found it to be useful within the same year.

- (i) Early —Ripening from last week of May to first week of June
- (ii) Medium—Ripening during 2nd to 4th week of June
- (iii) Late —Ripening in first week of July and after

(b) *Nature of ripening of berries*: The nature of ripening of berries in a bunch is another important character used to separate grape varieties by Chadha (1965). He found that varieties were either uniform ripening or uneven ripening in a certain locality. A large number of varieties also did not ripen at all and remained green even till October, when left on the vine in North India. This character was found to be constant throughout a 3-year study. In general, interspecific hybrids between *labrusca* and *vinifera* and other species were characterised by uneven or never ripening characters. Another group of varieties similar in all characteristics was also characterised typically by uneven ripening. This character has, however, a limited value as the same varieties which do not ripen or ripen unevenly under one set of conditions, ripen uniformly under a different set of agro-climatic conditions.

## 2. Cluster

The grapes grow in a cluster (compound raceme or panicle), which in cultivated varieties varies greatly in weight, number of berries, form and compactness. The cluster grows in the same position as the tendril, i.e., at the side of a node opposite to a leaf. The various characters of a cluster are discussed below:

(a) *Size*: The size of the cluster depends on the size and number of berries it contains and these in turn depend on the variety, environmental conditions of the vine and relation of total weight of the crop to the productive capacity of the vine. So this character has a limited value for ampelography because of the wide range within a variety. It may, however, be useful in extreme cases or with varieties that are reasonably constant in size of cluster. For example, Chasselas Blanco (33) has extremely small and Fakhri (45) extremely big bunches. Similarly, Bharat Early (11) has reasonably uniform bunch size. Berg (1959) attached considerable importance to this character.

On the basis of weight (average of ten clusters), the following size classes are suggested:

- (i) Small —less than 100 g

- (ii) Medium —100-250 g
- (iii) Large —250-500 g
- (iv) Very large—more than 500 g

Similarly, on the basis of average bunch length the following classes are suggested:

- (i) Short —less than 10 cm
- (ii) Medium—10-15 cm
- (iii) Long —more than 15 cm

(b) *Form*: According to Chadha (1965), the cluster is very irregular and cannot be easily described in terms of geometrical form. There are also substantial variation in the cluster characters even on the same vine. The winged and shouldered nature of the cluster has, however, been found to be a typical character of a group of varieties and helps a long way in identifying a particular group from the other varieties.

A cluster may be globular, short conical, long conical, conical or cylindrical in shape (Fig. 9). Also it may be :

- (i) Shouldered—A bunch with one or more sub-clusters entirely covered with berries and closely attached by short stem to main stem or peduncle above the top of the cluster (Fig. 10)
- (ii) Winged (Branched)—A bunch with one or more distinct clusters separately attached by long or medium stems to the main stem or the peduncle above the top of the cluster (Fig. 10)
- (iii) Double cluster—A bunch with a large wing giving the impression of a double cluster on one peduncle

(c) *Compactness*: The relative compactness of a cluster is a fairly constant varietal character. It refers to the degree with which the berries are arranged in the cluster and depends on a number of characters like size and number of berries, length of the stem, branches and pedicels, crop load and environmental factors. The degree of looseness may further be increased abnormally by a failure of some of the flowers to set. As such, this character could not be used with stability in classification and identification of grape cultivars. However on this basis the grape varieties can be grouped into four classes, namely, Loose, Well-filled, Compact and Very compact. (Fig. 11).

### 3. Stem

The size and form of the cluster vary with structure of its frame work (Fig. 12) upon which the berries are suspended. The various characters of important parts of stem are discussed below.

(a) *Peduncle*: It is the stem by which the cluster is attached to the cane. The colour of the peduncle and the presence or absence of pubescence and warts are important characters in its description. Besides, its size and

texture also lend useful clues. Based on mean length of 10 peduncles, the peduncle size falls in the following categories:

- (i) Short —less than 2 cm
- (ii) Medium—2 to 4 cm
- (iii) Long —more than 4 cm

Similarly, on the basis of thickness, the peduncle can be classified as:

- (i) Thin —Diameter less than 3 mm
- (ii) Medium—Diameter 3 to 4 mm
- (iii) Thick —Diameter more than 4 mm

On the basis of texture, the peduncle can be categorised as woody or herbaceous; brittle or tough.

(b) *Rachis*: It is the main axis of the cluster. On the basis of the length of the rachis, the following classes were made:

- (i) Short —less than 10 cm
- (ii) Medium—10 to 15 cm
- (iii) Long —more than 15 cm

Similarly, on the basis of thickness, it can be classified as:

- (i) Thin —Diameter less than 2.5 mm
- (ii) Medium—Diameter 2.5 to 3.5 mm
- (iii) Thick —Diameter more than 3.5 mm

(c) *Pedicel*: Pedicel is the small stem by which the berry is attached to the cluster. The pedicels may arise from primary, secondary or tertiary branches. They vary in size from variety to variety. Length and thickness of 30 pedicels taking 10 berries from 3 bunches was used for making various classes. On the basis of length, the following classes were made:

- (i) Short—less than 5 mm
- (ii) Long—5 mm and above

Similarly, on the basis of thickness (as diameter in the middle), the following classes were made:

- (i) Thin —Diameter less than 1.5 mm
- (ii) Thick—Diameter 1.5 mm and above

Depending upon the texture of the pedicel, it may be smooth or warty. Further, the adherence of the pedicel with the berry may be:

- (i) Weak—when the berry is detached easily without breaking the skin
- (ii) Firm—when brush pulls out of the berry instead of breaking from the pedicel

(d) *Torus*: The end of the pedicel towards the berry is a thickened, rounded and pappilate body known as 'torus'. It is the receptacle of the floral parts to which the berry remains attached, after the flower parts have fallen. On the basis of diameter the torus is categorised as:

- (i) Small—Diameter less than 4 mm
- (ii) Large—Diameter 4 mm and above

The torus may be smooth or rough.

(e) *Brush*: This is the bundle of conducting vascular strands passing through the torus to the berry. When a berry is pulled from the pedicel the vascular bundle in part remains attached to the torus and is called the brush. The colour and size of the brush vary with varieties and the maturity of berries. Based on length, the brush is categorised as:

- (i) Short—less than 3 mm
- (ii) Long—3 mm and above

On the basis of diameter, the brush is classed as:

- (i) Thin —Less than 3 mm
- (ii) Thick—3 mm and above

#### 4. Berry

Some characters of the berry offer important distinguishing measures within grape varieties. These are detailed below:

##### *EXTERNAL CHARACTERS*

(a) *Colour*: Of the various fruit characters, Helbling (1777), Katz (1936), Dix and Magness (1937), Bioletti (1938), Berg (1959) and Chadha (1965) attached importance to the colour as the first primary character for classification. The first attempt to classify grape varieties on the basis of colour was made by Helbling (1777), who classified grape varieties into three colour groups, namely, blue, red and white. G. Molon in 1893 (from Perold, 1927) and later workers like Dix and Magness (1937) and Bioletti (1938), however, considered black instead of blue. Lucas (1874) divided grape varieties into five colour classes, namely, green, yellow, grey, red and blue but the Commission on Ampelography in 1875 reduced these classes to two, i.e., coloured and white.

Katz (1936) however, made three classes on the basis of colour, namely, (i) white, (ii) pink, red and purple; and (iii) black. B. Oerb (1959) grouped the grape varieties into five classes on the same basis. He introduced two more colour classes, namely, green and brown. Chadha (1965) used two major colour classes in the classification of varieties on the basis of combined fruit and vegetative characters and three colour classes in classification based only on fruit characters. The colours used in the latter category are white (green), reddish and black.

It may, however, be cautioned that the presence of bloom on the skin usually modifies the colour. Colour is also affected by ripeness. So the exact degree of maturity for describing the colour is of utmost importance to enable it to be a useful character in classification.

The colour of grapes to be used for juice, wine or other manufacturing purposes is characterised and measured by the kind and amount of colour that can be extracted from the whole grape by maceration,

heating, fermentation or any similar manufacturing process. It differs in varieties in hue (quality), brightness (quantity) and stability (durability).

The locality and temperature have a distinct influence on colour development. In very hot regions, pigment formation of red and black grapes is inhibited while in cooler climates the colour development is enhanced. Some delicately coloured grapes become too dark in colour when grown in the cooler regions.

Observations on berry colour should be recorded when the bunches are fully mature. In varieties, which do not ripen under a given agro-climatic condition, observations should be taken on berries which ripen fully. On the basis of visual observations, fully developed and ripe berries have been classified as white or green, red and black. There are many variations under each group. Some of the variations in colour as described by Bioletti (1938) and used in the description are :

- (i) White-green, green, yellow, yellowish green, golden yellow
- (ii) Red-pink, light red, bright red, brick red
- (iii) Black-dull red, purple, reddish black, bluish black

(b) *Bloom* : Most varieties have bloom when mature. Bloom is a powdery external coating present on the berries. It modifies the colour of the grape and if undisturbed adds much to their beauty. The quantity of bloom varies with different varieties and may be light or heavy. Further, the bloom may be easily removable or stable.

(c) *Form* : Another important fruit character, according to Helbling, is shape of the berries, which he divided into two categories, namely, round and oval. Goethe (1878) suggested only three berry shapes, namely, round, elongated and indefinite. G. Molon in 1893 (From Perold, 1927) used this character in his primary classification with three categories, namely, round, oval or long. In 1877, the International Ampelographic Commission adopted at Florence three shapes of berries, viz., round, elongated and indefinite shape. Bioletti (1938) also considered shape and size of the berries next to colour. On the basis of these, the varieties could be further classified into three groups in each case. For shape, the classes were round, oval and irregular. Singh and Singh (1940) divided grape berries into five groups, viz., spherical, short oval, oval long oval and irregular. Chadha (1965) is of the opinion that there are large fluctuations of form within the same variety. Therefore, it is safer only to use two broad categories, i.e., round and elongated. For describing normal and fully developed berries, various terms as oblate spherical ellipsoidal, ovoid, obovoid, ellipsoidal-elongate, ovoid-elongate, cylindroidal, or falcoid can be used (Fig. 13). He further recommended that these shapes should be derived on the basis of quantitative measurements.

As in colour, Bioletti (1938) suggests the use of common words which cover a certain range of ideas for the general groups and more precise terms for the sub-groups. The classification suggested by him is as follows :

- (i) Round —Spherical, oblate
- (ii) Oval, short—Ellipsoidal, cylindroidal, ovoid, obovoid
- (iii) Oval, long —Ellipsoidal, cylindroidal, ovoid, obovoid
- (iv) Irregular —Truncate, pointed, fusiform, falcoid, falcoid-elongated

A broad classification of berry shape depending upon length and diameter ratio can be as follows :

- (i) Rounded —when the ratio of length to diameter (L/D) is less than 1.33
- (ii) Elongated—when the ratio of length to diameter (L/D) is more than 1.33

(d) *Size* : The size of berry again is a very variable character. It varies within the same cluster from berry to berry and is also modified by climate and agro-techniques. However, under a given set of conditions relative differences can be made out on the basis of average quantitative measurements. Size can be expressed in terms of diameter, volume or weight. Singh and Singh (1940) categorised berries into four different divisions namely, small, medium, large and very large, with diameter less than 10, 15 and 20 and more than 20 mm respectively, a similar classification into three groups, viz., small, medium and large has been made on the basis of size of berry by Chadha (1965). These terms, however, must be understood as relative and with reference to local conditions. According to Chadha (1965), the average size should be considered on the basis of size of 100 randomly selected berries in a bunch and not on the basis of 10 largest berries as suggested by Bioletti (1938). Though, the size can be expressed in terms of volume, diameter or weight, only the latter two criteria were found useful by Chadha (1965). Especially, size on the basis of weight gives more accurate comparison and its magnitude is more easily determined than the other criteria for expressing size.

Two types of averages can be taken. Bioletti (1938) suggests that average size of the largest berries found on a good cluster or a number of clusters grown under optimum conditions may be the best for classification. It is, however, felt that such an average is likely to give an erroneous picture about the size of the berry of a variety as the average size may be far less than the average of the best berries. In the present studies, the size was, therefore, represented on the basis of average weight of 100 random berries and the following classes were made :

- (i) Small —less than 1.0 g/berry
  - (ii) Medium—1.0 to 3.0 g/berry
  - (iii) Large —more than 3.0 g/berry
- (e) *Adherence* : This character is determined normally in terms of force in the form of weight required to detach a berry from its pedicel (Bioletti, 1938). Adherence of berry is important especially for grapes which have to be packed, shipped or stored. In some cases, berries detach during handling.

In others, adherence is very strong. In the present study only method of detaching berries by hand was made use of and the adherence was classified as :

- (i) Weak —When berry can be detached easily without breaking the skin
- (ii) Strong—When the berry is pulled out of the berry instead of breaking from the pedicel
- (f) *Apex* : It is the lower or tip end of berry and may be truncate, pointed or depressed.

### SKIN

Amongst the fruit characters, the nature of the skin of the mature berry, i.e., whether separating freely from the pulp or adherent to the pulp has been used in the present studies as of primary importance in separating varieties belonging to *V. labrusca* or its hybrids with *V. vinifera* and those belonging to pure *vinifera* group. In the latter case, the skin and pulp of mature berry have been found to be cohering. This character is, therefore, only useful for separating group of varieties within a species. The various characters of skin are described as under :

Adherent or slip skin—adhering to pulp or separating as a whole piece from the pulp

Skin may be thin or transparent with the result that veins below are visible or may be translucent.

According to thickness, skin may be thin, medium or thick.

The texture of the skin may be tender, medium, tough or cracking.

### PULP

Flesh or pulp offers variations in its colour, texture and the concentration of juice it contains.

The colour of the flesh may be green, white, yellow, golden, pink, or red. The texture of the flesh may be watery, melting, tender or tough or soft, firm or crisp. The juice may be very sweet, sweet, acid, very acid or astringent.

Some ampelographers also used groupings based on flavour. According to Bioletti (1938) this is of little use except to those who have a trained sense of taste. Such marked flavours as those of the muscats or of the *labrusca* varieties can be recognised by nearly every palate, but the delicate flavours, which distinguish many, perhaps most *vinifera* varieties can be recognised and clearly distinguished by comparatively few. They cannot be exactly measured nor very clearly described even by those who look at them well. This limits their value in classification. Flavours in grapes differ both qualitatively and quantitatively but owing to their elusive and almost indescribable nature, they are difficult to use as a basis upon which to establish

groups. Four groups with simple or neutral, aromatic, musky and foxy flavour may be made, wherever necessary.

Besides pulp, the quantity of juice in different varieties was determined and its colour, nature and taste were recorded.

### QUALITY

Besides morphological characters observations on quality are also useful for assessing a variety under a given agro-climatic condition. Observations on the following aspects may be useful.

(a) *Total soluble solids* : The total soluble solids can be determined with a hand refractometer.

(b) *Titrateable acidity* : The acidity can be estimated in terms of grams tartaric acid per 100 cc. of juice. The juice can be extracted and filtered simultaneously by passing it through clean, starch free muslin cloth. Five ml. of juice titrated against standardized N/10 NaOH by direct titration method (A.O.A.C., 1945), immediately after extraction of juice gives the titrateable acidity.

### 5. Seed

A majority of the grape varieties are seeded. According to Bioletti (1938), no grape variety is known which is absolutely free from seeds, perfect or abortive. The so called seedless grapes are those in which berries are nearly always without seeds or in which the berries in most cases contain only imperfect small soft rudimentary seeds, which usually pass unnoticed.

Seed characters have been considered very useful in the identification of grape varieties. Bioletti (1938), Hedrick (1938), Krimbas (1941), Olmo (1942) and Dragas *et al.* (1958) have laid emphasis on seed characters to distinguish the grape varieties otherwise similar in most of the characters. Bioletti (1938) classified vinifera varieties on the basis of average number of seeds per berry, weight of an average seed and morphology of seeds parts such as body, beak and keel. Olmo (1942) reported that the mature seed, as judged by its weight, length and width measurements, was even more constant than other fruit characters. He observed that although the seed length may increase appreciably with increase in berry size, the width remains constant, irrespective of the change in the size of berry. In 1946, he found correlation between seed weight and berry weight, the type of seed found in mature berries and their frequency and correlation between seed number and berry weight. Krimbas (1941) also pointed out that the ratio of length of berry to length of seed has proved one of the more stable characters for use in identification.

Dragas *et al.* (1958) made a study of some important morphological characters of seed in 24 grape varieties. Amongst the seed characters studied were shape, length, width and thickness, width-length ratio and weight.

These varied considerably between and within the 24 varieties examined, but in some cases were constant enough to serve in identifying the origin. However, seed dimensions and weight varied with locality, year and variety.

Chadha (1965) also found seed characters to be very stable and useful and separated grape varieties on the basis of qualitative and quantitative seed characters. Of all the seed characters studied by him, the nature and position of the chalaza was found to be the most stable and primary character of significant value in ampelography. Accordingly, he divided chalaza into eight distinct categories using the following characters, i.e., whether circular or oval (2), raised or sunken (2), located centrally or below centre (2). Next to the nature of chalaza, the size of the seed represented by length, breadth and weight is very important. The weight of the seeds when taken after air drying the seeds in the laboratory for two or three weeks has been found to be a stable varietal character; the objection in weight of fresh seeds being that the seeds are hygroscopic and consequently vary in weight with the humidity of the air. The other indices of size, viz., length and breadth though very stable are very time consuming and troublesome. For classifying grape varieties, on the basis of the seed size, 64 classes can be used employing combination of four classes, each formed on the basis of length, width and weight. So, only taking characters of chalaza and seed size into consideration  $64 \times 8 = 512$  various classes can be made. The number of seeds in a berry can only be used with advantage when conditions are alike and favourable and a number of berries are examined.

The various parts of a seed are described in Fig. 14.

(a) *Number* : The average number of seeds per berry was calculated for each variety from 100 berries taken at random from five bunches, 20 berries per bunch. On the basis of number of the seeds, the following categories were made :

- (i) Few —upto 100
- (ii) Medium —from 100-200
- (iii) Many —from 200-300
- (iv) Very many—more than 300

(b) *Size* : On the basis of different measurements on length, width and thickness, the seeds were classified as :

- |        |                 |                   |
|--------|-----------------|-------------------|
| Length | (i) Very short  | —less than 5.5 mm |
|        | (ii) Short      | —5.5 to 6.0 mm    |
|        | (iii) Medium    | —6.1 to 6.5 mm    |
|        | (iv) Long       | —6.6 to 7.0 mm    |
|        | (v) Very long   | —more than 7.0 mm |
| Width  | (i) Very narrow | —less than 3.5 mm |
|        | (ii) Narrow     | —3.5 to 4.00 mm   |
|        | (iii) Medium    | —4.1 to 4.5 mm    |
|        | (iv) Broad      | —more than 4.5 mm |

- Thickness (i) Thin —less than 3.0 mm  
 (ii) Medium—3.0 to 3.3 mm  
 (iii) Thick —more than 3.3 mm
- Weight The size of seed is best given by weight. On the basis of weight of 100 air dried seeds, these were classified as :  
 (i) Small —less than 2.5 g/100 seeds  
 (ii) Medium —between 2.5 to 3.5 g/100 seeds  
 (iii) Large —between 3.5 to 4.5 g/100 seeds  
 (iv) Very large—4.5 g and above/100 seeds
- (c) *Form* : The body of the seed may be round, cuneate, oblong, elongated or flattened.
- (d) *Texture* : The seed may be soft, medium or hard.
- (e) *Taste* : The seeds may be tasteless, harsh or astringent in taste.
- (f) *Adherence* : The seeds may be adherent or non-adherent to flesh.
- (g) *Location* : The seeds are located in the berry either centrally or towards the basal portion.
- (h) *Chalaza* : The chalaza can be described according to its position on the body of the seed into the following classes :  
 (i) Above centre, medium or below centre  
 (ii) Circular or oval  
 (iii) Distinct or not  
 (iv) Raised or sunken
- (i) *Beak* : The beak may be :  
 (i) Straight or incurved  
 (ii) Rough, wrinkled or smooth

On the basis of average of 20 length measurements, the beak was classified as :

- (i) Short —less than 2.0 mm  
 (ii) Medium—2.0 to 2.5 mm  
 (iii) Long —more than 2.5 mm

On the basis of characters described in the previous pages the following descriptive blank can be used for grape variety descriptions.

## E. AMPELOMETRY IN VINE CLASSIFICATION

Many workers on ampelography have stressed the use of biometrical measurements in the identification of grape varieties. The suggestions on this aspect were made as early as 1876 when during the fourth session of the International Ampelographic Commission in Marburg, H. Goethe for the first time proposed to take the angle made by the two main lateral nerves with the middle nerve as the basis for classification. His brother, R. Goethe found that this value remained constant with one and the same variety.

In recent years, Galet (1951) and Rodrigues (1939, 1941, 1942 a and b,

1948, 1950, 1952, 1955) have been the two advocates of use of ampelometry in vine classification and have tried to find out the usefulness of various measurements in identifying and separating rootstocks, varieties, species and hybrids. Rodrigues (1939) described details of taking leaf-measurements. There are indications that very careful measurements in the identification of three distinct regions of the leaves of the hybrids show significant differences (Rodrigues, 1942). Rodrigues (1955) discussed the role of fruit-measurements in the identification of vine varieties. Rodrigues and Macedo (1959) used the leaf-measurements and the discriminant equations for characterising vine rootstocks.

Carvalho *et al.* (1941-42) also regarded various linear and angular measurements of the leaf veins and the relative dimensions of the leaf and considered it useful in identification.

Stoeff and Radoutchev (1944-45) discussed the importance of an exact method of describing the vine leaf as a means of identifying the variety and the problems which arise especially in connection with the changes the leaf undergoes during development are discussed with reference to the Bulgarian grape varieties.

Capria and Vega (1956) working with grape varieties of South America, studied some ampelographic measurements of vine, from the point of view of varietal diagnosis. They made a detailed statistical study and found relationship between (1) vein length, (2) angle between veins, (3) length of petiole and length of main central vein, (4) distance of primary leaf indents from the petiole functions and lengths of lateral main veins of value definite in identification of grape varieties.

Galet (1956) still insists on ampelometric system. However, the sub-committee for the ampelography made a decision that the fundamentals of a uniform system of ampelographic descriptions were to be defined on universal scale. Branas (1959) has, however, pointed out that ampelometry has very limited application for identification, which demand the collection of large number of samples of a reference. Martin and Neague (1940) pointed out that although vine leaf measurements are determined by variety, environment and stock, they are not sufficiently distinctive to permit of varietal discrimination.

It is finally concluded that the biometric methods may have some value in the recognition of varieties but are not sufficiently precise to replace the traditional methods of identification.

## DESCRIPTIVE BLANK

### A. General Characters of the Vine

#### I. VIGOUR

(a) Trunk: Thin; Medium; Thick.

- (b) Vigour: Poor; Medium; Vigorous.

## II. BARK

- (a) Nature: Adherent; Loose; Very loose.  
 (b) Length of the ribbon: Short; Medium; Long.  
 (c) Nature of the ribbon: Thin; Thick. Narrow; Broad. Compact; Fissured. Brittle; Flexible.  
 (d) Colour of the underbark: Light Brown; Medium Brown; Dark Brown.

## III. CANES

- (a) Colour: Dark Brown; Brown; Light Straw; Greyish.  
 (b) Length: Short; Medium; Long.  
 (c) Thickness: Thin; Thick.  
 (d) Branching: Few; Medium; Many.  
 (e) Pubescence: Glabrous; Pubescent.

## IV. BUDS

- (a) Apex: Broad; Pointed.  
 (b) Colour: Bright Tinted; Brown.  
 (c) Pubescence: Glabrous; Pubescent.  
 (d) Growth Initiation: Very Early; Early; Medium Late; Late.

## V. GROWING SHOOT

- (a) Colour: Non-pigmented; Pigmented.  
 (b) Pubescence: Glabrous; Cob-webby; Downy; Wooly; Felted.

## VI. TENDRIL

- (a) Colour: Green; Pigmented.  
 (b) Sequence: Continuous; Intermittent; Irregular.  
 (c) Nature: Simple; Bifid; Trifid; Tetrafid; Pentafid.  
 (d) Length: Short; Medium; Long.  
 (e) Pubescence: Glabrous; Pubescent.  
 (f) Surface: Smooth; Warty.  
 (g) Thickness: Thin; Thick.

# B. Leaf Characters

## I. UNFOLDING LEAVES

- (a) Colour :  
 (b) Pubescence: Glabrous; Cob-webby; Downy; Wooly; Felted.

## II. FULL-GROWN LEAVES

- (a) Colour  
 (b) Form: Orbicular; Cuneiform; Cordate; Reniform; Pentagonal.  
 (c) Lobes: Entire; 3-lobed; 5-lobed; 7-lobed.  
 (d) Size: Small; Medium; Large; Very Large.  
 (e) Thickness: Thin; Thick.  
 (f) Texture: Smooth; Rough.  
 (g) Pubescence (above and below): Glabrous; Cob-webby;

Downy; Wooly; Felted.

(h) Sinus:

Superior Lateral Sinus:

- (i) Width: Closed; Perforate; Narrow; Wide.
- (ii) Depth: None; Shallow; Medium; Deep; Very Deep.
- (iii) Shape: V-shaped; U-shaped.

Inferior Lateral Sinus:

- (i) Prominence: Prominent; Inconspicuous.
- (ii) Width: Closed; Perforate; Narrow; Wide.
- (iii) Depth: None; Shallow; Medium; Deep; Very Deep.
- (iv) Shape: V-shaped; U-shaped.

Petiolar Sinus:

- (i) Width: Closed; Narrow; Medium; Wide.
- (ii) Shape: V-shaped; U-shaped.

### III. DENTITION

- (a) Series: One-series; Two-series; Three-series.
- (b) Number of Teeth: Few; Medium; Many
- (c) Terminal Teeth:
  - (i) Length: Short; Medium; Long.
  - (ii) Acuteness: Very Narrow; Narrow; Broad; Very Broad.
  - (iii) Nature: Pointed; Blunt.
- (d) Teeth of other series:
  - (i) Length: Short; Medium; Long.
  - (ii) Acuteness: Very Narrow; Narrow; Broad; Very Broad.

### IV. PETIOLE

- (a) Size in relation to leaf blade: Short; Medium; Long.
- (b) Colour: Green; Purple pigmented.
- (c) Pubescence: Glabrous; Pubescent.

## C. Inflorescence Characters

- (a) Flower buds: Glabrous; Pubescent.
- (b) Nodes at which inflorescence appear.
- (c) Sex: Staminate; Pistillate; Hermaphrodite.
- (d) Stamens:
  - (i) Nature: Upright; Reflexed.
  - (ii) Relative height of stamen and pistil: Stamens at the level; higher or lower than pistil.

## D. Fruit Characters

### I. RIPENING

- (a) Period: Early; Medium; Late.
- (b) Uniformity: Even; Uneven.

## II. CLUSTER

- (a) Size: Small; Medium; Large; Very Large. Short; Medium; Long.
- (b) Form: Regular; Globular; Conical; Short Conical; Long Conical; Cylindrical.  
Irregular: Shouldered; winged.
- (c) Compactness: Loose; well-filled; Compact; Very Compact.

## III. STEM

1. *Peduncle*

- (a) Colour:
- (b) Pubescence: Glabrous; Pubescent.
- (c) Warts: Present; Absent.
- (d) Size: Short; Medium; Long. Thin; Medium; Thick.
- (e) Texture: Herbaceous; Woody; Brittle; Tough.

2. *Rachis*

- (a) Colour:
- (b) Size: Short; Medium; Long. Thin; Medium; Thick.
- (c) Primary and Secondary Branches: Few; Many. Short; Medium; Long.

3. *Pedicel*

- (a) Branching : from primary, secondary or tertiary branches.
- (b) Size: Short; Long. Thin; Thick.
- (c) Texture: Smooth; Warty.
- (d) Adherence: Weak; Firm.

4. *Torus*

- (a) Size: Small; Large.
- (b) Texture: Smooth; Rough.

5. *Brush*

- (a) Colour.
- (b) Size: Short; Long. Thin; Thick.

## IV. BERRY

1. *External characters*

- (a) Colour:
  - (i) White: Green; Yellowish Green; Yellow; Golden Yellow.
  - (ii) Red: Pink; Light Red; Bright Red; Brick Red.
  - (iii) Black: Dull Red; Purple; Reddish Black; Bluish Black.
- (b) Bloom: Present; Absent. Light; Heavy. Removed Easily; Not Removed Easily.
- (c) Form: Oblate; Spherical; Ellipsoidal; Ovoid; Obovoid; Ellipsoidal-Elongate; Ovoid-Elongate; Cylindroidal; Falcoid.
- (d) Size: Small; Medium; Large. Less Variable; Moderately Variable; Highly Variable.

- (e) Adherence: Weak; Strong.
- (f) Apex: Truncate; Pointed; Depressed.

## 2. *Skin*

- (a) Adherence of Pulp: Adherent; Slip Skin.
- (b) Transparency: Poor; Medium; Good.
- (c) Thickness: Thin; Medium; Thick.
- (d) Texture: Tender; Medium; Tough.
- (e) Taste: Sweet; Neutral; Harsh.

## 3. *Pulp*

- (i) Colour.
- (ii) Transparency: Poor; Medium; Good.
- (iii) Texture: Firm; Crisp; Soft; Tough; Melting.
- (iv) Veins: Visible; Prominent; Not Prominent.
- (v) Flavour: Musky; Foxy; Aromatic; Neutral.
- (vi) Taste: Very Sweet; Sweet; Acid; Sub-Acid.
- (vii) Juice:
  - (i) Colour: White; Red; Blue;
  - (ii) Nature: Turbid; Clear.

## 4. *Quality*

- (a) Total soluble solids (%).
- (b) Tartaric Acid (%).
- (c) Juice (%).

## 5. *Seeds*

- (a) Number: Few; Medium; Many; Very Many.
- (b) Size:
  - (i) Length: Very Short; Short; Medium; Long; Very Long.
  - (ii) Width: Very Narrow; Narrow; Medium; Broad.
  - (iii) Thickness: Thin; Medium; Thick.
  - (iv) Weight: Small; Medium; Large; Very Large.
- (c) Form: Round; Cuneate; Oblong.
- (d) Texture: Soft; Medium; Hard.
- (e) Taste: Tasteless; Harsh; Astringent.
- (f) Adherence to Flesh: Adherent; Non-adherent.
- (g) Location: Centre; Below Centre; Above Centre.
- (h) Chalaza:
  - (i) Above Centre; Medium; Below Centre.
  - (ii) Circular; Oval.
  - (iii) Distinct; Not Distinct.
  - (iv) Raised; Sunken.
- (i) Beak:
  - (i) Length: Short; Medium; Long.
  - (ii) Nature: Smooth; Rough. Incurved; Wrinkled.

## CHAPTER 3

# DESCRIPTION OF VARIETIES

### 1. ALAMWICK

*Vines* vigorous. *Bark* loose and detaches in long, broad, thick, smooth and fissured straps. *Canes* brown, long, thick, glabrous; internodes medium long. *Buds* broad at apex, covered with brown pubescence and pink tinted. *Growing shoots* green with purple patches, glabrous or almost so. *Tendrils* green, intermittent, bi- and tri-fid, thick, medium long, glabrous.

*Unfolding leaves* variously pigmented; pale green in colour with copper coloured margins; cob-webby above and below. *Full-grown leaves* orbicular, 5-lobed, large, moderately thick, smooth; glabrous above and below. Superior lateral sinus medium deep, narrow, perforated; inferior lateral sinus narrow, shallow, V-shaped; petiolar sinus narrow, acute and V-shaped. Teeth in 3-series, many in number, narrow; primary teeth very narrow, secondary teeth very broad. Petiole yellowish green, medium long.

*Flowers* hermaphrodite, stamens upright, anthers higher than stigma. *Inflorescence* appears on 4th to 6th nodes.

*Bunches* attractive, large, medium long, long conical to cylindrical, shouldered, rather compact. Peduncle light green, medium long, medium thick, glabrous, devoid of warts. Rachis light green, medium long, thick; primary branches many, short; secondary branches few and short. Pedicels arising mostly from primary branches, long, thin, glabrous, warty, warts few. Torus small, rough. Brush pigmented, long and thin.

*Berries* bright red to brick red, oval ellipsoidal, large; size moderately variable; bloom thin, easily removable; apex rounded, adherence medium strong. Skin adherent to pulp, thick, tough, transparency medium. Pulp firm, crisp, juicy, slightly aromatic; veins prominent. Juice clear and sweet.

*Seeds* medium in number (1-4; av.2), very long, broad, very large, oblong, hard, tasteless, non-adherent; chalaza circular, raised and located below centre; beak long, straight and rough.

Ripening uneven in North but fairly uniform under West Indian conditions; mid-season maturing in 2nd to 3rd week of June in North and middle of March in Poona. Quality medium (T.S.S. 16-18%) in Delhi and Lucknow (U.P.), but quite good (T.S.S. 18-20%) in Abohar (Punjab), Hissar (Haryana) and Poona (Maharashtra). Acidity 0.5 to 1.0%, juice 65-75%. Medium cropper; yields better on arbour than on kniffin system.

It is susceptible to rust and highly susceptible to downy mildew.

## 2. ALBANY SURPRISE

*Vines* medium in vigour. *Bark* very loose and detaches in medium long, medium wide, thin, smooth and fissured straps from the stem. *Bark* of canes also detaches into papery thin straps. *Canes* long, medium thick; internodes long. *Buds* broad at apex, covered with brown pubescence and pink tinted. *Growing shoots* greyish green, wooly. *Tendrils* greyish green, irregular, slender, medium long, bi- and tri-fid, highly pubescent.

*Unfolding leaves* greyish green above and silvery white below. Border of the leaf beautifully pigmented; pubescence wooly above and below. *Full-grown leaves* orbicular, 3-5 lobed, large, thick, rough; cob-webby above and downy beneath. Superior lateral sinus shallow, narrow, wide; inferior lateral sinus almost absent; petiolar sinus narrow, acute, V-shaped. Teeth in 3-series, many in number, apical tooth broad, pointed; primary teeth narrow; secondary teeth broad. Petiole greyish green with purplish streaks, short.

*Flowers* hermaphrodite, stamens upright, anthers at the same level as stigma. *Inflorescence* appears on 2nd to 4th nodes from the base.

*Bunches* small, medium long, cylindrical to globular, well filled. Peduncle light green, medium long, medium thick. Rachis light green, short, thick; primary branches many, short; secondary branches few, short. Pedicels arising mostly from primary branches, long. Torus thick, rough. Brush cream coloured, long and thin.

*Berries* yellowish green, oblate, medium large; size moderately variable; bloom thin, easily removable; variable; apex truncate, medium in adherence. Skin slip skin type, thick, tough, transparency poor to medium. Pulp soft, melting. Juice clear, greenish yellow, insipid in taste.

*Seeds* dark brown; medium in number (1-4; av.2), medium long, broad, large, thick, hard, tasteless, non-adherent; chalaza round, sunken and located below centre; beak medium long.

Introduced in India from New Zealand. Ripening not uniform in Delhi, late, last week of June to first week of July. Quality poor, T.S.S. 12%, acidity 1%, juice 80%. A medium cropper.

It is resistant to anthracnose and *Cercospora* leaf-spot.

## 3. ANAB-E-SHAHI

*Vines* very vigorous. *Bark* very loose and detaches in long, broad, thick, rough and fissured straps. *Canes* brown, long, thick, glabrous; internodes long. *Buds* broad at apex, covered with brown pubescence. *Growing shoots* green with purple streaks, glabrous or almost so. *Tendrils* yellowish green, purplish at base, intermittent, bi- and tri-fid, thick, long, smooth, glabrous or almost so. (Fig, 15)

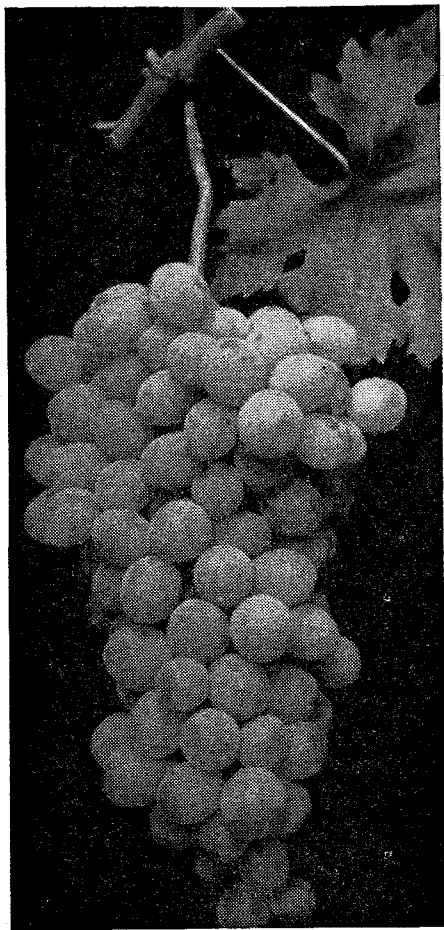


Fig. 15 Anab-e-Shahi

*Unfolding leaves* variously pigmented; green mixed with brown streaks on the body and brownish margin; downy above and below. *Full-grown leaves* cuneiform, 5-lobed, large, thin, smooth; upper surface green, lower surface light green; glabrous above and below. Superior lateral sinus medium deep to deep, narrow to wide, perforated, V-shaped; inferior lateral sinus prominent, medium deep, V-shaped; petiolar sinus medium wide, acute and U-shaped. Teeth in 3-series, medium in number, narrow; primary teeth very narrow; secondary teeth broad. Petiole deep purple, long, glabrous.

*Flowers* hermaphrodite, stamens upright, anthers higher than stigma. *Inflorescence* appears on 5th to 7th nodes.

*Bunches* very attractive, medium large to large (400-600 gm) medium long, cylindrical to long conical, neither shouldered nor winged, wellfilled to moderately compact. Peduncle light green, medium long, thick, glabrous, devoid of

warts. Rachis light green, medium long, medium thick; primary branches many, short; secondary branches few and short. Pedicels arising mostly from rachis and primary branches, long, medium thick, glabrous, warty, warts numerous. Torus small, rough. Brush creamy white, long and thin.

*Berries* greenish yellow when raw and amber when fully ripe, ovoid elongated, medium large, size moderately variable; bloom thick, not easily removable; apex round, adherence strong. Skin adherent to pulp, medium thick, medium tough, transparency poor. Pulp firm, crisp, flavour neutral, slightly insipid; veins prominent. Juice clear and sweet.

*Seeds* many (1-6; av.2-3), long, medium broad, medium large, round,

soft, astringent, non-adherent; chalaza oval, raised, and located below centre; beak medium long, incurved and rough.

It was introduced in Hyderabad by Abdul Baquer Khan from the Middle East around 1890. The original name of this variety is not known. Its present name 'anab' meaning grape and 'shahi' was conferred by the Nizam of Hyderabad to whom the bunches were presented during 1943. It is considered by some to be synonymous with Malta.

Ripening is uniform, mid-season to late, i.e., last week of June to mid July in North and March-April in Maharashtra, Deccan and South.

Quality is average in North and good in South and West India. T.S.S. 14-16%, acidity 0.5 to 0.6%; juice 55-75%. Susceptible to cracking in the case of early rains in North India.

Very light cropper on kniffin and head system but very prolific bearer on overhead bower system. Average yield 35,000 kg/ha (Phadnis, 1965) yields up to 80,000 kg/ha have been reported from Maharashtra and Andhra Pradesh.

Keeping quality is good. It can stand shipping well and remains fresh for a week after harvest. It has a good export potential. Recent consignments of this variety sent by Andhra Pradesh Government to Singapore and Malaysia have evoked a favourable response from the importers and there seems to be adequate scope for sale of this variety in these markets (Indian Institute of Foreign Trade, 1968).

It is one of the most important commercial grape varieties of India. It has wide range of adaptability in different soil and climate conditions, prolific yields, attractive large bunches and berries and good shipping qualities. In Baramati area of Maharashtra it is performing exceedingly well on soils with pH around 8.5. In North India, good quality is obtained only in arid irrigated tracts of Abohar (Punjab), Ganganagar (Rajasthan) and Hissar (Haryana). In humid regions and years of early monsoons, berries become watery and insipid. It is cultivated intensively in Andhra Pradesh and now in Maharashtra, Gujarat and Mysore States. Its only defect is low sugar content.

It is highly susceptible to rust, powdery mildew and downy mildew, moderately susceptible to anthracnose and resistant to *Cercospora* leaf-spot. In Hyderabad, it has been found susceptible to stem borer even in very well maintained vineyards.

#### 4. ANGUR KALAN

*Vines* medium in vigour. *Bark* adherent and detaches in short, narrow, thick and fissured strips. *Canes* medium long, thick; internodes medium long. *Buds* broad at apex, covered with brown pubescence. *Growing shoots*

green with purplish streaks; glabrous. *Tendrils* purplish at base, intermittent, bi- and tri-fid, long, glabrous.

*Unfolding leaves* variously pigmented; cob-webby above and below. *Full-grown leaves* orbicular, entire to 3-lobed, medium large, medium thick, smooth; glabrous above and below. Superior lateral sinus shallow, wide; inferior lateral sinus almost absent; petiolar sinus medium wide, V-shaped. Teeth medium in number, apical tooth broad, pointed. Petiole medium long, green above, reddish below.

*Flowers* hermaphrodite, stamens upright, anthers at a lower level than stigma. *Inflorescence* appears on 3rd to 5th nodes.

*Bunches* attractive, large, long, cylindrical, slightly shouldered, loose to well filled. Peduncle light green, long, medium thick. Rachis light green, long, thick; primary branches many, medium long; secondary branches few. Pedicels arising mostly from rachis and primary branches, short. Torus thick, rough. Brush greenish white, long.

*Berries* golden yellow with pinkish blush when fully ripe, oblate, large, size highly variable; bloom thin, easily removable; apex truncate, adherence strong. Skin medium thick, adherent to pulp, transparency poor. Pulp firm, juicy. Juice greenish yellow, clear.

*Seeds* few (1-3; av.1), cuneate, long, medium broad, thick, heavy, pinkish brown; chalaza oval, sunken, located in the middle; beak short.

Introduced from U.S.S.R. Ripening is uniform, midseason, 3rd week of June in Delhi, 4th week of March and 1st week of April at Hessaraghatta (Mysore State). Quality is good. T.S.S. 18-20%, acidity 0.6-0.7%, juice 70-80%. Prolific bearer. This variety is male sterile and could be a useful parent in hybridization programme. It has been reported to be resistant to anthracnose and powdery mildew and moderately susceptible to *Cercospora* leaf-spot.

## 5. BAILY ALICANTE

*Vines* low to medium in vigour. *Bark* adherent and detaches in short, narrow, fissured straps. *Canes* short, thin; internodes medium long. *Buds* pointed at apex, covered with brown pubescence. *Growing shoots* purplish, downy. *Tendrils* greyish green, purplish at base, intermittent, bi- and tri-fid, medium long, cob-webby,

*Unfolding leaves* greyish green above and silvery white below; border of the leaf beautifully pigmented; wooly above and below. *Full-grown leaves* orbicular, 3-5 lobed, large, thick, rough; glabrous above, cob-webby below. Superior lateral sinus shallow, perforated; inferior lateral sinus shallow, wide; petiolar sinus, narrow to closed, V-shaped. Teeth many, apical tooth broad, pointed. Petiole purplish, short.

*Flowers* hermaphrodite, stamens upright, anthers longer than the stigma. *Inflorescence* appears on 3rd to 5th nodes.

*Bunches* small, medium long, conical to cylindrical, shouldered, loose, peduncle short, medium thick, glabrous or almost so. Rachis short, thin; primary branches short; secondary branches few. Pedicels arising mostly from rachis and primary branches, medium long. Torus large, smooth. Brush yellowish green, short.

*Berries* light red, oblate, small, highly variable; bloom thin, easily removable; apex pointed, adherence medium. Skin adherent to pulp, medium thick, transparency poor. Pulp melting; juice pinkish yellow, clear, sweet.

*Seeds* cuneate, medium in number (1-4; av.1-2); medium long, broad, medium thick, medium heavy, hard, non-adherent; chalaza circular, sunken and located in the centre.

An introduction from Japan. Ripening is uniform, mid-season, 3rd week of June in Delhi. Quality good. T.S.S. 19-20%, acidity 1.0%, juice 75-80%. Light to medium cropper.

## 6. BANGALORE BLUE

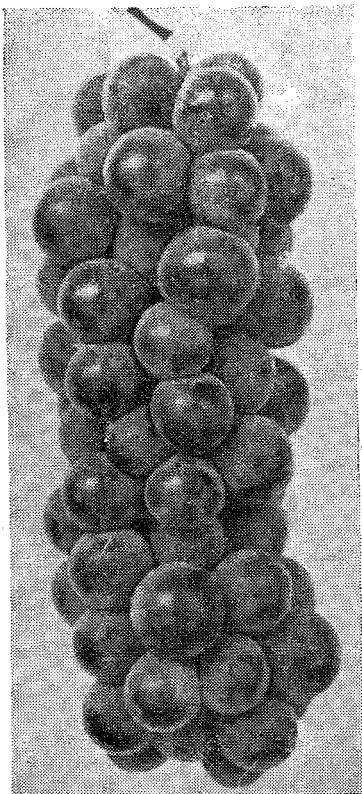


Fig. 16. Bangalore Blue

*Vines* vigorous. *Bark* very loose and detaches in long, very broad, thin, very smooth and almost compact straps; bark of canes also detaches into paper-thin straps. *Canes* brown, long, thick; internodes medium long. *Buds* broad at apex, covered with brown pubescence. *Growing shoots* green, medium thick, long, strongly pubescent. *Tendrils* irregular, mostly bi-fid, sometimes tri-fid, greyish green, thick, medium long, heavily pubescent. (Fig. 16)

*Unfolding leaves* greyish green above and silvery white below; some pinkish tinge along the margin of the leaves, above or (and) below or pink patches on the lamina surface; woolly above and below. *Full-grown leaves* cuneiform, entire or 3-lobed, rarely 5-lobed, very large, thick, rough; cobwebby above and felted below. Superior lateral sinus shallow, narrow to wide, V-shaped; inferior lateral sinus absent; petiolar sinus medium

wide, acute and V-shaped. Teeth in 3-series, purple pigmented, medium in number, broad; primary teeth narrow; secondary teeth very broad. Petiole medium long.

*Flowers* hermaphrodite, stamens upright, anthers higher than stigma. *Inflorescence* appears on 2nd to 6th nodes.

*Bunches* small, short, regular, globular to short conical, neither shouldered nor winged, well filled to compact. Peduncle light green, short, thin, pubescent, devoid of warts. Rachis light green, short, thin; primary branches few, short; secondary branches absent; pedicels arising mostly from rachis and primary branches, short, medium thick, warty. Torus small, rough. Brush purplish pigmented when berries ripe, long and thin.

*Berries* dark purple, ovoid to ellipsoidal, small, size less variable; bloom thick, not easily removable; apex pointed, adherence medium strong. Skin thick, slip skin type, rough, transparency poor. Pulp mucilaginous, juicy, foxy in flavour, veins visible but not prominent. Juice purple coloured, clear, pleasantly flavoured.

*Seeds* few in number (1-3; av.2), long, broad, very large, oblong, hard, astringent, non-adherent; chalaza oval, sunken, located below centre and extending up to raphe; beak short, straight and rough.

It is a *vinifera* and *labrusca* hybrid (Chatterjee and Randhawa, 1952). It is chiefly grown in Mysore State. Though mediocre as a dessert grape, it is being extensively used for making juice and wine in Mysore State and the products command a good market value. Juice is thick and of purple colour. Ripening is fairly uniform in the South. However, it does not ripen in the North even when bunches are left on the vine up to September-October and only a few berries turn colour. Quality is poor in North India and medium in South India. T.S.S. 16-18%, acidity 0.8-1.0% when fully ripe. Medium cropper. Keeping quality good. Does well both on kniffin and overhead bower system. It responds well to medium long pruning. It is amenable to staggering of pruning and can be made to yield a succession of crops. In Mysore State, two commercial crops are being taken by the grape growers each in February-March and August-September.

It is known for its hardiness and resistance to diseases. It has been found to be almost resistant to anthracnose and *Cercospora* leaf-spot, but susceptible to both powdery and downy mildews. It is being used in the breeding programmes to incorporate disease resistance in otherwise superior commercial grape cultivars.

## 7. BANGALORE PURPLE

*Vines* medium in vigour. *Bark* loose and detaches in long, broad, thick, smooth and highly fissured straps. *Canes* medium long, thick, internodes medium long. *Buds* broad at apex, covered with brown pubescence,

*Growing shoots* green with purplish streaks, strongly pubescent. *Tendrils* green, purplish pigmented, irregular, bi-fid, medium thick, medium long, smooth, heavily pubescent.

*Unfolding leaves* greyish green above and silvery white below (with colouration other than pink) and purplish or brownish at the margin; little older leaves have more brownish colour spread throughout the lamina; wooly above and below. *Full-grown leaves* 5-lobed, very large, thick, rough and leathery, glabrous above and wooly below. Superior lateral sinus shallow to medium deep, narrow, V-shaped; inferior lateral sinus inconspicuous; petiolar sinus narrow, V-shaped. Teeth in 3-series, medium in number, broad; primary teeth broad; secondary teeth broad. Petiole purplish, medium long, pubescent.

*Flowers* hermaphrodite, stamens upright, anthers at the level of stigma.

*Inflorescence* appears on 2nd to 5th nodes.

*Bunches* medium large, long, short conical, branched, well filled or compact. Peduncle light green, short, medium thick, glabrous, devoid of warts. Rachis green, medium long, medium thick; primary branches few, short; secondary branches few and short. Pedicels arising from rachis and primary branches; medium long, thin, warty, warts many. Torus small, rough, warty. Brush green, sometimes purple pigmented, medium long and thin.

*Berries* bluish black, spherical, medium large, size moderately variable; bloom thin, easily removable; apex truncate, adherence medium strong. Skin adherent to pulp, thick, tough; transparency poor. Pulp tender, melting, musky in flavour, veins prominent. Juice clear and slightly acidic.

*Seeds* medium in number (1-3; av.2), long, medium broad, large, round, soft, astringent, non-adherent; chalaza circular, raised and located below centre; beak medium long, incurved and rough.

This variety is considered to be synonymous with Bangalore Blue by Phadnis (1965) and Gandhi (1960). However, the vegetative and fruit characters of the two varieties are entirely different from one another.

This variety does not ripen uniformly in the North. Ripening is late, 4th week of June to 1st week of July. Bunches do not ripen fully. Susceptible to cracking and rotting in the North because of onset of rains; shot berries commonly found.

It is susceptible to rust and downy mildew and resistant to anthracnose and *Cercospora* leaf-spot.

### 8. BANQUI ABYAD

*Vines* poor to medium in vigour. *Bark* loose and detaches in short, narrow, thin, smooth, highly fissured and brittle strips. *Canes* short, thick; internodes short. *Buds* broad at apex, covered with brown pubescence. *Growing shoots*

deep purplish, glabrous or almost so. *Tendrils* green, deep purplish at base, intermittent, bi-fid, thick, short, glabrous or almost so.

*Unfolding leaves* variously pigmented; downy above and below. *Full-grown leaves* cuneiform, 5-lobed, small, thick, smooth, dark green; glabrous above and below. Petiole dark purplish medium long, glabrous.

*Flowers* hermaphrodite, stamens upright, anthers at the level of stigma. *Inflorescence* appears on 2nd to 5th nodes.

*Bunches* medium large, long, short conical to cylindrical, often shouldered, compact or very compact. Peduncle purplish, medium long, thin, glabrous, tough, devoid of warts. Rachis medium long, thin; primary branches many, long; secondary branches few. Pedicels arising mostly from primary branches, medium long, thin, rough, glabrous, warty, warts few. Torus small, rough. Brush green, long and thin.

*Berries* greenish yellow, spherical, sometimes oblate, medium large, size less variable, bloom thin, easily removable; apex truncate, adherence medium strong. Skin adherent to pulp, thin, tender, transparency poor to medium. Pulp firm, juicy, musky in flavour, very sweet, veins prominent. Juice slightly turbid, greenish and sweet.

*Seeds* many (1-6; av.2-3), narrow, small, oblong, soft, tasteless, non-adherent; chalaza oval, raised and located below centre; beak medium long, incurved and rough.

Ripening is uniform, early, 4th week of May to 1st week of June in North India. Quality is good. T.S.S. 20%, acidity 0.7%, juice 60-65%. Light cropper, slightly susceptible to cracking.

It is a green, seeded, early and very sweet grape variety. It is resistant to rust and *Cercospora* leaf-spot but susceptible to downy mildew and moderately susceptible to anthracnose.

## 9. BARBAROSSA

*Vines* medium in vigour. *Bark* loose and detaches in medium long, medium broad, thin, smooth and fissured straps. *Canes* long, thick, smooth, striped; internodes long. *Buds* broad at apex, covered with brown pubescence. *Growing shoots* green, purplish pigmented, fairly pubescent. *Tendrils* purplish at base, intermittent, bi-fid, rarely tri-fid, thick, medium long, heavily pubescent.

*Unfolding leaves* greyish green above and silvery white below (with colouration other than pink) and purplish or brownish at the margin; little older leaves have more brownish colour spread throughout the lamina; wooly above and below. *Full-grown leaves* cordate, 3 or 5-lobed, medium large, thick, rough and leathery; glabrous above and wooly below. Superior lateral sinus shallow, narrow, V-shaped; inferior lateral sinus shallow, V-shaped; petiolar sinus, deep and U-shaped. Teeth in 3-series,

medium in number, broad; primary teeth narrow; secondary teeth broad. Petiole green, medium long, thick.

*Flowers* hermaphrodite, stamens upright, anthers slightly higher than stigma. *Inflorescence* appears on 3rd to 4th nodes.

*Bunches* medium large, medium long, short conical or cylindrical, branched, compact. Peduncle green, short, thin, glabrous, devoid of warts. Rachis green, medium long, thin; primary branches few, short; secondary branches few. Pedicel arising from the primary branches and rachis, medium long, medium thick, warty, warts many. Torus small, rough. Brush bright pink, long and thin.

*Berries* purplish black, spherical, medium large, size highly variable; bloom medium thick, not easily removable; apex rounded, adherence weak. Skin adherent to pulp, thick, tough, transparency poor. Pulp firm, crisp, pleasant in flavour, veins very prominent. Juice clear and sweet.

*Seeds* many (2-4; av.3), medium long, medium broad, medium large, round, hard, astringent, non-adherent; chalaza oval, raised and located below centre; beak medium long, incurved and rough.

It is considered to be identical with varieties Danugue, Gros Guillaume (Perold, 1927).

Ripening not uniform in North, but uniform in South and Western India. Bunches do not ripen fully in Delhi. In Hessaraghatta (Mysore State) it ripens by the middle of March whereas at Poona it ripens by the end of March. Quality is poor in Delhi and medium in Poona, T.S.S. 18%, acidity 0.5%, juice 45-55% and very good at Hessaraghatta where T.S.S. goes from 20 to 22%. Pleasant when fully ripe. Responds well to short pruning.

It is resistant to anthracnose and *Cercospora* leaf-spot, but susceptible to powdery mildew.

## 10. BEAUTY SEEDLESS

*Vines* medium in vigour. *Bark* adherent and detaches in very short, rough and brittle straps. *Canes* purple pigmented, short, thin; internodes medium long. *Buds* broad at apex, covered with brown pubescence. *Growing shoots* green, purple pigmented, glabrous or almost so. *Tendrils* green, slightly purplish at base, intermittent, bi- and tri-fid (even tetra-, penta- and octa-fid tendrils found), slender, short, glabrous or so. (Fig. 17)

*Unfolding leaves* variously pigmented; glabrous or nearly so above and below. *Full-grown leaves* cuneiform, 5-lobed; sometimes 3-lobed, small, thin, smooth; glabrous above and below. Superior lateral sinus medium deep to deep, perforate to narrow, V-shaped; inferior lateral sinus shallow to medium deep, V-shaped. Teeth in 3-series, medium in number, broad; primary teeth narrow; secondary teeth very broad. Petiole dark purple, medium long and glabrous.

*Flowers* hermaphrodite, stamens upright, anthers higher than stigma.  
*Inflorescence* appears on 3rd to 5th nodes.

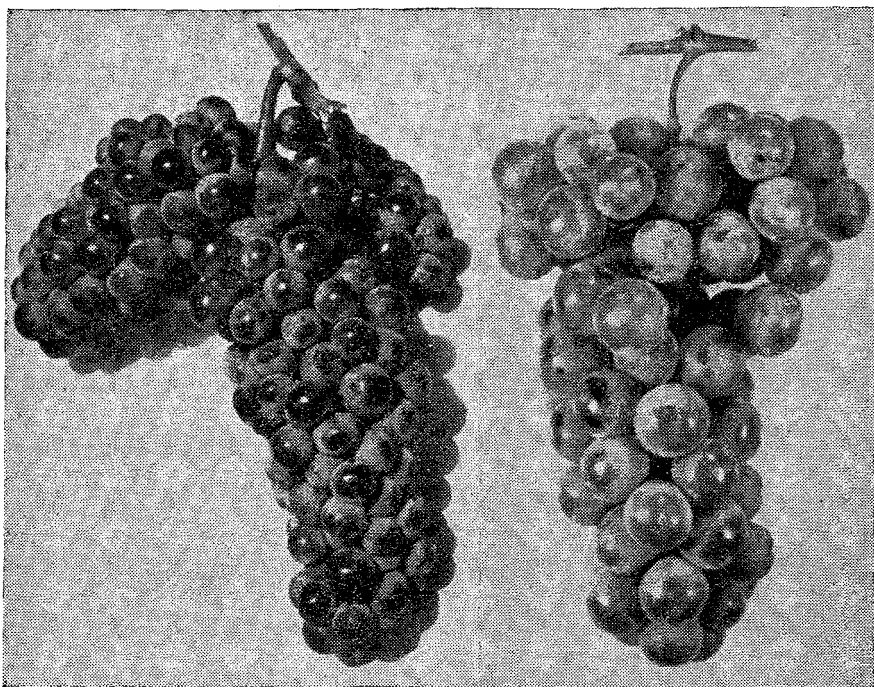


Fig. 17 Beauty Seedless

Fig. 18 Bharat Early

*Bunches* medium to large, long conical to cylindrical, shouldered, well filled to compact. Peduncle green, medium long, medium thick, glabrous, devoid of warts. Rachis green, medium long, medium thick; primary branches many, medium long; secondary branches few and short. Pedicels arising mostly from primary branches, medium long, thin, glabrous, warty, warts many. Torus small and rough. Brush green with slightly pinkish tinge, very long and thick.

*Berries* bluish black, spherical, small, size moderately variable; bloom thick, not easily removable; apex truncate, adherence strong, weak when over ripe. Skin adherent to pulp, thin, transparency poor. Flesh tender, watery, fairly sweet, flavour poor, veins not prominent. Juice turbid and slightly acidic.

*Seedless*, small, soft and rudimentary seeds found in some berries.

It is an introduction from California, the U.S.A. Ripening is fairly uniform, very early, end of May to first week of June in North India. Quality is good. T.S.S. 18-21%, acidity 0.6 to 1%, juice 70-75%. Keeping quality

low; berries shrivel if left on the vine for long. Prolific bearer. Bears well both on kniffin and head system but yields highest on overhead bower. Average yield about 35,000 Kg/ha. Yields up to 75,000 Kg/ha have been obtained on bower systems at Abohar, Punjab (Nauriyal *et al*, 1967).

It is an early ripening, coloured, seedless, sweet and prolific bearing grape. Its scope of cultivation is limited to only near big cities and towns, where it may find quick disposal. It has done well in the North in Punjab, Haryana, Delhi and U.P. On account of its high juice percentage, sweetness and heavy yield potential, it is likely to prove useful in the processing industry for juice and raisin making. It is not susceptible to cracking.

It is resistant to rust, moderately susceptible to anthracnose and *Cercospora* leaf-spot.

### 11. BHARAT EARLY

*Vines* medium in vigour. *Bark* adherent and detaches in short, rough and brittle straps. *Canes* short, thin; internodes medium long. *Buds* broad at apex, covered with brown pubescence. *Growing shoots* light green, glabrous or almost so. *Tendrils* intermittent, bi- and tri-fid, medium thick, medium long, glabrous (Fig. 18)

*Unfolding leaves* variously pigmented; cob-webby above and below. *Full-grown leaves* cuneiform, 3 or 5-lobed, medium large, thin, smooth, glabrous above and below. Superior lateral sinus shallow to medium deep, wide, V-shaped; inferior lateral sinus shallow, V-shaped; petiolar sinus narrow, acute and V-shaped. Teeth in 3-series, fair in number, narrow; primary teeth very narrow; secondary teeth broad. Petiole light purplish, long, glabrous.

*Flowers* hermaphrodite, stamens upright, anthers higher than stigma. *Inflorescence* appears on 5th to 7th nodes.

*Bunches* small to medium large, long, short conical to long conical, neither shouldered nor winged, well filled or compact. Peduncle green, medium long, medium thick, glabrous, devoid of warts. Rachis green, medium long, medium thick; primary branches few and medium long; secondary branches few. Pedicels arising mostly from rachis and primary branches, medium long, thick, glabrous, smooth and devoid of warts. Torus large and rough. Brush creamy white, medium long and thin.

*Berries* greenish, spherical to oblate, small, size less variable; bloom thin, easily removable, apex truncate, adherence weak to medium strong. Skin adherent to pulp, medium thick, tough, transparency poor. Pulp melting, watery, musky in flavour, veins visible, transparency very good. Juice clear and very sweet.

*Seeds* very many (1-5; av.3), short, very narrow, small oblong, hard,

tasteless, non-adherent; chalaza circular, raised and located below centre; beak medium long, incurved and smooth.

Ripening is uniform, mid-season, 3rd to 4th week of June in Delhi. Quality good. T.S.S. 20-22%, acidity 0.5-0.8%, juice 70-80%. Rotting starts if left on the vine for long. Light to medium cropper. Yields better on arbour than on kniffin system. Yields 12,000 to 15,000 Kg/ha on arbour when planted  $10' \times 10'$ .

This is a green, seeded mid-season variety with high T.S.S. and musky flavour and does well in North India. It is resistant to anthracnose and highly susceptible to *Cercospora* leaf-spot.

## 12. BHOKRI

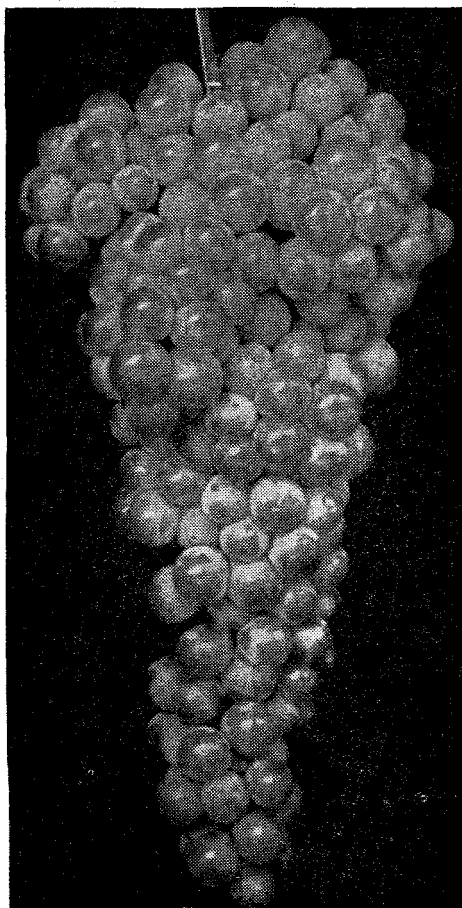


Fig. 19 Bhokri

*Vines* very vigorous. *Bark* adherent and detaches in short, narrow, rough and brittle straps. *Canes* purple, medium long, thick; internodes long. *Buds* broad at apex and covered with brown pubescence. *Growing shoots* green with purple patches, glabrous or almost so. *Tendrils* yellowish green, purplish at base, intermittent, bi- and tri-fid, thick, long, smooth, almost glabrous. (Fig. 19)

*Unfolding leaves* variously pigmented; purple at the margin with brown streaks on the body; downy above and below. *Full-grown leaves* orbicular, 5-lobed, large, thin, smooth; dark green above and light green below; glabrous above and below. Superior lateral sinus shallow, narrow, V-shaped; inferior lateral sinus shallow, less marked, V-shaped; petiolar sinus narrow, acute and V-shaped. Teeth in

3-series, medium in number, very narrow; primary teeth very narrow; secondary teeth narrow. Petiole purple, medium long, glabrous.

*Flowers* hermaphrodite, stamens upright, anthers higher than stigma. *Inflorescence* appears on 4th to 6th nodes.

*Bunches* large, long, long conical to cylindrical, sometimes shouldered, compact. Peduncle green, medium long, medium thick, glabrous, devoid of warts. Rachis green, medium long, medium thick; primary branches many, short; secondary branches few and short. Pedicels arising mostly from primary branches, medium long, medium thick, glabrous, warty, warts few. Torus small, rough. Brush creamy white, medium long and thin.

*Berries* greenish yellow, spherical, medium large size, moderately variable; bloom thin, not easily removable; apex truncate or pointed, adherence weak. Skin adherent to pulp, medium thick, medium tough, transparency weak. Skin adherent to pulp, medium thick, medium tough, transparency good, veins prominent. Pulp melting. Juice clear and sub-acid.

*Seeds* brownish black, medium in number (1-3; av.2), medium long, medium broad, medium large, round, hard, tasteless, slightly adherent; chalaza circular, raised and located below centre; beak medium long, incurved and rough.

This is believed to be one of the oldest varieties under cultivation in India. It was introduced in Deccan in 1838 under the name Bokhari. From Deccan, it was introduced into neighbouring districts of Nasik and Poona, where it came to be known as Bhokri (Pillay, 1968). It is also known as Nasik (Gandhi, 1960) and is synonymous with Pachadraksha grape grown near Madurai in Tamil Nadu.

Prior to 1950, it occupied nearly 99 per cent of the area under grape in Maharashtra, Tamil Nadu and Andhra Pradesh. Even now, it occupies nearly 40 per cent of the area under grape in Maharashtra and Tamil Nadu. In recent years, however, it has been losing its importance as a commercial variety and is being replaced by other varieties like Anab-e-shahi and Thompson Seedless.

Ripening is uniform, mid-season, middle of June to end of June in North India, last week of February to mid March at Hessaraghatta (Mysore). Quality is medium. T.S.S. 16-18%, acidity 0.5-0.8%, juice 60-75%. Berries crack with rain. Keeping quality not good; can be transported over long distances.

It is a very heavy yielder; annual yields go up to 60,000 Kg/ha both in Tamil Nadu (Krishnamurthi and Madhav Rao, 1964) and Barmati area of Maharashtra (Venkataratnam, 1962).

It is a prolific bearer even on single stake system. Yielding capacity, however, increases with trellis system and further with overhead bower. It should be pruned to 3 to 4 buds.

It is a very vigorous, green, seeded grape, which is sub-acid but heavy cropper. It is being used in the breeding programme for evolving high yielding types. It is highly susceptible to rust, powdery mildew and downy mildew, moderately susceptible to anthracnose and resistant to cercospora leaf spot.

### 13. BIAN SHIRAI

*Vines* vigorous. *Bark* adherent and detaches in short, narrow, fissured straps. *Canes* short, thick; internodes short. *Buds* broad at apex, covered with brown pubescence. *Growing shoots* green with purplish colouration, glabrous. *Tendrils* light green, intermittent, bi- and, tri-fid, long, slender, glabrous.

*Unfolding leaves* with varying degree of pigmentation; cob-webby above and below. *Full-grown leaves* orbicular, 5-lobed, medium large, medium thick, smooth; glabrous above and below. Superior lateral sinus shallow, narrow; inferior lateral sinus shallow, wide; petiolar sinus narrow, V-shaped. Teeth many, apical tooth broad, blunt. Petiole green, purple pigmented, medium long.

*Flowers* hermaphrodite, stamens upright, anthers longer than stigma, short. *Inflorescence* appears on 3rd to 6th nodes.

*Bunches* medium large, medium long, irregular, shouldered to winged, sometimes double clustered. Peduncle medium long, medium thick. Rachis medium long, thick; primary branches long; secondary branches many. Pedicels arising mostly from secondary branches, short. Torus thick, rough. Brush yellowish green, medium long.

*Berries* yellowish green, spherical, medium large, size highly variable; bloom thin, easily removable; apex pointed, adherence strong. Skin medium thick, adherent to pulp. Pulp juicy, juice greenish yellow, slightly acidic.

*Seeds* cuneate, many (1-5; av. 2-3); medium large, medium long, medium broad, medium thick; chalaza circular, sunken, located in the middle; beak long.

It is an introduction from U.S.S.R. Ripening is uniform, mid-season, third week of June in Delhi and middle of March to end of March at Hessaraghatta (Mysore State). Quality medium. T.S.S. 15-16%, acidity 0.8-0.9%, juice 70-80%. T.S.S. goes upto 18% at Hessaraghatta. Cropping medium.

It is moderately susceptible to cercospora leaf spot. It has been reported to be moderately susceptible to anthracnose by Jeyarajan *et al.*, (1969) from Abohar, while, resistant by Sridhar and Sohi (1970) from Hessaraghatta. It is moderately resistant to powdery mildew.

### 14. BLACK CHAMPA

*Vines* vigorous. *Bark* loose and detaches in long, medium broad, thin,

rough and highly fissured straps. *Canes* purplish, medium long, thick; internodes medium long, striped. *Buds* broad at apex and covered with brown pubescence. *Growing shoots* green with purplish streaks, glabrous or almost so. *Tendrils* green with faint purplish streaks, intermittent, bi-fid, rarely tri-fid, thick, short, smooth; glabrous or almost so.

*Unfolding leaves* greyish green above and silvery white below with colourations other than pink, and purplish or brownish at the margin; little older leaves have more brownish colour spread throughout the lamina; wooly above and below. *Full-grown leaves* cuneiform, 5-lobed, large, thin, rough and leathery; glabrous above and wooly below. Superior lateral sinus shallow to medium deep, narrow, V-shaped; inferior lateral sinus inconspicuous, shallow to medium deep, V-shaped; petiolar sinus medium wide, round and V-shaped. Teeth in 2-series, medium in number; very narrow; primary teeth very narrow; secondary teeth narrow. Petiole long.

*Flowers* hermaphrodite, stamens upright, anthers slightly higher than stigma. *Inflorescence* appears on 3rd to 6th nodes.

*Bunches* medium large, medium long, short conical, branched, well filled or compact. Peduncle green, short, thin, glabrous, devoid of warts. Rachis green, medium long, thin, primary branches few, short; secondary branches few. Pedicels arising from rachis and primary branches, medium long, thin. Torus small, rough, warty. Brush green, sometimes purple pigmented, short and thin.

*Berries* bluish black, spherical to oblate, small; bloom thick, easily removable; apex truncate, adherence poor. Skin adherent to pulp, medium thick, tough, transparency poor. Pulp tender, melting, musky in flavour, veins prominent. Juice clear and sweet.

*Seeds* few (1-4; av.2), long, medium broad, medium large, oblong, hard, tasteless, non-adherent; chalaza circular, raised and located below centre; beak medium long, incurved and rough.

Ripening late, 4th week of June to 2nd week of July in Delhi; uneven, bunches do not ripen fully. Ripening even, medium, i.e. March-April in Poona and Bangalore. Quality excellent. T.S.S. 20-24% in North, goes up to 26% at Hessaraghatta, acidity 0.4-0.5%, juice 55-65%. Keeping quality good.

Medium cropper and gives 12,000 to 15,000 kg/ha. It responds well to medium pruning. Susceptible to cracking and rotting if rains come during ripening stage.

It is a purple, seeded grape with excellent fruit quality. It is being extensively used in grape breeding programme at the Indian Institute of Horticultural Research at Hessaraghatta. It is susceptible to rust, powdery mildew and downy mildew and resistant to anthracnose and cercospora leaf spot.

15. **BLACK CHAMPION**

*Vines* medium in vigour. *Bark* slightly adherent and detaches in long, medium broad, papery thin, smooth and highly fissured straps. *Canes* long, thick; internodes medium long, striped. *Buds* broad at apex, covered with brown pubescence. *Growing shoots* glabrous or almost so. *Tendrils* green with faint purplish streaks, intermittent, bi-fid, thick, medium long, glabrous or so.

*Unfolding leaves* greyish green above and silvery white below, with colouration other than pink, and purplish or brownish at the margin; little older leaves have more brownish colour spread throughout the lamina; wooly above and below. *Full-grown leaves* cuneiform, 3 to 5-lobed, large, thin, rough and leathery; glabrous above and wooly below. Superior lateral sinus shallow, narrow to wide, V-shaped; inferior lateral sinus shallow, V-shaped; petiolar sinus narrow, acute and U-shaped. Teeth in 3-series, medium in number, narrow; primary teeth very narrow; secondary teeth broad. Petiole medium long.

*Flowers* hermaphrodite, stamens upright, anthers higher than stigma. *Inflorescence* appears on 2nd to 6th nodes.

*Bunches* medium large, medium long, short conical, branched, compact to very compact. Peduncle green, short, thin, glabrous, devoid of warts. Rachis green, medium long, thin; primary branches few, short; secondary branches few. Pedicels arising from the primary branches and rachis, medium long, medium thick, warty, warts many. Torus small, rough. Brush bright pink, long and thin.

*Berries* bluish black, spherical, small, size moderately variable; bloom thick, easily removable; apex truncate, adherence poor. Skin adherent to pulp, thick, tough, transparency poor. Pulp tender, melting, musky in flavour, veins prominent. Juice clear and sweet.

*Seeds* medium in number (1-4; av.2), long, medium broad, large, round, hard, tasteless, non-adherent; chalaza circular, raised and located centrally; beak medium long, incurved and wrinkled.

Ripening not uniform, bunches do not ripen fully in North India. Quality poor to medium; T.S.S. 17-18%, acidity 0.5%, juice 50%, late, 4th week of June to 1st week of July under North Indian conditions. Susceptible to cracking and rotting. Shot berries commonly found. Bunches spoil by rains. Performance in South and West India not reported.

It is moderately susceptible to anthracnose and resistant to *Cercospora* leaf-spot.

16. **BLACK CORNICHON EARLY**

*Vines* medium in vigour. *Bark* loose and detaches in medium long, narrow, papery thin, smooth and fissured straps. *Canes* medium long, thick;

internodes medium long. *Buds* broad at apex, covered with brown pubescence. *Growing shoots* glabrous or almost so. *Tendrils* green with faint purplish streaks, intermittent, bi-fid, medium thick, medium long, glabrous or so.

*Unfolding leaves* greyish green above and silvery white below, with colouration other than pink and purplish or brownish at the margin; little older leaves have more brownish colour spread throughout the lamina; woolly above and below. *Full-grown leaves* reniform, 5-lobed, large, thin, rough and leathery; glabrous above and woolly below. Superior lateral sinus medium deep, narrow, V-shaped; inferior lateral sinus shallow, V-shaped; petiolar sinus narrow, acute, and V-shaped. Teeth in 3-series, medium in number, narrow; primary teeth very narrow; secondary teeth broad. Petiole medium long.

*Flowers* hermaphrodite, stamens upright, anthers higher than stigma. *Inflorescence* appears on 2nd to 5th nodes.

*Bunches* medium large, medium long, short conical or cylindrical, branched, well filled to compact. Peduncle green, short, thin, glabrous, devoid of warts. Rachis green, short, thin; primary branches few, short; secondary branches few. Pedicels arising mostly from primary branches, medium long, medium thick, warty. Torus small, rough, warty. Brush pinkish pigmented, long and thin.

*Berries* bluish black, spherical to obovoid, small, size highly variable; bloom thick, easily removable; apex truncate, adherence medium strong. Skin adherent to pulp, medium thick, tough, transparency poor. Pulp tender, melting, musky in flavour; veins very much prominent. Juice clear and slightly acidic.

*Seeds* many (1-6; av.3), long, narrow, medium large, oblong, hard, tasteless, non-adherent; chalaza circular, raised and located centrally; beak medium long, straight and wrinkled.

Ripening not uniform, and bunches do not ripen fully in North India, late, 4th week of June to 1st week of July. Quality poor under North Indian conditions, T.S.S. 13-14%, acidity 0.7%, juice 60-65%. Susceptible to cracking and rotting. Shot berries commonly found. Bunches spoiled by rains. Performance in other regions of country not reported.

## 17. BLACK CORNICHON LATE

*Vines* medium in vigour. *Bark* loose and detaches in medium long, wide, papery thin, very smooth and fissured straps. *Canes* long, thick; internodes medium long. *Buds* broad at apex, covered with brown pubescence and pink tinted. *Growing shoots* strongly pubescent. *Tendrils* purplish at base, irregular, bi- and tri-fid, thick, medium long, heavily pubescent.

*Unfolding leaves* greyish green above and silvery white below, some pinkish tinge along the margin of the leaves above or (and) below or pink

patches on the lamina surface; wooly above and below. *Full-grown leaves* cuneiform, entire or 3 to 5-lobed, large, thick, rough; cob-webby above and felted below. Superior lateral sinus shallow, wide, V-shaped; inferior lateral sinus absent; petiolar sinus wide, acute and V-shaped. Teeth in 3-series, medium in number, broad; primary teeth narrow, secondary teeth very broad. Petiole long.

*Flowers* hermaphrodite, stamens upright, anthers higher than stigma. *Inflorescence* appears on 2nd to 4th nodes.

*Bunches* small, short, regular, globular to short conical, neither shouldered nor winged, well filled. Peduncle light green, short, thin, pubescent, devoid of warts. Rachis light green; primary branches few, short; secondary branches absent. Pedicels arising mostly from rachis and primary branches, medium thick, warty. Torus small, rough. Brush purplish pigmented when berries ripe, long and thin.

*Berries* light purple, ellipsoidal, small, size moderately variable; bloom thin, easily removable; apex pointed, adherence medium strong. Skin very thick, slip skin type, tough, transparency poor. Pulp melting, leathery, juicy, foxy in flavour, veins prominent. Juice turbid and insipid.

*Seeds* medium in number (1-3; av.2), long, medium wide, large, round, hard, tasteless, non-adherent; chalaza oval, sunken, located below centre and extending up-to raphe; beak medium long, straight and rough.

Ripening not uniform, very late, few berries turn colour, others remain unripe and green even till October under North Indian condition. Quality very poor. T.S.S. 11%, acidity 0.65%. Light cropper. Performance in other regions of the country not reported.

It is resistant to anthracnose and *Cercospora* leaf-spot.

## 18. BLACK HAMBURG

*Vines* vigorous. *Bark* loose and detaches in long, broad, thick, rough and fissured straps. *Canes* dark brown, medium long, thick; internodes long. *Buds* broad at apex, covered with brown pubescence. *Growing shoots* yellowish green, glabrous or almost so. *Tendrils* light green, intermittent, bi-fid, rarely tri-fid, thick, long, smooth, glabrous or so.

*Unfolding leaves* greyish green above and silvery white below with colouration other than pink and purplish or brownish at the margin; little older leaves have more brownish colour spread throughout the lamina; pubescence wooly above and below. *Full-grown leaves* cuneiform, 5-lobed, sometimes 3-lobed, small, thin, rough, leathery, dark green above and light green below, glabrous above and wooly below. Superior lateral sinus shallow, wide, sometimes narrow, V-shaped; inferior lateral sinus shallow, V-shaped; petiolar sinus narrow, well marked, U-shaped. Teeth in 3-series,

fair in number, narrow; primary teeth very narrow; secondary teeth broad. Petiole purple pigmented, long, medium thick, almost glabrous.

*Flowers* hermaphrodite, stamens upright, anthers slightly higher than stigma. *Inflorescence* appears on 5th to 8th nodes.

*Bunches* medium large, medium long, short conical to cylindrical, irregular, branched, well filled to compact. Peduncle green, long, thin, glabrous, devoid of warts. Rachis light green, short, thin, glabrous; primary branches few, short; secondary branches few. Pedicels arising mostly from primary branches, medium long, medium thin, glabrous, warty, warts few. Torus small, smooth. Brush green, sometimes pinkish pigmented, long and thin.

*Berries* bluish black, spherical to oblate, medium large, size moderately variable; bloom thin, easily removable; apex truncate, adherence medium strong. Skin adherent to pulp, medium thick, soft, transparency poor. Pulp tender, melting, musky in flavour, veins prominent. Juice clear, brownish yellow and sweet.

*Seeds* many (1-6; av.3), medium long, narrow, medium large, round, hard, tasteless, non-adherent; chalaza oval, raised and located centrally; beak medium long, incurved and rough.

According to Dr. Hogg, this grape was imported into England from Hamburg by John Warner in the early part of the eighteenth century and hence the name Black Hamburg. In 1901, the 120 year old vine of this variety in Hampton Court still produced about 1,500 bunches. Its synonyms are Frankenthaler, Hampton Court, Blauer Trollinger and Frankenthal (Perold, 1927).

In India, the variety has been tried in a number of places and has shown medium performance in the North at Delhi, Lucknow (U.P.), Attari (Punjab). It was recommended as a promising variety on the basis of its performance at Lyallpur (Singh and Singh, 1940).

Ripening is uneven both in North and at Poona, late, 4th week of June to 1st week of July in Delhi and Attari (Punjab) and mid-June to mid-July in Lucknow. Quality medium in North, T.S.S. 16-18%, acidity 0.5-0.6%, juice 50-55%. T.S.S. goes up to 21% at Hesaraghatta (Mysore). In Poona, quality is very good and T.S.S. goes up to 24%. A medium to heavy cropper. Susceptible to cracking and rotting. Bunches spoiled by early rains in North. It is soft, so not suitable for distant markets.

It is highly susceptible to rust, powdery mildew and *Cercospora* leaf-spot and resistant to anthracnose.

## 19. BLACK MUSCAT

*Vines* medium in vigour. *Bark* adherent and detaches in short, rough and brittle straps. *Canes* long, thin; internodes medium long. *Buds* broad at

apex. covered with brown pubescence. *Growing shoots* green, glabrous or almost so. *Tendrils* light green, intermittent, bi- and tri-fid (penta-fid also found), medium thick, short, glabrous. (Fig. 20)

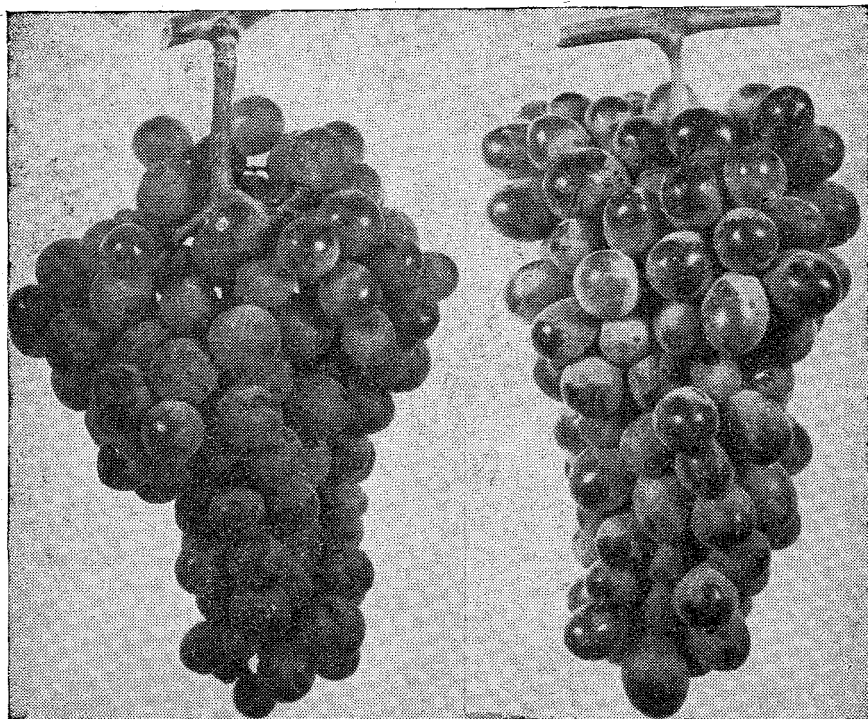


Fig. 20 Black Muscat

Fig. 21 Black Prince

*Unfolding leaves* greyish green above and silvery white below with colouration other than pink and purplish or brownish at the margin; little older leaves have more brownish colour spread throughout the lamina; wooly above and below. *Full-grown leaves* cuneiform, 5-lobed, sometimes 3-lobed, medium large, thin, smooth, glabrous above and downy below. Superior lateral sinus shallow, narrow, V-shaped; inferior lateral sinus shallow, V-shaped; petiolar sinus medium wide, acute and V-shaped. Teeth in 3-series, medium in number, broad; primary teeth narrow; secondary teeth broad. Petiole light purple medium long, glabrous.

*Flowers* hermaphrodite, stamens upright, anthers higher than stigma. *Inflorescence* appears on 3rd to 7th nodes.

*Bunches* medium large, medium long, short conical to cylindrical, neither shouldered nor winged, loose to well filled. Peduncle green, medium

long, thin, glabrous, tough, devoid of warts. Rachis green, medium long, thin; primary branches many, medium long; secondary branches few. Pedicels arising mostly from primary branches, medium long, thin, glabrous, less warty. Torus small, rough. Brush greenish white medium long and thick.

*Berries* deep purple, spherical, small, size highly variable; bloom thick, easily removable; apex truncate to pointed, adherence weak. Skin adherent to pulp, medium thin, tough, transparency poor. Pulp greenish, melting, juicy, excellent musky flavour, veins visible but not prominent. Juice greenish, clear and sweet.

*Seeds* many (0.5; av.2-3), cuneate, long, medium large, medium broad, hard, tasteless, slightly adherent; chalaza oval, raised, located below centre and extending up to raphe; beak medium long, incurved and smooth.

It is a *vinifera* grape (Mortensen and Randolph 1940). It is considered to be synonymous to Moscatello (Hedrick, 1908).

It has been tried all over North India and has performed well in Delhi, Punjab and U.P. at Lucknow and Bangalore. Ripening is mid-season, 3rd to 4th week of June in Delhi and 1st to 4th week of June in Lucknow and middle of March to end of March at Hesaraghatta (Mysore). Ripening is fairly uniform; quality is medium good. T.S.S. 16-18%, goes up to 20% at Hesaraghatta, acidity 0.6-0.7%, juice 50-60%. Medium to heavy cropper. Not susceptible to cracking.

The variety is resistant to rust and *Cercospora* leaf-spot, moderately resistant to powdery mildew, but susceptible to downy mildew. While it has been reported to be highly susceptible to anthracnose under Saharanpur condition (Prasad and Nirvan, 1965), it has shown resistance to this disease under Hesaraghatta (Bangalore) and Abohar (Ferozepur) conditions (Sridhar and Sohi, 1970; Jeyarajan *et al.*, 1969).

## 20. BLACK PRINCE

*Vines* vigorous. *Bark* loose and detaches in long, broad, thin, very smooth and fissured straps from the stem. *Canes* long, thick; internodes long. *Buds* broad at apex, covered with brown pubescence. *Growing shoots* green with dark purple streaks; glabrous or almost so. *Tendrils* intermittent, medium thick, medium long, bi- and tri-fid, pubescent. (Fig. 21.)

*Unfolding leaves* greyish green above and silvery white below, devoid of any pigmentation; pubescence wooly above and below. *Full-grown leaves* cuneiform, 3 to 5-lobed, very large, thin, smooth, dark green above and light green below; glabrous above and wooly below. Superior lateral sinus shallow, wide, V-shaped; inferior lateral sinus absent; petiolar sinus narrow, round and V-shaped. Teeth in 3-series, medium in number, narrow; terminal tooth long, narrow and pointed; primary teeth very

narrow; secondary teeth narrow. Petiole yellowish green with purple streaks; medium long, medium thick, and pubescent.

*Flowers* hermaphrodite, stamens upright, anthers at the level of stigma. *Inflorescence* appears on 5th to 8th nodes.

*Bunches* medium large, medium long, regular, cylindrical, neither shouldered nor winged, compact or very compact. Peduncle green, medium long, thin, glabrous or nearly so, tough, devoid of warts. Rachis light green, medium long, thin; primary branches few, short; secondary branches few. Pedicels medium long, thin, slightly pubescent, warts many. Torus small, rough. Brush blood red, long and thin.

*Berries* deep reddish to purplish black, ellipsoidal elongated, small, size moderately variable; bloom blue, thick, easily removable; apex slightly pointed, adherence weak to medium strong. Skin adherent to flesh, medium thick, medium tough, transparency poor. Flesh firm, crisp, juicy, good flavoured, veins visible only after removal of skin. Juice greenish, clear and sweet.

*Seeds* medium in number (0-4; av.1-2), long, medium broad, medium large, round, hard, astringent, slightly adherent; chalaza oval, raised and located below centre; beak medium long, incurved and rough.

It is a *vinifera* grape (Mortensen and Randolph 1940). Its synonyms include Boston, Pocock's Damascus (Perold, 1927). It has performed well in North India at Delhi, Lucknow, Kanpur, Attari and Lyallpur. At Lyallpur, it was included among the eight promising varieties recommended for cultivation (Singh and Singh, 1940).

Ripening is uniform, mid-season, 3rd to 4th week of June in Delhi, first week of July in Attari and last week of May in Kanpur. Quality good, T.S.S. 17-18%, goes up to 19% at Kanpur and Hissar. Acidity 0.7-0.8%, juice 60-70%. It has done exceedingly well in Krishnagiri area in Salem District and Nilakottai Taluk of the Madurai district of Tamil Nadu where it is grown in preference to Pachadraksha. Medium cropper. Not susceptible to cracking. Keeping quality very good. Bears well with short pruning.

It is highly susceptible to rust and downy mildew.

## 21. BLACK QUEEN

*Vines* medium in vigour. *Bark* adherent and detaches in short, narrow and fissured straps. *Canes* short, thick; internodes medium long. *Buds* broad at apex, covered with brown pubescence and pink tinted. *Growing shoots* strongly pubescent. *Tendrils* light green, intermittent, bi- or tri-fid, slender, short, pubescent.

*Unfolding leaves* greyish green above and silvery white below; some pinkish tinge along the border of the leaves above or (and) below or pink patches on the lamina surface; wooly above and below. *Full-grown leaves*

cordate, 3-lobed to entire, large, medium thick, glabrous above and cobwebby below. Superior lateral sinus shallow to almost absent; inferior lateral sinus almost absent; petiolar sinus closed to perforate, V-shaped. Teeth few, apical tooth broad and blunt. Petiole purplish, medium long.

*Flowers* hermaphrodite, stamens upright, anthers higher than stigma. *Inflorescence* appears on 3rd to 5th nodes.

*Bunches* medium large, conical to cylindrical, sometimes shouldered, compact to well filled. Peduncle medium long, thick. Rachis medium long, medium thick; primary branches medium long; secondary branches few. Pedicels arising mostly from primary branches, short, almost smooth. Torus medium thick, smooth. Brush creamy with pinkish tinge, medium long.

*Berries* bluish black, spherical, medium large, size highly variable; bloom thick, not easily removable; apex truncate, adherence strong. Skin tough, adhering to pulp. Pulp crisp, juicy.

*Seeds* many (1-5; av.3), very long, medium broad, medium large, round, hard, tasteless and located centrally; chalaza oval, raised, located below centre; beak medium long, incurved, rough.

An introduction from Japan. Ripening is uniform, mid season, 3rd week of June in Delhi. Quality is good. T.S.S. 18-20%, acidity 1%, juice 70-80%. Cropping medium.

## 22. BLACK ROUND

*Vines* medium in vigour. *Bark* very loose and detaches in the form of long, broad, thick, rough and highly fissured straps. *Canes* reddish with dark brown stripes, medium long, thick; internodes long. *Buds* broad at apex, covered with brown pubescence. *Growing shoots* purple pigmented, glabrous or almost so. *Tendrils* light green with faint purplish streaks towards base, intermittent, bi- and tri-fid, slender, medium long, glabrous or so. (Fig. 22)

*Unfolding leaves* greyish green above and silvery white below, with colouration other than pink and purplish or brownish at the margin; little older leaves have more brownish colour spread throughout the lamina; pubescence wooly above and below. *Full-grown leaves* cuneiform, 5-lobed, large, thick, rough and leathery, glabrous above and wooly below. Superior lateral sinus shallow, narrow, V-shaped; inferior lateral sinus shallow, inconspicuous; petiolar sinus narrow, acute and V-shaped. Teeth in 3-series, medium in number, very narrow; primary teeth very narrow; secondary teeth narrow. Petiole medium long.

*Flowers* hermaphrodite, stamens upright, anthers slightly higher than stigma. *Inflorescence* appears on 2nd to 5th nodes.

*Bunches* medium large, short, short conical, branched, well filled, compact. Peduncle green, short, thin, glabrous, devoid of warts. Rachis green, short, thin; primary branches few, short; secondary branches few.

Pediceles arising mostly from primary branches, medium long, warty, warts few. Torus small, rough. Brush pinkish pigmented, long and thin.

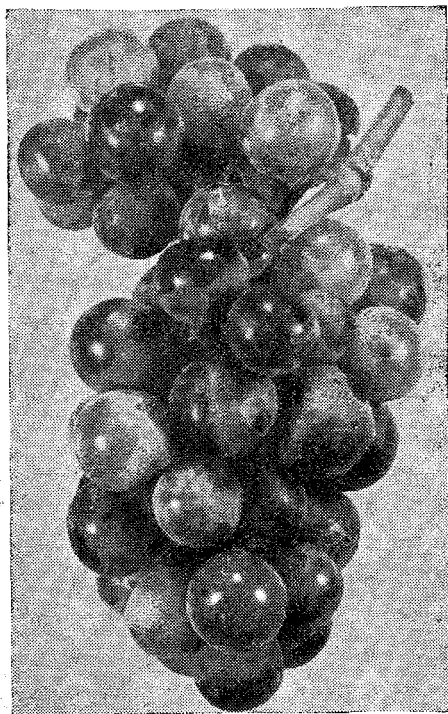


Fig. 22 Black Round

When fully ripe, quality is good. T.S.S. 22-23%, acidity 0.6% and juice 50-60%. Medium to heavy cropper. Bunches spoiled by rains in North.

It is highly susceptible to rust and downy mildew.

*Berries* bluish black, spherical, small, size moderately variable; bloom thick, not easily removable; apex rounded, adherence medium strong. Skin adherent to pulp, thick, tough, transparency poor. Pulp tender, melting, musky in flavour, veins prominent. Juice clear and sweet.

*Seeds* many (1-4; av.3), long, narrow, medium large, oblong, hard, tasteless, non-adherent to flesh; chalaza oval, raised and located centrally; beak medium long, incurved and rough.

Ripening not uniform in North but fairly uniform in Poona. In the North, bunches do not ripen fully and ripening is late, from 4th week of June to 1st week of July. At Poona, ripening time is middle of March to end of March.

### 23. BOURVIC

*Vines* poor in vigour. *Bark* adherent and detaches in short, rough and brittle strips. *Canes* short, thin; internodes short. *Buds* broad at apex, covered with brown pubescence and deep pink tinted. *Growing shoots* glabrous or almost so. *Tendrils* light green, intermittent, bi-fid, slender, short, glabrous.

*Unfolding leaves* greyish green above and silvery white below; some pinkish tinge along the border of the leaves above or (and) below or pink patches on the lamina surface; pubescence woolly above and below. *Full-grown leaves* pentagonal, 5 to 7-lobed, small, thin, smooth, glabrous above and woolly below. Superior lateral sinus medium deep, perforated,

U-shaped; inferior lateral sinus medium deep, V-shaped; petiolar sinus medium wide, round and U-shaped. Teeth in 3-series, medium in number, narrow; primary teeth narrow; secondary teeth broad. Petiole medium long.

*Flowers* hermaphrodite, stamens upright, anthers higher than stigma. *Inflorescence* appears on 3rd to 5th nodes.

*Bunches* small, short, short conical to cylindrical, shouldered, loose to well filled. Peduncle green, short, medium thick; glabrous or nearly so, tough, devoid of warts. Rachis green, short, medium thick, primary branches few, short; secondary branches absent. Pedicels arising mostly from rachis or primary branches, medium long, thin, warty. Torus small, rough, warty. Brush green, medium long and thin.

*Berries* light green, spherical, small, size less variable; bloom thin, easily removable; apex pointed, adherence weak. Skin adherent to flesh, medium thick, tough, transparency poor. Flesh melting, watery, musky in flavour, veins not visible. Juice clear, greenish and very sweet.

*Seeds* medium in number (1-4; av.2), very short, narrow, small, cuneate, soft, tasteless, adherent to flesh; chalaza oval, sunken and located below centre; beak short, incurved and rough.

Ripening is uniform, mid-season, 2nd to 3rd week of June in Delhi. Quality poor to medium. T.S.S. 15-16%, acidity 0.5%, juice 25-30%. Not susceptible to cracking. Performance in other regions of the country not reported.

It is a seeded, green grape with small bunches of poor quality. It is highly susceptible to rust and downy mildew.

#### 24. **BUCKLAND'S SWEET WATER**

*Vines* medium in vigour. *Bark* slightly adherent and detaches in short, medium wide and compact strips. *Canes* medium long, thick; internodes short. *Buds* broad at apex, covered with brown pubescence. *Growing shoots* green with dark purple streaks, glabrous or almost so. *Tendrils* light green, intermittent, bi- and tri-fid, sometimes tetra-fid, slender, short, glabrous.

*Unfolding leaves* variously pigmented; pubescence cob-webby above and below. *Full-grown leaves* cuneiform, 5-lobed, small, thick, smooth; dark green above and light green below; glabrous above and below. Superior lateral sinus shallow, narrow, V-shaped; inferior lateral sinus shallow, V-shaped; petiolar sinus medium wide, round and V-shaped. Teeth in 3-series, medium in number, narrow and pointed; terminal tooth narrow and pointed; primary teeth very narrow; secondary teeth broad. Petiole light green with pink shades, medium long, slightly pubescent.

*Flowers* hermaphrodite, stamens upright, anthers higher than stigma. *Inflorescence* appears on 1st to 5th nodes.

*Bunches* medium large, long, short conical to long pyramidal, often shouldered, loose. Peduncle light green, long, medium thick, glabrous, tough, corky, devoid of warts. Rachis light green, medium thick, primary branches many, short; secondary branches many. Pedicels arising mostly from primary branches, long, thin, glabrous, warty, warts many, conspicuous. Torus small, rough. Brush creamy green in colour, medium long and thin.

*Berries* greenish white, spherical, often ovoid ellipsoidal, small, size moderately variable; bloom thin, easily removable; apex slightly pointed, adherence medium strong. Skin adherent to flesh, thin, cracks, transparency good, veins and seed below visible. Flesh tender, melting, flavour mild or absent, slightly acidic, veins very prominent. Juice clear, greenish and slightly insipid in taste.

*Seeds* many (1-4; av.3), very short, narrow, small, round, hard, astringent, non-adherent to flesh; chalaza circular, raised and located below centre; beak short, incurved and rough.

Ripening uniform and mid-season, middle of June to end of June in Delhi and middle of March to end of March at Hessaraghatta (Mysore). Quality poor in Delhi, T.S.S. 12-13% and medium at Hessaraghatta, T.S.S. 14-16%; acidity 0.7 to 0.8%. Not susceptible to cracking. Shot berries commonly found.

It is a seeded green grape of poor quality. It is highly susceptible to rust and downy mildew and susceptible to powdery mildew but resistant to anthracnose and *Cercospora* leaf-spot.

## 25. BUFFALO

*Vines* medium in vigour. *Bark* adherent and detaches in short, thin, narrow, compact, brittle strips. *Canes* purplish brown, short, thin; internodes very short. *Growing shoots* green, pubescent. *Tendrils* green, intermittent, bi- and tri-fid, smooth, short, slender, wooly.

*Unfolding leaves* silvery green above and below, wooly above and below. *Full-grown leaves* orbicular, 3-lobed, medium sized, thin, rough, glabrous above and wooly below. Superior lateral sinus shallow, narrow, U-shaped; inferior lateral sinus usually absent; petiolar sinus closed, lobes overlapping. Teeth in 2-series, medium in number, short, very broad, pointed; primary teeth short, very broad, pointed; secondary teeth short, very broad, pointed. Petiole green, purple pigmented, medium long, medium thick, pubescent.

*Flowers* hermaphrodite, stamens upright, anthers higher than stigma. *Inflorescence* appears mostly on 3rd to 5th nodes.

*Bunches* medium long, conical, irregular, shouldered, loose to well filled. Peduncle green, short, thick, slightly pubescent, tough, warty. Rachis green

medium long, thin; primary branches short. Pedicels arising from primary branches and rachis, medium long, thin, warty. Torus small, rough. Brush purplish, long, thin.

*Berries* reddish black, spherical to slightly ellipsoidal, small to medium, variability slight; bloom present, thick, not removed easily; apex rounded, adherence weak. Skin slip skin type, transparency poor, medium thick, tough, harsh. Pulp greenish, tender, translucent, juicy, not aromatic, sweet. Juice green, sweet.

*Seeds* dark brown, many, medium large, medium long, hard, tasteless, adherent; chalaza elongated, distinct, sunken to slightly even; beak medium smooth, incurved.

Buffalo is the result of a cross between *Herbert* × *Watkins* (Mills × Ontario) made in 1921. The variety was named in 1938.

Ripening even; tends to be uneven when vines are allowed to overbear, mid-season, by middle of March in Poona. Quality medium; T.S.S. 18% (T.S.S. goes up to 24% in U.S.A., Slate *et al.*, 1962), acidity 0.4-0.5%, juice 70%. Cropping medium to heavy. Keeping quality very good. This variety has shown promise for wine making (Bradt, 1952).

Moderately susceptible to rust and downy mildew.

## 26. CARDINAL

*Vines* medium in vigour. *Bark* adherent and detaches in short, rough and brittle straps. *Canes* short, thin; internodes short. *Buds* broad at apex, covered with brown pubescence. *Growing shoots* glabrous or almost so. *Tendrils* light green, slightly purplish at base, intermittent, bi- and tri-fid, slender, short, glabrous.

*Unfolding leaves* variously pigmented, cob-webby above and below. *Full-grown leaves* cuneiform, 5-lobed, medium large, thick, smooth, glabrous above and below. Superior lateral sinus medium deep, perforated, V-shaped; inferior lateral sinus shallow to medium deep, V-shaped; petiolar sinus narrow, flat and U-shaped. Teeth in 3-series, medium in number, narrow; primary teeth narrow; secondary teeth broad. Petiole medium long.

*Flowers* hermaphrodite, stamens upright, anthers higher than stigma. *Inflorescence* appears on 1st to 8th nodes.

*Bunches* small, long conical or short conical, neither winged nor shouldered, well filled. Peduncle green, medium long, thin, glabrous, devoid of warts. Rachis green, medium long, thin; primary branches many, long; secondary branches absent. Pedicels light green, arising from primary branches, medium long, thin, glabrous, rough. Torus small, rough, warty. Brush yellowish green, sometimes purple pigmented, medium long and thin.

*Berries* remain bright red or brick red and rarely reddish black, spherical, often ellipsoidal, small, size highly variable; bloom thin, not easily removable; apex truncate, adherence weak. Skin adherent to pulp, thick, tough; transparency poor. Pulp sweet with muscat flavour when berries fully ripe. Juice clear and slightly insipid in taste.

*Seeds* medium in number (0.4 ; av.2), long, medium broad, medium large, oblong, hard, tasteless, non-adherent and located centrally; chalaza circular, sunken and located below centre; beak medium long, straight and rough.

This variety is a cross of *Tokay* × *Ribier* made by E. Snyder of the Federal Horticulture Field Station, Fresno, California. Ripening is not very uniform. Ripens late in the North, i.e., from third week of June to first week of July and from middle of March to first week of April at Hessaraghatta (Mysore). Quality is good. T.S.S. 20-22%, acidity 0.6-0.7%, juice 60-65%. Bunches spoiled in case of early rains in North.

It is a coloured, seeded, sweet variety of grape with attractive bunches and a good flavour and has done well in arid irrigated tracts of North. Its performance in Baramati area of Maharashtra and Hessaraghatta (Mysore) is also very encouraging. It is susceptible to rust, moderately susceptible to anthracnose and *Cercospora* leaf-spot; moderately resistant to powdery mildew and resistant to downy mildew.

## 27. CARIGNANE

*Vines* medium in vigour. *Bark* adherent and detaches in very short, brittle straps. *Canes* light reddish brown with broad stripes, medium long, thick; internodes short. *Buds* broad at apex, covered with brown pubescence. *Growing shoots* glabrous or almost so. *Tendrils* with faint purplish streaks, intermittent, bi- and tri-fid, slender, short, nearly glabrous.

*Unfolding leaves* greyish green above and silvery white below; some pinkish tinge along the border of the leaves above or (and) below or pink patchess on the lamina surface; wooly above and below. *Full-grown leaves* cordate, 5-lobed, rarely 3-lobed, medium large, thin, smooth, glabrous above, cob-webby to downy below. Superior lateral sinus shallow to medium deep, wide, V-shaped; inferior lateral sinus shallow, V-shaped; petiolar sinus narrow, acute and V-shaped. Teeth in 3-series, fair in number, broad; primary teeth broad, secondary teeth broad. Petiole short.

*Flowers* hermaphrodite, stamens upright, anthers at the same level or slightly higher than stigma. *Inflorescence* appears on 2nd to 6th nodes.

*Bunches* medium large, medium long, conical or cylindrical, shouldered, compact to very compact. Peduncle green, short, medium thick, glabrous, devoid of warts. Rachis green, medium long, thin; primary branches many,

short; secondary branches few. Pedicels arising from the main stem and primary branches, medium long, medium thick, glabrous, warty, warts many. Torus small, very rough, warty. Brush green, sometimes pinkish pigmented, medium long and thin.

*Berries* bluish black when fully ripe, obovoid, often ellipsoidal, medium large, size highly variable; bloom thick, not easily removable; apex truncate, adherence strong. Skin adherent to pulp, medium thick, tough, transparency poor. Pulp soft, crisp, slightly aromatic, veins prominent. Juice turbid and slightly acidic.

*Seeds* medium in number (1-4; av.2), long, narrow, small, cuneate, hard, tasteless, non-adherent; chalaza oval, raised and located below centre; beak medium long, incurved and rough.

This is a *vinifera* grape (Mortensen and Randolph, 1940). It originated in Spain where it is known as Tinto and has been grown in South of France since probably the twelfth century. There and in Algeria, it is one of the most important varieties. It is most useful in California for making of bulk red table wines (Winkler, 1965). According to Perold (1927), its synonyms are Carignan, Crignane, Bois dur, Plant d'Espagne and Tinto.

Ripening is not uniform in the North, mid-season, 3rd to 4th week of June at Delhi and uniform and from middle of March to end of March at Hessaraghatta (Mysore). Quality medium, T.S.S. 17%, acidity 1%, juice 50-55% in North. In South, at Hessaraghatta and in Baramati area of Maharashtra quality very good and T.S.S. from 20-22%. Not susceptible to cracking. Medium cropper on head system. Responds well to head or cordon pruning.

It is a coloured, seeded grape of poor quality in North and good quality in South and West India.

It is resistant to anthracnose and cercospora leaf spot. According to Perold (1927), it is highly susceptible to powdery mildew, anthracnose and downy mildew. Winkler (1965) also does not recommend its planting in areas where control of powdery mildew is difficult.

## 28. CASTIZA

*Vines* vigorous. *Bark* slightly adherent, detaches in medium long, thick, narrow, fissured and brittle strips. *Canes* reddish brown, long, thick; internodes medium long. *Buds* in early stages surrounded by bract like structure, glabrous. *Growing shoots* green with light purple streaks, glabrous to cobwebby. *Tendrils* green, intermittent, mostly tri-fid, smooth, long, medium thick, glabrous.

*Unfolding leaves* green, devoid of any pigments, downy above and below. *Full-grown leaves* pentagonal, 5-lobed, large, thick, smooth, glabrous above and below. Superior lateral sinus narrow to medium wide, deep, V-shaped;

inferior lateral sinus perforated and narrow, deep, V-shaped. Teeth, in 3-series, many in number, medium broad; primary teeth medium long, medium broad, pointed; secondary teeth short, broad. Petiole green, medium long, glabrous.

*Flowers* hermaphrodite, stamens upright, anthers higher than the stigma. *Inflorescence* appears on 3rd to 6th nodes.

*Bunches* medium large, long, long conical, shouldered, compact. Peduncle green, long, thick, glabrous, tough, free from warts. Rachis green, long, thick; primary branches many, medium long. Pedicel arising from primary branches and rachis, long, thick, smooth. Torus large, rough. Brush medium long, thick.

*Berries* light purplish, obovoid, medium to large, variability slight; bloom present, medium thick, removed easily; apex round, adherence strong. Skin adherent, medium transparency, thick, tough, harsh, neutral flavour. Pulp yellowish green, transparency poor, texture firm, veins visible, taste sweet with musky flavour. Juice sweet, musky flavour, clear.

*Seeds* cuneate, medium in number (1-4; av. 1-2), small, short, narrow, hard, tasteless, adherent; chalaza below centre, oval, distinct, slightly sunken extending up to raphe; beak short, medium smooth, straight.

This is a very old variety and was under cultivation in Montpellier, South Africa, around 1910. According to Perold (1927), it is synonymous with *Molinera* Gsorda. In India, it is a recent introduction. Ripening is uniform, early to mid-season. In Poona, it is ready by the first week of March. Quality good. T.S.S. 19-20%, acidity 0.4-0.5%, juice 70%. Keeping quality good. Harvest can be spread over a longer period. It should be pruned on long canes for best results. With short pruning, it bears poor crop. It can be shipped in perfect condition due to its thick skin and firm flesh.

This variety needs to be given a wider trial for its cultivation in different agro-climatic regions of the country on account of its all-round good qualities.

## 29. CATAWBA

*Vines* very vigorous. *Bark* very loose and detaches in medium long, medium wide, papery thin, smooth and almost compact straps. *Canes* dark brown, long, thick; internodes long. *Buds* broad at apex, covered with brown pubescence. *Growing shoots* strongly pubescent. *Tendrils* greyish green, continuous, sometimes irregular, bi-fid, thick, medium long, highly pubescent.

*Unfolding leaves* greyish green above and silvery white below; some pinkish tinge along the border of the leaves above or (and) below or pink patches on the lamina surface; wooly above and below. *Full-grown leaves*

cuneiform, 3-lobed, sometimes 5-lobed, large, thick, round; upper surface dark green, dull, lower surface greyish colour; cob-webby above and felted below. Superior lateral sinus shallow, wide, sometimes narrow, V-shaped; inferior lateral sinus absent; petiolar sinus narrow to medium wide, acute and V-shaped. Teeth in 3-series, many in number, broad; primary teeth narrow; secondary teeth broad. Petiole medium long.

*Flowers* hermaphrodite, stamens upright, anthers higher than stigma. *Inflorescence* appears on 2nd to 4th nodes.

*Bunches* small, short, regular, globular to short conical, devoid of wings, loose to well filled. Peduncle light green, medium long, thin, pubescent, devoid of warts. Rachis light green, short, thin; primary branches few, short; secondary branches absent. Pedicels arising mostly from rachis and primary branches, short, medium thick, warty. Torus small, rough. Brush pale green, long and thin.

*Berries* light purple, purplish red when fully ripe, spherical to ellipsoidal, small, size moderately variable; bloom thick, easily removable; apex truncate, adherence strong. Skin thick, slip skin type, tough, transparency poor. Pulp melting, leathery, juicy, foxy in flavour, veins prominent. Juice turbid and slightly insipid in taste.

*Seeds* medium in number (1-3; av.2), long, broad, very large, round, hard, tasteless, non-adherent; chalaza oval, sunken, located below centre and extending up to raphe; beak medium long, straight and rough.

This is one of the earliest varieties of grape grown in America. It is a *labrusca* and *vinifera* hybrid (Mortensen and Randolph, 1940). Its origin is considered to be unknown. However, during 1823, John Adlum introduced this grape for cultivation in Columbia (U.S.A.).

In India, it was introduced in the hilly areas of Himachal Pradesh at Berti (Kandaghat) at elevations ranging from 3,000 to 5,000 feet above sea level around 1937 by the Horticulturist of then Patiala State and performed well (Varma, 1947). In the plains of North India, the variety does not ripen fully even when left on the vine up to October. Its performance from other regions of the country has not been reported.

### 30. CHAMPANEL

*Vines* medium in vigour. *Bark* very loose and detaches in long, medium wide, thick, very smooth and almost compact straps. *Canes* long, thick; internodes medium long. *Buds* broad at apex, covered with brown pubescence and pink tinted. *Growing shoots* strongly pubescent. *Tendrils* deep purplish, irregular, bi- and tri-fid, thick, medium long, densely pubescent.

*Unfolding leaves* greyish green above and silvery white below; margin of the leaf beautifully pigmented, woolly above and below. *Full-grown leaves* cordate, 3-lobed or entire, large, thin, rough; cob-webby above and

felted below. Superior lateral sinus shallow, wide, V-shaped; inferior lateral sinus absent; petiolar sinus wide, flat, V-shaped. Teeth in 2-series, fair in number, broad; primary teeth narrow; secondary teeth very broad. Petiole medium long.

*Flowers* hermaphrodite, stamens upright, anthers much higher than stigma. *Inflorescence* appears on 1st to 4th nodes.

*Bunches* small, short, globular to short conical, neither shouldered nor winged, loose or well filled. Peduncle dark purple, short, thin, highly pubescent, devoid of warts. Rachis dark purple, short, thin; primary branches few, short; secondary branches absent. Pedicels arising from primary branches and rachis, medium long, short, warty. Torus small, rough. Brush usually does not separate when pedicel is removed.

*Berries* bluish black or purple, spherical to obovoid, small, size less variable; bloom thick, easily removable; apex truncate, adherence weak. Skin thick, slip skin type, tough, transparency very poor. Pulp tender, melting, leathery, foxy in flavour, veins prominent. Juice turbid, slightly acidic.

*Seeds* many (1-4; av.2-3), medium long, medium broad, medium large, round, soft, tasteless, non-adherent; chalaza oval, raised, located below centre and extending up to raphe; beak short, straight, rough.

It is a hybrid between *V. champini* and *V. labrusca* (Mortensen and Randolph, 1940). Ripening late, not uniform, only some berries turn colour, others remain green even after July and quality poor in Delhi. Ripening middle of March to end of March and quality medium at Hessaraghatta (Mysore), T.S.S. 17-18%. Light cropper. Not susceptible to cracking.

It is susceptible to downy mildew and rust and resistant to anthracnose, powdery mildew and *Cercospora* leaf-spot.

### 31. CHANDIGARH

*Vines* medium in vigour. *Bark* slightly adherent and detaches in very long, very narrow, rough and highly fissured straps. *Canes* long, thick; internodes short. *Buds* broad at apex, covered with brown pubescence and pink tinted. *Growing shoots* glabrous or almost so. *Tendrils* greyish green, intermittent, bi-fid, sometimes tri- and tetra-fid, thick, medium long, glabrous or so.

*Unfolding leaves* greyish green above and silvery white below, with colouration other than pink and purplish or brownish at the margin; little older leaves have more brownish colour spread throughout the lamina; woolly above and below. *Full-grown leaves* reniform, 5-lobed, medium large, thin, smooth; glabrous above and cob-webby to downy below. Superior lateral sinus shallow, wide, V-shaped; inferior lateral sinus usually

absent, if present shallow, V-shaped; petiolar sinus narrow, acute and V-shaped. Teeth in 3-series, medium in number, very narrow; primary teeth very narrow; secondary teeth broad. Petiole medium long.

*Flowers* hermaphrodite, stamens upright, anthers slightly higher than stigma. *Inflorescence* appears on 1st to 7th nodes, mainly from 3rd to 5th nodes.

*Bunches* medium large, medium long, conical or short conical, branched, well filled or compact. Peduncle light green, short or medium long, thin, glabrous, devoid of warts. Rachis light green, medium long, thin; primary branches many, short; secondary branches few. Pedicels arising mostly from rachis and primary branches, long, thin, glabrous, warty. Torus small, rough. Brush greenish yellow, slightly pinkish, long and thick.

*Berries* bluish black, spherical to obovoid, large, size less variable; bloom thick, easily removable; apex truncate, adherence strong. Skin adherent to pulp, medium thick, tough, transparency poor. Pulp tender, melting, musky in flavour, veins prominent. Juice clear and sweet.

*Seeds* many (1-6; av.3), very long, medium broad, medium large, oblong, soft, tasteless, non-adherent; chalaza oval, raised and located centrally; beak medium long, incurved and rough.

Ripening is not uniform, late, 4th week of June to 1st week of July in Delhi. Quality good. T.S.S. 21-22%, acidity 0.4-0.5%, juice 60%. Heavy cropper. Susceptible to cracking and rotting. Shot berries commonly found. According to Singh (1961), this variety has shown promise in U.P.

It is highly susceptible to anthracnose.

### 32. CHARAS

*Vines* medium in vigour. *Bark* adherent and detaches in short, narrow and fissured straps. *Canes* medium long, medium thick; internodes short. *Buds* broad at apex, covered with brown pubescence. *Growing shoots* green with purplish streaks, cob-webby. *Tendrils* light green, purplish at base, intermittent, bi- and tri-fid, slightly pubescent.

*Unfolding leaves* greyish green above and silvery white below, devoid of any pigmentation; wooly above and below. *Full-grown leaves* orbicular, 5-lobed, medium large, rough, thick, flat, glabrous above and cob-webby below. Superior lateral sinus shallow, wide; inferior lateral sinus shallow, wide; petiolar sinus narrow to medium, U-shaped. Teeth many, apical tooth broad, blunt. Petiole green, purple pigmented, long.

*Flowers* hermaphrodite, stamens upright, anthers higher than stigma. *Inflorescence* appears on 3rd to 5th nodes.

*Bunches* large, long conical, neither shouldered nor winged, loose to well filled. Peduncle long, thick. Rachis medium long, thick; primary

branches long; secondary branches many, short. Pedicels arising mostly from secondary branches, long. Torus medium thick, rough. Brush yellowish green with pinkish tip, long.

*Berries* bluish black, oblate, medium large, highly variable; bloom present, thick, not easily removable; adherence medium, apex truncate. Skin medium thick, adherent to pulp, tough, transparency poor. Pulp firm, juicy, juice pinkish yellow.

*Seeds* medium in number (1-4; av.2), long, broad, medium thick, cuneate, heavy; texture medium, light brown; chalaza circular, sunken, located in the middle; beak medium long.

An introduction from U.S.S.R. Ripening uniform, mid-season, 2nd week of June in Delhi. Quality good. T.S.S. 21%, acidity 0.6%, juice 80%. Medium cropper. It is moderately susceptible to anthracnose and rust, highly susceptible to downy mildew but resistant to *Cercospora* leaf-spot.

### 33. CHASSELAS BLANCO

*Vines* poor in vigour. *Bark* adherent and detaches in short, brittle straps. *Canes* short, thin; internodes short. *Buds* broad at apex, covered with brown pubescence. *Growing shoots* glabrous or almost so. *Tendrils* light green, intermittent, bi-fid, slender, short, glabrous.

*Unfolding leaves* variously pigmented; cob-webby above and below. *Full-grown leaves* cuneiform, 5-lobed, small, thick, smooth; glabrous above and below. Superior lateral sinus medium deep, narrow, V-shaped; inferior lateral sinus medium deep, V-shaped; petiolar sinus narrow, acute and V-shaped. Teeth in 3-series, medium in number, narrow; primary teeth very narrow; secondary teeth broad. Petiole medium long.

*Flowers* hermaphrodite, stamens upright, anthers at the same level or slightly higher than stigma. *Inflorescence* appears on 4th to 5th nodes.

*Bunches* small, short, short conical, loose to well filled, neither shouldered nor winged. Peduncle light green, short, thin, glabrous, tough, devoid of warts. Rachis dark brown, short, thin; primary branches few, short; secondary branches few or absent. Pedicels green, arising from rachis and primary branches, short, medium thick, warty, warts few. Torus small, rough, warty. Brush green, medium long and thin.

*Berries* greenish white, spherical to ellipsoidal, small, size less variable; bloom thin, easily removable; apex slightly pointed, adherence weak to medium strong. Skin adherent to pulp, medium thick, tough, transparency very good, veins and seed below clearly visible. Pulp melting, watery, slightly musky in flavour, slightly acidic, veins visible. Juice greenish, clear and sweet.

*Seeds* medium in number (1-4; av.2), short, narrow, small, round, soft,

tasteless, non-adherent; chalaza circular, raised and located below centre; beak short, straight and smooth.

Ripening uniform, mid-season, 1st to 2nd week of June in Delhi. Quality poor to medium, T.S.S. 15%, acidity 0.6-0.7%, juice 55-65%. Not susceptible to cracking. Berries start shrivelling if kept long on the vine. Performance in other regions of the country not reported.

#### 34. CHASSELAS VIOLET

*Vines* medium in vigour. *Bark* slightly adherent and detaches in short, wide, thin, brittle and fissured straps. *Canes* medium long, thin; internodes medium long. *Buds* broad at apex, covered with brown pubescence. *Growing shoots* glabrous or almost so. *Tendrils* green, purplish pigmented, intermittent, bi-fid, slender, short, glabrous.

*Unfolding leaves* variously pigmented; downy above and below. *Full-grown leaves* cuneiform, 5-lobed, small, thin, smooth, glabrous above and below. Superior lateral sinus medium deep to deep, perforate to narrow, V-shaped; inferior lateral sinus medium deep, V-shaped; petiolar sinus narrow, acute, V-shaped. Teeth in 3-series, medium number, very narrow; primary teeth very narrow; secondary teeth narrow. Petiole medium long.

*Flowers* hermaphrodite, stamens upright, anthers higher than stigma. *Inflorescence* appears on 3rd to 4th nodes.

*Bunches* medium large, medium long, cylindrical, compact. Peduncle purplish, short, thin, glabrous. Rachis purplish, short, thin; primary branches few, short; secondary branches absent. Pedicels arising from rachis and primary branches, medium long, thin, rough, highly warty. Torus small, thick, rough. Brush green, pinkish pigmented, medium long and thin.

*Berries* light purple, obovoid, small, size moderately variable; bloom thin, easily removable; apex truncate, adherence medium strong or weak. Skin adherent to pulp, thick, tough, transparency poor. Pulp tender, melting, flavour mild, veins prominent after removal of skin. Juice turbid, sweet and slightly acidic.

*Seeds* many (1-5; av.3), long, medium broad, medium large, oblong, hard, tasteless, non-adherent; chalaza oval, raised, located below centre and extending up to raphe; beak medium long, incurved and rough.

Ripening is not uniform, mid-season, 3rd week to 4th week of June in Delhi. Quality is medium. T.S.S. 15-16%, acidity 0.5-0.6%, juice 55-60%. Not susceptible to cracking or rotting. Performance from other regions of the country not reported. It is resistant to anthracnose and *Cercospora* leaf-spot.

#### 35. CHAUHAN SPECIAL

*Vines* medium in vigour. *Bark* very loose and detaches in long, broad, medium

thick, compact and flexible straps. *Canes* light brown, long, thick; internodes long. *Buds* broad at apex, covered with brown pubescence. *Growing shoots* light green with purple shade, glabrous or almost so. *Tendrils* yellowish green, purple pigmented, intermittent, bi- and tri-fid, smooth, long, medium thick, slightly pubescent.

*Unfolding leaves* variously pigmented, cob-webby above and below. *Full-grown leaves* orbicular, 5-lobed, large, medium thick, smooth; glabrous above and below. Superior lateral sinus perforate or narrow, medium deep, V-shaped; inferior lateral sinus less prominent, narrow, shallow, V-shaped; petiolar sinus narrow, deep, U-shaped. Teeth in 3-series, many in number, medium long, narrow; primary teeth medium long, narrow, pointed; secondary teeth short, broad. Petiole yellowish green, medium long, glabrous.

*Flowers* hermaphrodite, stamens upright, anthers at the same level as stigma. *Inflorescence* appears on 5th to 6th nodes.

*Bunches* attractive, large to very large, long, short cylindrical or conical, often shouldered, compact to very compact. Peduncle green, long, thick, glabrous, tough, devoid of warts. Rachis green, long, thick; primary branches many, long. Pedicel short, medium thick, warty. Torus large, rough. Brush green, medium long, thick.

*Berries* bright red to brick red, large, ellipsoidal elongated, size moderately variable; bloom thick, removed easily; apex rounded to truncate; adherence strong; skin adherent to pulp, transparency medium, thickness medium, texture tough, taste and flavour neutral. Pulp green, medium transparency, crisp, veins prominent, flavour good.

*Seeds* medium in number (1-4; av.2); large, long, medium broad, oblong, hard, tasteless, non-adherent; chalaza below centre, circular, raised in some cases; beak medium long, straight, rough.

Ripening is uneven, mid-season to late. Quality is good. T.S.S. 18%, acidity 0.7%, juice 70%. Bearing heavy. Berries susceptible to cracking. It can stand shipping better. Its performance is better on overhead bower than on kniffin system.

It is a coloured, seeded grape of good quality and resembles with Kandhari variety in respect of its vegetative and fruit characters. It has done well in North India.

It is moderately susceptible to anthracnose and *Cercospora* leaf-spot.

### 36. CONCORD

*Vines* very vigorous. *Bark* loose and detaches in medium long, wide, medium thick, and fissured straps from the stem. *Canes* dark reddish brown, long, thick; internodes long. *Buds* broad at apex, covered with brown pubescence. *Growing shoots* strongly pubescent. *Tendrils* greyish green, irregular, sometimes even continuous, bi-fid, sometimes tri-fid, thick, long, heavily pubescent.

*Unfolding leaves* greyish green above and silvery white below; some pinkish tinge along the margin of the leaves above or (and) below or pink patches on the lamina surface; wooly above and below. *Full-grown leaves* cuneiform, 3-lobed, sometimes 5-lobed, large, thick, rough; upper surface dark green, glossy, smooth, lower surface light bronze; cobwebby above and felted below. Superior lateral sinus shallow, wide, V-shaped; inferior lateral sinus absent; petiolar sinus wide, acute, V-shaped. Teeth in 3-series, medium in number, narrow; primary teeth very narrow; secondary teeth very broad. Petiole medium long.

*Flowers* hermaphrodite, stamens upright, anthers much higher than stigma. *Inflorescence* appears on 2nd to 4th nodes.

*Bunches* small, short, regular, globular to short conical, neither shouldered nor winged, loose to well filled. Peduncle light green, short, thin, pubescent, devoid of warts. Rachis light green, short, thin; primary branches few, short; secondary branches absent. Pedicels arising mostly from rachis, short, medium thick, warty, warts few. Torus small, rough. Brush pale green, long, thin.

*Berries* dark purple, when fully ripe, spherical, often ellipsoidal, small, size moderately variable; bloom thin, easily removable; apex truncate, adherence strong. Skin very thick, slip skin type, tough, transparency poor. Flesh melting, leathery, juicy, foxy flavour, veins prominent. Juice turbid, insipid.

*Seeds* medium in number (1-3; av.2), medium long, broad, large, round, hard, tasteless, non-adherent; chalaza oval, sunken, located below centre and extending up to raphe; beak short, straight, rough.

One of the oldest *labrusca* grape cultivar (Vaile 1939, Mortensen and Randolph, 1940). It was grown by Mr. E.W. Bull of Concord, Massachusetts in 1843 out of seed from a wild grape. It was introduced for cultivation in 1854 and its popularity from that date was phenomenal.

In India, it has been tried in Northern regions only. Along with Catawba it was introduced and tried in the hilly areas of Himachal Pradesh at Berti (Kandaghat) at elevations ranging from 3,000 to 5,000 feet above sea level around 1937 and performed well. In the plains of North India cropping is heavy, but the bunches do not mature fully, even when left on the vine up to October. Its performance from other regions of the country has not been reported.

### 37. CONVENT LARGE BLACK

*Vines* medium in vigour. *Bark* slightly adherent and detaches in short to medium long, medium wide, rough and fissured straps. *Canes* short, thick; internodes long. *Buds* broad at apex, covered with brown pubescence and

pink tinted. *Growing shoots* glabrous or almost so. *Tendrils* green, intermittent, bi- and tri-fid, thick, medium long, glabrous or almost so.

*Unfolding leaves* greyish green above and silvery white below, with colouration other than pink, and purplish or brownish at the margin; little older leaves have more brownish colour spread throughout the lamina; wooly above and below. *Full-grown leaves* cuneiform, 5-lobed, large, thin, smooth, glabrous above, rough and wooly below. Superior lateral sinus shallow, wide, V-shaped; inferior lateral sinus shallow, V-shaped; petiolar sinus narrow, acute and V-shaped. Teeth in 2-series, medium in number, very narrow; primary teeth very narrow; secondary teeth broad. Petiole medium long.

*Flowers* hermaphrodite, stamens upright, anthers slightly higher than stigma. *Inflorescence* appears on 2nd to 5th nodes.

*Bunches* medium large, medium long, short conical, branched, compact or very compact. Peduncle green, short, thin, glabrous, devoid of warts. Rachis green, short, thin; primary branches few, short; secondary branches few. Pedicels arising from rachis and primary branches, medium long, thin, warty. Torus small, warty. Brush green, short and thin.

*Berries* bluish black, spherical, medium large, size less variable; bloom thin, easily removable; apex truncate, adherence medium strong. Skin adherent to pulp, medium thick, tough, transparency poor. Pulp tender, melting, musky in flavour, veins prominent. Juice clear and sweet.

*Seeds* many (1-5; av. 2-3), long, medium broad, medium large, oblong, hard, tasteless, non-adherent; chalaza circular, raised and located centrally; beak medium long, incurved and rough.

Ripening is uniform, quality poor in North India. Medium cropper. Susceptible to cracking and rotting. Shot berries many. Performance from other regions of the country not reported.

It is resistant to anthracnose, powdery mildew and *Cercospora* leaf-spot.

### 38. CONVENT LARGE WHITE

*Vines* medium in vigour. *Bark* adherent and detaches in short, brittle straps. *Canes* short, thin; internodes short. *Buds* broad at apex, covered with brown pubescence. *Growing shoots* green with purple patches, glabrous or almost so. *Tendrils* green, intermittent, usually bi-fid, also tri-fid and tetra-fid, short, glabrous or almost so. (Fig. 23)

*Unfolding leaves* greyish green above and silvery white below, with colouration other than pink, and purplish or brownish at the margin; little older leaves have more brownish colour spread throughout the lamina; pubescence wooly above and below. *Full-grown leaves* cuneiform, 5 or 3-lobed, medium large, thin, smooth, glabrous above and downy below. Superior

lateral sinus shallow, V-shaped; petiolar sinus narrow, acute and U-shaped. Teeth in 3-series, medium in number, very narrow; primary teeth very narrow; secondary teeth narrow. Petiole short.

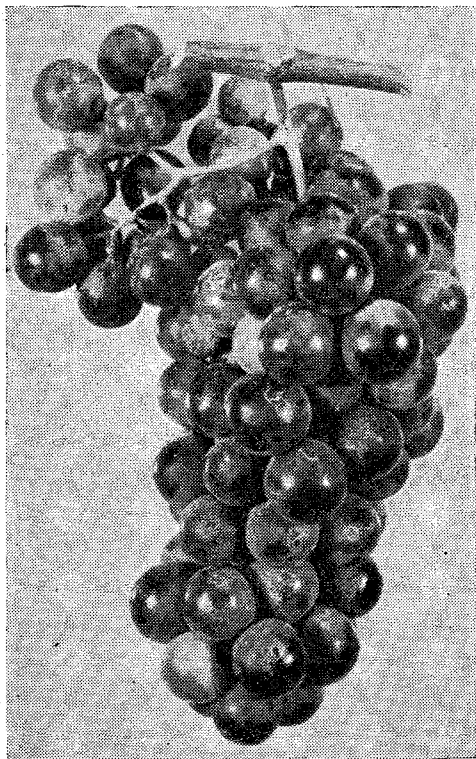


Fig. 23 Convent Large White

*Flowers* hermaphrodite, stamens upright, anthers higher than stigma. *Inflorescence* appears on 3rd to 5th nodes.

*Bunches* medium large, medium long, short conical to cylindrical, neither shouldered nor winged, well filled or compact. Peduncle green, short, thin, glabrous, devoid of warts. Rachis green, medium long, medium thick; primary branches many, short or medium long; secondary branches few. Pedicels arising from rachis or primary branches, short, thin, warty, warts very prominent, few. Torus small, rough, warty. Brush green, often slightly purple pigmented, medium long and thin.

*Berries* deep purple, spherical, small, size moderately variable; bloom thick, not easily removable; apex truncate to pointed, adherence

weak to medium strong. Skin adherent to pulp, thick, tough, transparency poor. Pulp greenish, melting, juicy, musky in flavour, veins visible but not prominent. Juice musky in flavour, clear, greenish and sweet.

*Seeds* many (0-5; av.2-3), medium long, narrow, small, cuneate, hard, tasteless, slightly adherent; chalaza oval, raised and located below centre; beak medium long, incurved and rough.

Ripening fairly uniform, mid-season, 2nd to 4th week of June in Delhi and early in Poona. Quality medium in North (T.S.S. 16%) but good in Poona (T.S.S. 20%), acidity 0.6-0.7% and juice 50-60%. Not susceptible to cracking.

It is highly susceptible to rust and downy mildew and resistant to anthracnose and cercospora leaf spot.

## 39. COUNTRY BANGALORE

*Vines* vigorous. *Bark* loose and detaches in short, wide, smooth and highly fissured straps. *Canes* brown streaked, medium long, thick, glabrous; internodes medium long. *Buds* broad at apex, covered with brown pubescence. *Growing shoots* green with purple tinge, glabrous or almost so. *Tendrils* purplish at base, intermittent, bi-fid, medium thick, medium long, glabrous or so.

*Unfolding leaves* greyish green above and silvery white below, with colouration other than pink and purplish or brownish at the margin; little older leaves have more brownish colour spread throughout the lamina; pubescence wooly above and below. *Full-grown leaves* cuneiform, 5-lobed, medium large, thin, rough, leathery, glabrous above and wooly below. Superior lateral sinus shallow, narrow, V-shaped; inferior lateral sinus shallow, V-shaped; petiolar sinus medium wide, acute and V-shaped. Teeth in 3-series, primary teeth narrow; secondary teeth broad. Petiole medium long.

*Flowers* hermaphrodite, stamens upright, anthers at the same level or slightly higher than stigma. *Inflorescence* appears on 2nd to 5th nodes.

*Bunches* small to medium large, medium long, long conical, branched, well filled to compact. Peduncle light green, short, thin, glabrous, herbaceous, devoid of warts. Rachis short, thin; primary branches few, short; secondary branches few and short. Pedicels arising mostly from rachis and primary branches, medium long, thin, glabrous, warts few. Torus small, rough. Brush light green with dark purple pigments, long and thick.

*Berries* bluish black, spherical or obovoid, medium large, size moderately variable; bloom thick, easily removable; apex truncate, adherence medium strong. Skin adherent to pulp, thick, tough, transparency poor. Pulp tender, melting, musky in flavour, veins prominent. Juice clear and sweet.

*Seeds* yellowish brown, medium in number (1-4; av.2), very long, medium broad, large, oblong, soft, tasteless, non-adherent; chalaza circular, raised and located centrally; beak medium long, straight and rough.

Ripening uneven both in Delhi as well as in Poona. Ripens late, 1st to 2nd week of July in North and medium late under Poona conditions. Quality good. T.S.S. 20%, acidity 0.6-0.8%, juice 60%. Medium cropper. Susceptible to cracking and rotting in North on account of rains during ripening.

It is susceptible to rust and downy mildew and resistant to anthracnose and *Cercospora* leaf-spot.

## 40. DAKH

*Vines* medium in vigour. *Bark* loose and detaches in medium long, narrow,

smooth and slightly fissured straps. *Canes* brown, medium long, thin, glabrous; internodes medium long. *Buds* broad at apex, covered with brown pubescence. *Growing shoots* green with purple shade, glabrous or almost so. *Tendrils* green with faint purplish streaks, intermittent, bi-fid, sometimes tri-fid, thick, medium long, glabrous or so.

*Unfolding leaves* variously pigmented, downy above and below. *Full-grown leaves* cuneiform, 5-lobed, small, thick, glabrous above and below. Superior lateral sinus shallow, wide, V-shaped; inferior lateral sinus shallow, V-shaped; petiolar sinus narrow, round and V-shaped. Teeth in 3-series, medium in number, narrow; primary teeth very narrow; secondary teeth very broad. Petiole medium long.

*Flowers* hermaphrodite, anthers at the same level as stigma. *Inflorescence* appears on 4th to 6th nodes.

*Bunches* large, long, long conical to cylindrical, compact. Peduncle light green, short, thick, glabrous, devoid of warts. Rachis light green, medium long, medium thick; primary branches few, short; secondary branches few and short. Pedicels arising from the main stem and primary branches, medium long, thick, glabrous, warty, warts few. Torus large, rough. Brush yellowish with brownish pigmentation, long and thin.

*Berries* bright red to brick red, obovoid oblong, large, size less variable; bloom thick, not easily removable; apex truncate, adherence medium strong. Skin adherent to pulp, medium thick, tough, transparency poor. Pulp firm, juicy, good flavoured. Juice clear, thick and sweet.

*Seeds* yellowish brown, medium in number (1-4; av. 1-2), very long, broad, very large, oblong, hard, tasteless, non-adherent; chalaza circular, raised, located below centre and extending up to raphe; beak medium long, straight and rough.

This variety did well at Lyallpur (W. Punjab) and was recommended amongst the promising varieties for commercial cultivation in Punjab (Singh and Singh, 1940). It has also done well in Poona. It is a prolific bearer. Ripening is uneven, mid-season to late, 3rd to 4th week of June in Delhi. At Attari (Punjab), it ripens by 1st week of June. Quality good. T.S.S. 16-18%, acidity 0.7%, juice 55-70%. At Poona, T.S.S. goes up to 21%. Not susceptible to cracking. It is known for its thick juice and is good for juice making but is not very good as a table grape.

It is susceptible to rust and downy mildew.

#### 41. DABOUKI

*Vines* vigorous. *Bark* slightly adherent and detaches in very short, narrow and smooth straps. *Canes* long, thick; internodes short. *Buds* broad at apex, covered with brown pubescence. *Growing shoots* glabrous or almost so. *Tendrils* green with purplish streaks at base, irregular, tri-fid, rarely bi-fid, sometimes tetra-fid, slender, long, pubescent.

*Unfolding leaves* greyish green above and silvery white below, with colouration other than pink, and purplish or brownish at the margin; little older leaves have more brownish colour spread throughout the lamina; wooly above and below. *Full-grown leaves* orbicular, 5-lobed, small, thick, rough, leathery, glabrous above and wooly below. Superior lateral sinus medium deep, perforate, V-shaped; inferior lateral sinus medium deep, V-shaped; petiolar sinus narrow, round to flat and V-shaped. Teeth in 3-series, medium in number, very narrow; primary teeth very narrow; secondary teeth broad. Petiole medium long.

*Flowers* hermaphrodite, stamens upright, anthers slightly higher than stigma. *Inflorescence* appears on 2nd to 5th nodes.

*Bunches* large, long, conical, shouldered, loose to well filled. Peduncle light green, medium long, medium thick, glabrous, devoid of warts. Rachis light green, medium long, thin; primary branches many, long; secondary branches few to medium. Pedicels arising mostly from primary branches, medium long, medium thick, glabrous, warty, warts many. Torus small, rough. Brush light green, long, thin.

*Berries* light green, spherical, medium large, size less variable; bloom thin, easily removable; apex truncate, adherence strong. Skin adherent to pulp, thin, transparency good. Pulp soft, veins visible. Juice, clear, insipid.

*Seeds* many in number (1-4; av.2-3), short, medium broad, medium large, round, soft, tasteless, non-adherent; chalaza circular, raised and located below centre; beak short, straight and rough.

It is an introduction from Israel. Cropping is heavy. It, however, does not ripen under Delhi conditions. The berries remain green, hard and insipid in taste and thus poor in quality. Its performance in other regions of the country, has, however, not been reported. It is variously spelled as Debuki and Debuke.

It is susceptible to rust and highly susceptible to downy mildew.

## 42. DELIGHT

*Vines* medium in vigour. *Bark* adherent and detaches in short, thick, narrow, fissured and brittle straps. *Canes* brown, medium long, thin; internodes medium long. *Buds* broad at apex, covered with brown pubescence. *Growing shoots* green with purplish streaks, glabrous or almost so. *Tendrils* yellowish green, intermittent, tri-fid; smooth, long, thick, slightly pubescent. (Fig. 24)

*Unfolding leaves* yellowish green, devoid of any other pigmentation; glabrous or almost so on both the surfaces. *Full-grown leaves* cuneiform, 5-lobed, medium large, medium thick, smooth, tough, glabrous above and below. Superior lateral sinus narrow, shallow to medium, U-shaped; inferior lateral sinus prominent, narrow, shallow, V-shaped; petiolar sinus wide,

medium deep, U-shaped. Teeth in 3-series, primary teeth narrow, pointed; secondary teeth short, very broad. Petiole purplish, medium long, glabrous.

*Flowers* hermaphrodite, stamens upright, anthers slightly higher than stigma. *Inflorescence* appears on 2nd to 5th nodes; secondary branches many, short.

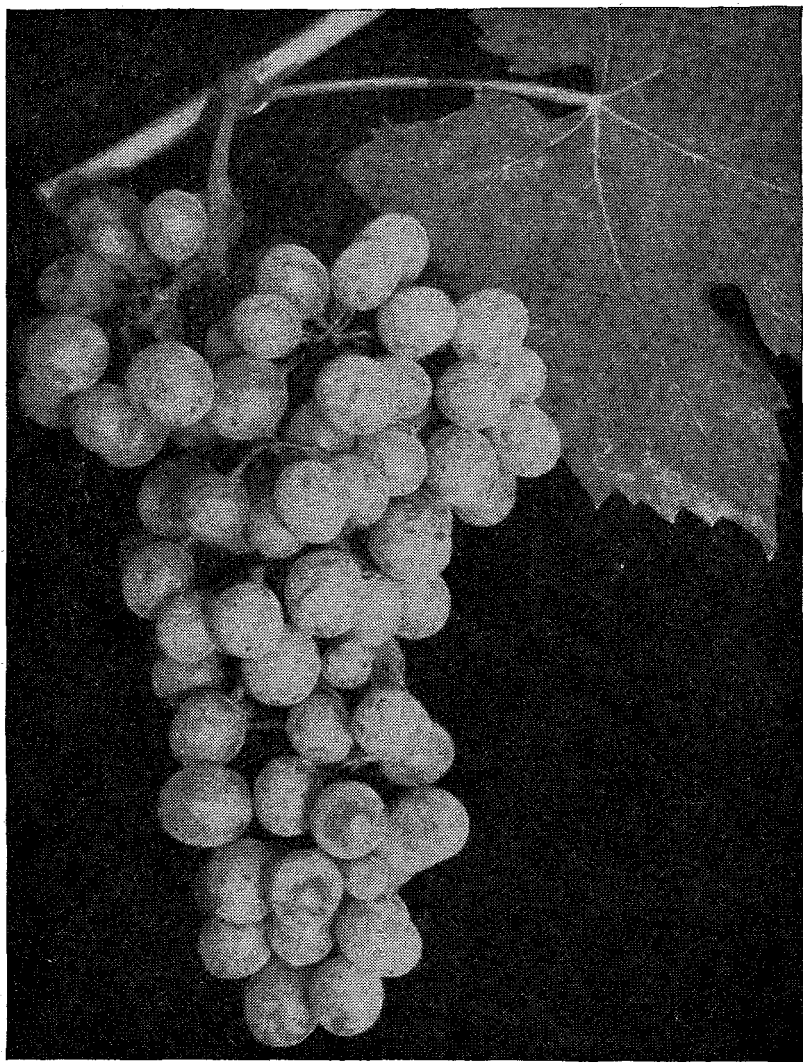


Fig. 24 Delight

*Bunches* medium to long, conical, shouldered, well filled to compact. Peduncle medium long, medium thick, glabrous, tough, warty. Rachis light green, long, medium thick; primary branches many, short to medium. Pedicel arising from primary branches and secondary branches, long, thin, warty. Torus small, rough. Brush green, medium long, thin.

*Berries* green, ellipsoidal to ovoid, rather small, variability slight; bloom present, thin, not removed easily, apex rounded, adherence medium strong. Skin green, adherent to the pulp, medium thick, medium tough, transparency poor, taste and flavour neutral. Pulp green, texture firm, veins visible, flavour musky, taste sweet. Juice greenish, taste sweet, flavour musky at prime maturity.

*Seeds* absent.

This is a sister seedling of Perlette evolved by Dr. H. P. Olmo at the Division of Viticulture, University of California, Davis. It is a hybrid between varieties Scolokertek hiralyneje 26 (Hungarian)  $\times$  Sultanina Marble (Russian). The cross was made in 1936 and the vine first fruited in 1940. The variety was marked for its early maturity and characteristic muscat like flavour inherited from its Hungarian parent.

This is a recent introduction in India and the variety has performed well in Punjab (Nauriyal *et al.*, 1967), Haryana (Daulta, 1969), U.P. (Singh, 1962) and has been recommended for small scale cultivation in arid irrigated tracts of Abohar.

It is less vigorous than either Perlette or Thompson Seedless. Ripening is uniform and early, last week of May to middle of June in Northern India. Quality is good. T.S.S. 18-21%, acidity 0.5-0.6%, juice 70%. At prime maturity, it is as good as Thompson Seedless. It has good keeping quality and can ship well to distant markets. It is a good bearer, but yields are lower than Perlette. In raisin making tests at Davis, Delight has been rated superior to Perlette but equal to Thompson Seedless (Olmo, 1948 b).

It is susceptible to rust and downy mildew, moderately susceptible to *Cercospora* leaf-spot and moderately to highly susceptible to anthracnose.

#### 43. DUTCH SWEET

*Vines* medium in vigour. *Bark* adherent and detaches in short, wide, thick and rough straps. *Canes* long, thin; internodes short. *Buds* broad at apex, covered with brown pubescence. *Growing shoots* glabrous or almost so. *Tendrils* green, intermittent, bi- and tri-fid, slender, short, glabrous.

*Unfolding leaves* greyish green above and silvery white below, with colouration other than pink, and purplish or brownish at the margin; little older leaves have more brownish colour spread throughout the lamina; woolly above and below. *Full-grown leaves* cuneiform, 3 to 5-lobed, small, thin, rough, leathery, glabrous above and woolly below. Superior lateral sinus

shallow, wide, V-shaped; inferior lateral sinus absent, if present shallow, V-shaped; petiolar sinus medium wide, acute and V-shaped. Teeth in 3-series, medium in number, narrow; primary teeth very narrow; secondary teeth broad. Petiole short.

*Flowers* hermaphrodite, stamens upright, anthers higher than stigma. *Inflorescence* appears on 2nd to 5th nodes.

*Bunches* medium large, medium long, short conical, branched, well-filled or compact. Peduncle green, short, thin, glabrous, herbaceous, devoid of warts. Rachis light green, medium, thin; primary branches few, short; secondary branches few and short. Pedicels arising from primary branches, medium long, thin, glabrous, warty, warts few. Torus small, rough. Brush green, deep red pigmented, medium long, thin.

*Berries* deep purple, spherical, small, size moderately variable; bloom thin, easily removable; apex truncate to pointed, adherence weak. Skin adherent to pulp, thick, tough, transparency poor. Pulp greenish, melting, juicy, musky in flavour, veins visible but not prominent. Juice clear, greenish, sweet.

*Seeds* medium in number (1-4; av.2), long, narrow, medium large, cuneate, hard, tasteless, non-adherent; chalaza oval, raised, located below centre and extending up to raphe; beak medium long, straight, smooth.

Ripening is fairly uniform, mid-season, 3rd to 4th week of June in Delhi. Quality is medium, T.S.S. 17-18%, acidity 0.7-0.8%, juice 60-65%. Not susceptible to cracking.

It is moderately susceptible to rust, downy mildew, anthracnose and *Cercospora* leaf-spot.

#### 44. EARLY MUSCAT

*Vines* medium in vigour. *Bark* adherent and detaches in narrow, rough and brittle straps. *Canes* short, thin; internodes medium long. *Buds* broad at apex, covered with brown pubescence. *Growing shoots* green, glabrous or almost so. *Tendrils* light green, intermittent, bi-, tri-, and tetra-fid, slender, short, glabrous.

*Unfolding leaves* variously pigmented, cob-webby above and below. *Full-grown leaves* cuneiform, 5-lobed, small, thin, smooth, glabrous above and below. Superior lateral sinus medium deep, perforate, sometimes narrow, overlapping; inferior lateral sinus shallow, V-shaped; petiolar sinus wide, flat and V-shaped. Teeth in 3-series, medium in number, narrow; primary teeth very narrow; secondary teeth narrow. Petiole light purplish, short, glabrous.

*Flowers* hermaphrodite, stamens upright, anthers higher than stigma. *Inflorescence* appears on 3rd to 6th nodes.

*Bunches* medium large, long, short conical, shouldered, well filled or

compact. Peduncle light green, medium long, thin, glabrous, smooth, warty; warts dark brown. Rachis green, medium long, thin; primary branches medium long, thin; secondary branches few, short. Pedicels arising from primary branches, medium long, thin, warty, warts many. Torus small, rough, warty. Brush green, medium long, thin.

*Berries* yellowish green, golden green when over-ripe, spherical, small, size moderately variable; bloom thin, easily removable, apex truncate, adherence weak. Skin adherent to pulp, thin, tough, transparency good, veins below visible. Pulp tender, melting, musky in flavour, sweet or very sweet, veins prominent. Juice clear, greenish, sweet.

*Seeds* many in number (1-5; av. 2-3), very short, narrow, small, round, hard, tasteless, non-adherent; chalaza circular, raised and located below centre; beak short, incurved, smooth.

It is an introduction from California, U.S.A. Ripening is uniform, early, last week of May to 1st week of June in Delhi, Punjab and Haryana. Quality good. T.S.S. 17-19%, acidity 0.6-0.8%, juice 65-70%. Not susceptible to cracking.

It is a green, seeded grape of good quality with pronounced muscat flavour and ripens quite early under North Indian condition. It has done well in Punjab, Haryana and Delhi. It is moderately susceptible to anthracnose and *Cercospora* leaf-spot.

#### 45. FAKHRI

*Vines* very vigorous. *Bark* very loose and detaches in very long, broad, medium thick, smooth, almost compact straps. *Canes* purple, long, thick, glabrous; internodes medium long. *Buds* broad at apex, covered with brown pubescence. *Growing shoots* green with dark purple streaks, slightly pubescent. *Tendrils* intermittent, bi- and tri-fid; thick, long, smooth, glabrous or so. (Fig. 25)

*Unfolding leaves* variously pigmented, downy above and below. *Full-grown leaves* orbicular, 5-lobed, sometimes 3-lobed, medium large, thick, smooth, dark green above, light green below, glabrous above and below. Superior lateral sinus shallow, wide, V-shaped; inferior lateral sinus shallow, V-shaped; petiolar sinus narrow, acute and V-shaped. Teeth in 3-series, medium in number, narrow; primary teeth very narrow; secondary teeth very broad. Petiole long.

*Flowers* hermaphrodite, stamens upright, anthers higher than stigma. *Inflorescence* appears on 5th to 7th nodes.

*Bunches* attractive, very large, long, long pyramidal, irregular, heavily shouldered, loose to well-filled. Peduncle light green, long, thick, glabrous and devoid of warts. Rachis green, long, thick; primary branches many, long; secondary branches long and many. Pedicels arising from primary

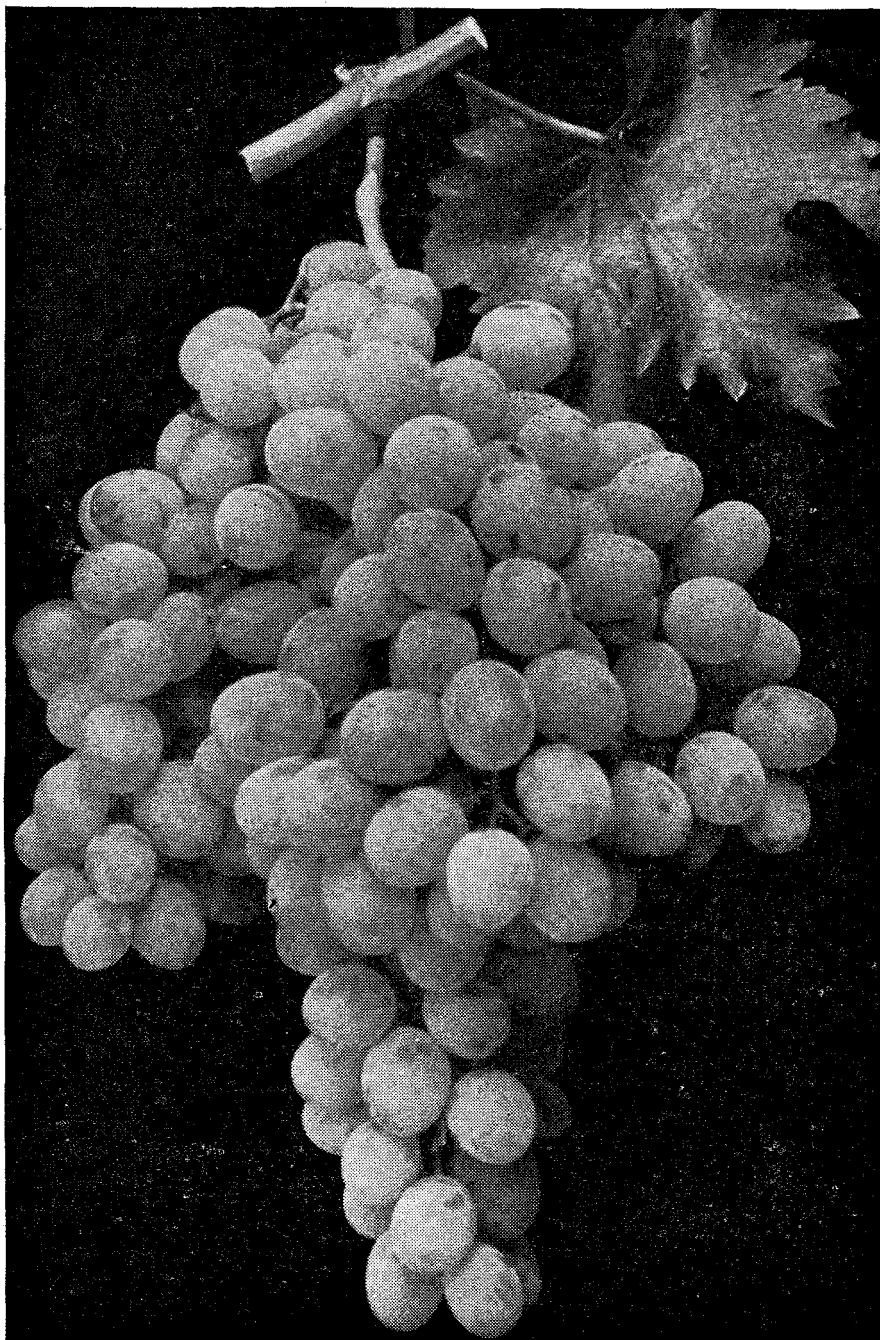


Fig. 25 Fakhri

and secondary branches in almost equal number, long, thick, glabrous and warty. Torus large, rough. Brush creamy white, long, thick.

*Berries* yellowish green, oval, medium large, size less variable; bloom thin, easily removable; apex pointed, adherence medium strong. Skin adherent to pulp, very thin, medium tough, transparency very good, veins and seeds below visible. Pulp tender, juicy, slightly aromatic, sweet (slightly insipid in North), veins visible. Juice clear, yellowish and insipid in taste.

*Seeds* dark brown, many (1-4; av. 2-3), short, narrow, small, oblong, soft, tasteless, slightly adherent to flesh and located centrally; chalaza circular, raised and located below centre; beak short, incurved and rough.

This variety is believed to have been introduced in Deccan in 1838 under the name of Fakiri. It further spread into Poona and Nasik districts, where it came to be known as Phakdi. It is now variously spelled as Phakdi, Fakadi and Fakhri. It has not done well in North India due to its ripening coinciding with rainy season resulting in poor quality.

Ripening is uniform, late, first fortnight of July in Delhi and first to third week of March at Hessaraghatta (Mysore). Quality poor due to onset of rains and T.S.S. does not go beyond 14%. Quality good in South and Western India. T.S.S. 16-18%, acidity 0.5-0.6%, juice 45-50%. Heavy cropper. Yields from 25,000 to 30,000 Kg/ha. Keeping quality poor, hence not suitable for long distance transport. Not grown commercially to any appreciable extent. Not susceptible to cracking.

It is susceptible to rust and downy mildew, resistant to *Cercospora* leaf-spot and moderate to highly susceptible to anthracnose and highly susceptible to powdery mildew.

#### 46. FLAME MUSCAT

*Vines* medium in vigour. *Bark* adherent and detaches in short, brittle straps. *Canes* thin; internodes short. *Buds* broad at apex, covered with brown pubescence. *Growing shoots* green, purplish pigmented, slightly pubescent. *Tendrils* green, purplish at base, intermittent, tri-fid, a few bi-fid, slender, short, slightly pubescent.

*Unfolding leaves* greyish green above and silvery white below, with colouration other than pink, and purplish or brownish at the margin; little older leaves have more brownish colour spread throughout the lamina; woolly above and below. *Full-grown leaves* cuneiform, 5-lobed, small, thin, smooth, glabrous above and below. Superior lateral sinus shallow, wide, V-shaped; petiolar sinus narrow, round and V-shaped. Teeth in 3-series, medium in number, broad; primary teeth narrow; secondary teeth broad. Petiole short.

*Flowers* hermaphrodite, stamens upright, anthers higher than stigma. *Inflorescence* appears on 2nd to 5th nodes.

*Bunches* attractive, medium large, medium long, short conical, shouldered, well filled to compact. Peduncle green, medium long, thin, glabrous, herbaceous, devoid of warts. Rachis medium long, thin; primary branches many, long; secondary branches many, short. Pedicels arising from primary and secondary branches, medium long, warty, warts many covering the pedicel. Torous small, rough, warty. Brush green, medium long, thin,

*Berries* light purple or brick red, spherical, small, size moderately variable; bloom thick, easily removable; apex truncate, adherence medium strong. Skin adherent to pulp, thick, tough, transparency poor. Pulp firm, crisp, musky in flavour, veins prominent. Juice clear, sweet.

*Seeds* many (1-5; av. 2-3), short, narrow, medium large, oblong, soft, astringent, non-adherent; chalaza oval, raised and located centrally; beak medium long, incurved, rough.

This is considered to be a pink variation of variety Muscat of Alexandria and is grown in South Africa under the name Hannepoot (Winkler, 1962).

Ripening is not uniform, late, 4th week of June to 1st week of July in North India and 3rd week of March in Poona. Quality good. T.S.S. 20-22%, acidity 0.5-0.6%, juice 60-65%. Medium cropper and responds well to short pruning. Shot berries many.

It is susceptible to rust and downy mildew and resistant to powdery mildew and cercospora leafspot; while it has been reported to be resistant to anthracnose by Sridhar and Sohi (1970) at Hesaraghatta, it has been found to moderately susceptible to this disease by Jeyarajan *et al.*, (1969) under Abohar (Punjab) conditions.

#### 47. FOSTER'S SEEDLING

*Vines* medium in vigour. *Bark* adherent and detaches in very short, medium wide, thick, rough and highly fissured straps. *Canes* purple, medium long, thin; internodes medium long. *Growing shoots* green, sometimes dark purple, glabrous or almost so. *Tendrils* green, intermittent, bi-fid, rarely tri-fid, slender, medium long, almost glabrous.

*Unfolding leaves* green, devoid of any pigmentation, glabrous or almost so. *Full-grown leaves* orbicular, 3-5 lobed, large, thin, rough, glabrous above and below. Superior lateral sinus shallow, narrow, V-shaped; inferior lateral sinus prominent, V-shaped; petiolar sinus almost closed. Teeth in 3-series, medium in number, narrow; primary teeth long, narrow; secondary teeth medium broad, pointed. Petiole yellowish green with purple shade, medium long, thick, slightly pubescent.

*Flowers* hermaphrodite, stamens upright, anthers slightly higher than stigma. *Inflorescence* appears on 2nd to 4th nodes.

*Bunches* medium large, medium long, pyramidal, neither shouldered

nor winged, loose to well filled. Peduncle light green, medium long, thick, glabrous, herbaceous, devoid of wart. Rachis green, medium long, medium thick; primary branches many, short; secondary branches many, medium long. Pedicels arising from primary and secondary branches, long, medium thick, glabrous, warty, warts few. Torus small, rough, warty. Brush medium long, thick.

*Berries* yellowish green, spherical, medium sized, size less variable; bloom thin, not easily removable; adherence medium strong. Skin adherent to pulp, thick, tough, transparency poor. Pulp greenish, melting, juicy, excellent flavour, veins visible but not prominent. Juice clear, greenish, sweet.

*Seeds* dark brown, many (1-5; av. 2-3), small, short, narrow, oblong, medium hard, tasteless, slightly adherent, located centrally; chalaza circular, raised, located in the centre; beak long, straight, rough.

Ripening fairly uniform, mid-season, middle of June in Punjab. Medium to heavy cropper. Quality good. T.S.S. 16-18%, acidity 0.5-0.7%, juice 50-60%.

This variety was first tried at Lyallpur in pre-partition days (prior to 1947) and was considered one of the best eight varieties under trial (Singh and Singh, 1940). Later it gave good performance at Attari (Punjab), (Singh *et al.*, 1961).

#### 48. GOLD

*Vines* medium in vigour. *Bark* adherent and detaches in medium long, thick, narrow, fissured and brittle straps. *Canes* medium long, medium thick; internodes long. *Buds* broad at apex, covered with brown pubescence. *Growing shoots* green, glabrous. *Tendrils* light green, irregular, bi- and trifid, smooth, medium long, medium thick, slightly pubescent.

*Unfolding leaves* green, devoid of any pigmentation, downy above and below. *Full-grown leaves* orbicular to cuneiform, 5-lobed, very large, medium thick, medium tough, glabrous above and below. Superior lateral sinus narrow, shallow, V-shaped; inferior lateral sinus prominent, narrow, shallow, V-shaped; petiolar sinus wide, V-shaped. Teeth many in number, medium long, broad; primary teeth narrow, pointed; secondary teeth short to medium, broad. Petiole light purple, short, glabrous or almost so.

*Flowers* hermaphrodite, stamens upright, anthers slightly higher than stigma. *Inflorescence* appears from 3rd to 6th nodes.

*Bunches* small to medium, medium long, cylindrical, neither shouldered nor winged, very loose. Peduncle short, thick, glabrous, warty. Rachis yellowish green, long, medium thick; primary branches long, thick, warty. Torus small, rough. Brush green, long, thick.

*Berries* green, ellipsoidal, large, size less variable; bloom present,

thin, removed easily; apex truncate to slightly rounded, adherence medium. Skin green, adherent, transparency poor, thick, tough, taste and flavour neutral. Pulp greenish, transparency poor, texture firm, veins visible. Juice yellowish green, clear, abundant, sweet, musky flavour.

*Seeds* medium in number (1-4, av. 2), medium large, medium long, broad, oblong, hard, harsh, non-adherent; chalaza circular, raised, located in the centre; beak short, narrow, smooth, straight.

Ripening is uniform, mid-season, 2nd week of June to end of June in Abohar and Hissar. Quality good. T.S.S. 16-18%, acidity 0.5-0.6%, juice 65%. It has done well in the arid irrigated tracts of Punjab and Haryana. A heavy cropper on overhead bower. Keeping quality is good.

It is resistant to rust, highly susceptible to downy mildew and moderately susceptible to anthracnose and *Cercospora* leaf-spot.

#### 49. GOLDEN CHASSELAS

*Vines* medium in vigour. *Bark* adherent and detaches in short, thin, narrow, fissured and brittle straps. *Canes* medium long, thin; internodes short. *Buds* broad at apex, covered with brown pubescence. *Growing shoots* copper tinted, glabrous or almost so. *Tendrils* light green, irregular, bi-fid, sometimes tri-fid, slender, short, smooth, glabrous or almost so.

*Unfolding leaves* variously pigmented, downy above and below. *Full-grown leaves* cuneiform, 5-lobed, medium large; glabrous above and glabrous or almost so below. Superior lateral sinus medium deep, broad; inferior lateral sinus usually broad and deep; petiolar sinus broad and deep. Teeth in 3-series, few; primary teeth medium long, medium broad; secondary teeth short, broad. Petiole green, medium long, glabrous.

*Flowers* hermaphrodite, stamens upright, anthers at the same level or slightly higher than stigma. *Inflorescence* appears on 2nd to 5th nodes.

*Bunches* small to medium, medium long, cylindrical or short conical, sometimes branched, compact. Peduncle light green, short, thin, glabrous, herbaceous, devoid of warts. Rachis light green, short, thin; primary branches few, short; secondary branches few and short. Pedicels arising from rachis and primary branches; medium long, thin, glabrous, warty, warts many. Torus small, rough. Brush yellowish green, medium long, thin.

*Berries* light green or yellowish green, spherical, small, size moderately variable; bloom thin, easily removable; apex pointed, adherence medium strong. Skin adherent to pulp, medium thick, tough, transparency very good, veins below very clear. Pulp soft, melting, flavour absent, slightly insipid in taste, veins prominent. Juice clear, yellowish, insipid in taste.

*Seeds* many (1-4; av. 2-3), very short, narrow, small, round, hard, tasteless, non-adherent; chalaza circular, raised and located below centre; beak medium long, incurved, smooth.

Ripening uniform, mid-season, 3rd to 4th week of June in North and 1st week of March in Poona. Quality medium, T.S.S. 15%, acidity 0.5-0.7%, juice 50%. Not susceptible to cracking.

It is susceptible to rust and downy mildew.

### 50. GOLDEN MUSCAT

*Vines* medium in vigour. *Bark* loose and detaches in long, wide, smooth and compact straps. *Canes* medium long, thick; internodes short. *Buds* broad at apex, covered with brown pubescence and pink tinted. *Growing shoots* greyish green above, green below; slightly pubescent. *Tendrils* green with purplish streaks, intermittent, usually bi-fid, also tri- and tetra-fid, slender, short, wooly. (Fig. 26)

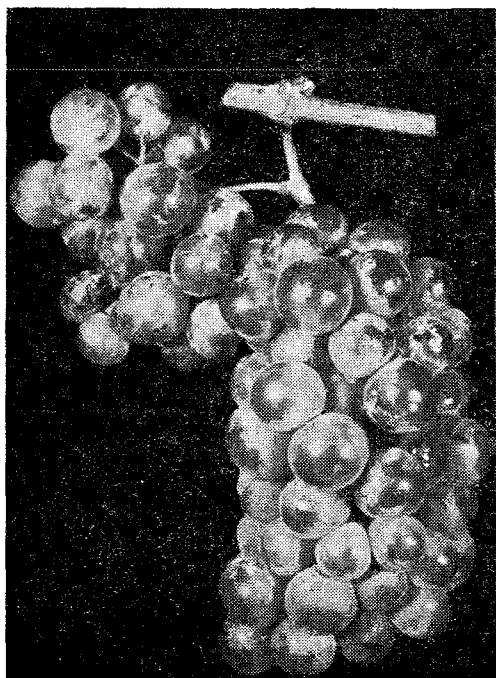


Fig. 26 Golden Muscat

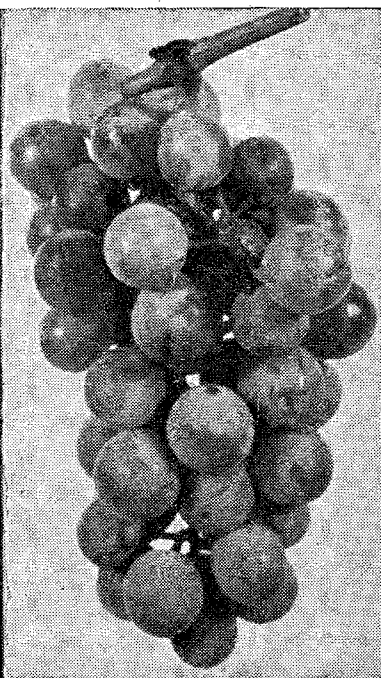


Fig. 27 Golden Queen

*Unfolding leaves* greyish green above and silvery white below, devoid of any pigmentation, wooly above and below. *Full-grown leaves* cuneiform, entire, 3 or 5-lobed, small, thick, rough, downy above and felted below. Superior lateral sinus shallow, wide, V-shaped; inferior lateral sinus inconspicuous to shallow, V-shaped; petiolar sinus narrow, round,

V-shaped. Teeth in 3-series, many in number, broad; primary teeth very narrow; secondary teeth very narrow. Petiole short.

*Flowers* hermaphrodite, stamens upright, anthers higher than stigma. *Inflorescence* appears on 1st to 6th nodes.

*Bunches* attractive, medium large, short, globular to cylindrical, neither shouldered nor winged, loose to well filled. Peduncle light green, medium long, thin, glabrous or nearly so, devoid of warts. Rachis light green, short, thin, pubescent; primary branches few, short; secondary branches absent. Pedicels arising from rachis or extremely short primary branches, medium long, medium thick, glabrous, warty, warts few. Torus small, rough. Brush light green, long, thin.

*Berries* golden yellow, ellipsoidal elongated, medium large, size less variable; bloom thin, easily removable; apex pointed, adherence weak. Skin thick, slip skin type, tender, transparency poor. Pulp firm, crisp. Juicy, foxy in flavour, veins visible but not prominent. Juice yellowish green, turbid, very sweet.

*Seeds* medium in number (1-6; av. 1-2), long, narrow, medium large, oblong, hard, tasteless, non-adherent; chalaza oval, sunken, located below centre and extending up to raphe; beak long, incurved, rough.

It is reported to be a *vinifera* × *labrusca* hybrid resulting from a cross between Muscat Hamburg × Diamond at the Fredonia Experiment Station, New York during 1918.

Ripening is uniform, mid-season, 4th week of June in Delhi. Quality medium, T.S.S. 15-16%, acidity 0.5%, juice 60-70%. Not susceptible to cracking. Performance from other regions not reported. It does well on trellis when cane pruned. Keeping quality poor to medium. Good for juice making.

It has been reported to be moderately susceptible to anthracnose.

### 51. GOLDEN QUEEN

*Vines* poor to medium in vigour. *Bark* loose and detaches in long, thin, very smooth, compact straps. *Canes* light brown, slightly smoky on one side, long, thin; internodes medium long. *Buds* broad at apex, covered with brown pubescence and pink tinted. *Growing shoots* dark in colour, strongly pubescent. *Tendrils* purple colour obscured by white pubescence, irregular, sometimes even continuous, bi- and tri-fid, thick, medium long, heavily pubescent. (Fig. 27)

*Unfolding* leaves greyish green above and silvery white below; some pinkish tinge along the margin of the leaves above or (and) pink patches on the lamina surface, wooly above and below. *Full-grown leaves* orbicular, 5-lobed, medium large, thin, rough, downy above and felted below. Superior lateral sinus shallow, wide, V-shaped; inferior lateral sinus absent;

petiolar sinus wide, flat and U-shaped. Teeth in 4-series, many in number, broad; primary teeth very narrow; secondary teeth very broad. Petiole dark purple, short, thick, pubescent.

*Flowers* hermaphrodite, stamens upright, anthers much higher than stigma. *Inflorescence* appears on 1st to 6th nodes.

*Bunches* small to medium large, medium long, long cylindrical or pyramidal, neither shouldered nor winged, loose to well filled. Peduncle light green, purplish when young, short, thin, pubescent. Rachis light green, short, thin; primary branches few, very short; secondary branches few. Pedicels arising mostly from rachis and primary branches, medium long, thin, warty. Torus small, very rough. Brush creamy white, long, thin.

*Berries* golden yellow to amber, spherical, medium large, size moderately variable; bloom thin, easily removable; apex pointed, adherence weak. Skin slip skin type, tough, transparency poor. Pulp firm, crisp, juicy, pronounced foxy flavour, veins visible but not prominent. Juice yellowish green, turbid, sweet.

*Seeds* dark brown, very many in number (1-5; av. 3-4), medium long, medium broad, medium large, oblong, hard, tasteless, non-adherent; chalaza oval, sunken, located below centre and extending up to raphe; beak medium long, straight, rough.

According to Dr. Hogg, it was raised by Mr. John Pearson of Chilwell, Nottingham from Alicante crossed by Ferdinand de Lesseps (Perold, 1927).

Ripening uniform, mid-season, 4th week of June to 1st week of July in North and first fortnight of March at Hessaraghatta (Mysore State). Quality medium, T.S.S. 16-17%, acidity 0.9 to 1.0%, juice 60%. T.S.S. goes up to 22% at Hessaraghatta (Mysore State). Quality poor with early rains; light to medium cropper.

It has been found to be moderately susceptible to anthracnose but resistant to powdery mildew.

## 52. GROS COLMAN

*Vines* vigorous. *Bark* loose and detaches in long, broad, thick, round and fissured straps. *Canes* purple, medium long, thick; internodes medium long. *Buds* broad at apex, covered with brown pubescence. *Growing shoots* purple, medium long, medium thick, strongly pubescent. *Tendrils* purplish, intermittent, bi- and tri-fid, medium long, moderately pubescent. (Fig. 28)

*Unfolding leaves* greyish green above and silvery white below; some pinkish tinge along the margin of the leaves above or (and) below or pink patches on the lamina surface; wooly above and below. *Full-grown leaves* orbicular, 3 to 5-lobed, large, thick, rough, leathery, glabrous above and wooly below. Superior lateral sinus shallow, wide, V-shaped; inferior lateral sinus absent; petiolar sinus narrow, acute, V-shaped. Teeth in 3-series,

medium in number, broad; primary teeth narrow; secondary teeth very broad. Petiole medium long.



Fig. 28 Gros Colman

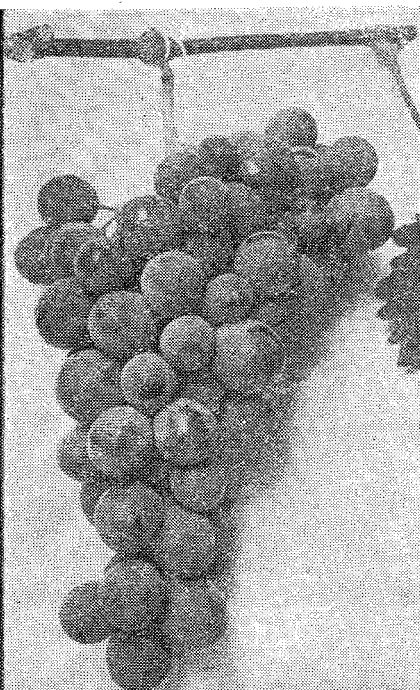


Fig. 29 Gulabi

*Flowers* hermaphrodite, stamens upright, anthers slightly higher than stigma. *Inflorescence* appear on 2nd to 5th nodes.

*Bunches* medium large, long, short conical, branched, compact. Peduncle green, medium long, thin, glabrous, smooth, devoid of warts. Rachis green, medium long; primary branches many, short; secondary branches few. Pedicels arising from primary branches, medium long, medium thick, warty, warts not many. Torus small, rough. Brush light green with purplish tinge when berries fully ripe, medium long, thin.

*Berries* dark purple changing to bluish black, spherical, medium large, size moderately variable; bloom thin, easily removable; apex truncate, adherence medium strong. Skin adherent to pulp, medium thick, tender, transparency poor. Pulp soft, melting, flavoured only when fully ripe, veins prominent. Juice brownish yellow, clear, very sweet.

*Seeds* many (1-5; av. 2-3), very long, medium broad, large, oblong, hard, tasteless, non-adherent; chalaza circular, raised and located centrally; beak medium long, incurved, rough.

A *vinifera* grape (Mortensen and Randolph, 1940), which originally came from Caucasus. It was imported into France in 1958, and is generally known as Dodrelabi. Mr. Rivers introduced this variety in England in 1860 under the name Gros Colmar. According to Dr. Hogg both Gros Colman or Gros Colmar are misnomers of Grosse Kolner.

Ripening is not uniform; bunches do not ripen fully, ripen late in 4th week of June to 1st week of July in Delhi and quality is poor. Medium to heavy cropper. Susceptible to cracking and rotting due to rains. Shot berries many. Bears well with short pruning.

It was found susceptible to powdery mildew.

### 53. GULABI

*Vines* medium in vigour. *Bark* loose and detaches in medium long, wide, thick, rough and fissured straps. *Canes* reddish brown, short, thin; internodes short. *Buds* broad at apex, covered with brown pubescence. *Growing shoots* green with purple shade, glabrous or almost so. *Tendrils* green, intermittent, bi- and tri-fid, slender, short, slightly pubescent. (Fig. 29)

*Unfolding leaves* variously pigmented; pubescence downy above and below. *Full-grown leaves* cuneiform, 3 or 5-lobed, small, thin, smooth, glabrous above and downy below. Superior lateral sinus shallow, wide, V-shaped; inferior lateral sinus shallow, V-shaped; petiolar sinus narrow, round U-shaped. Teeth in 3-series, medium in number, narrow; primary teeth very narrow; secondary teeth broad. Petiole light purple, long.

*Flowers* hermaphrodite, stamens upright, anthers higher than stigma. *Inflorescence* appears on 3rd to 5th nodes.

*Bunches* attractive, medium large, medium long, short conical or cylindrical, neither shouldered nor winged, loose to well filled; peduncle light green, medium long, thin, glabrous, devoid of warts. Rachis light green, medium long, thin; primary branches many, medium long. Pedicels arising from primary branches, medium long, thin, glabrous, warty, warts few. Torus small, rough, warty. Brush light green often pinkish pigmented, medium long, thick.

*Berries* deep purple, spherical, small, size moderately variable; bloom moderate, easily removable; apex truncate to pointed, adherence weak to medium strong. Skin adherent to pulp, medium thick, tough, transparency poor. Pulp greenish, melting, juicy, musky in flavour, veins visible but not prominent. Juice greenish, clear, sweet.

*Seeds* yellowish brown, medium in number (0-4; av. 2), long, medium broad, medium large, oblong, soft, tasteless, non-adherent; chalaza oval, raised, located below centre and extending up to raphe; beak medium long, incurved, rough.

This variety has performed well at Kanpur (Singh, 1965), Lucknow

(Kurtkōti, 1963), Saharanpur (Nand, 1965), Poona (Joshi, 1961), Hissar (Daulta, 1969), and Delhi (Chadha, 1965). According to Kurtkoti (1963), it is best suited to Lucknow condition due to its earliness and good quality. Nand (1965) recommends this variety for commercial cultivation in U.P. According to Phadnis (1965), it is one of the popular quality grape in Poona. According to Gandhi (1960), it is similar to Muscat Hamburg of Australia.

Ripening is fairly uniform. It is a mid-season variety in the North and ripens from 3rd to 4th week of June in Delhi, 1st week to end of June in Lucknow, last week of May in Kanpur and last week of February in Poona.

Quality is good. T.S.S. 18-20%, acidity 0.5-0.6%, juice 60-75%. T.S.S. up to 22% has been reported from Poona (Joshi, 1961). Not susceptible to cracking. It is a medium cropper with yield ranging from 12,000 to 20,000 Kg/ha.

It is highly susceptible to rust and downy mildew.

#### 54. HIMROD

*Vines* vigorous. *Bark* loose and detaches in short, thin, narrow, compact and flexible straps. *Canes* purplish, long to very long, thick; internodes long. *Growing shoots* green and purple pigmented, glabrous or so. *Tendrils* pale green, intermittent, tri-fid, smooth, long, thick, pubescent.

*Unfolding leaves* greyish green above and silvery white below, devoid of any pigmentation, wooly above and below. *Full-grown leaves* orbicular, 3 to 5-lobed, medium large, thick, rough, glabrous above and downy below. Superior lateral sinus narrow to medium wide, shallow, mostly V-shaped; inferior lateral sinus usually absent, narrow when present; petiolar sinus closed with lobes overlapping to narrow, V-shaped. Teeth in 3-series, many, narrow, pointed; primary teeth long, very narrow, pointed; secondary teeth short, very broad. Petiole light purplish, short, medium thick, tough, slightly pubescent.

*Flowers* hermaphrodite, stamens upright, anthers higher than stigma. *Inflorescence* appears from 2nd to 6th nodes.

*Bunches* attractive, medium large, long, broad, long conical to cylindrical, shouldered, straggly. Peduncle green, long, thick, glabrous, tough, warty. Rachis light green, long, thick; primary branches many, short; secondary branches many, short. Pedicels arise from primary and secondary branches, short, medium thick, warty. Torus small, rough. Brush long, thin.

*Berries* yellow green, dull amber when fully ripe, slightly ellipsoidal, medium large, size moderately variable; bloom present, removed easily, apex rounded, adherence strong. Skin adherent, adherence medium, transparency poor, thick, tough, taste harsh, flavour natural. Pulp green, translucent, tender, veins visible, mildly aromatic, sweet. Juice greenish, sweet, mildly aromatic, clear, abundant.

*Seeds* very small, abortive.

According to Slate *et al.* (1962), this seedless variety has originated from a cross made in 1928 between Ontario (American type)  $\times$  Sultanina (Thompson Seedless). This particular seedling was selected in 1938. However, it was introduced for commercial cultivation only in 1952.

This variety is a recent introduction in India. It has been tried at Saharanpur and Kanpur (U.P.) where it has performed very well. It is now being tried in other Northern States and needs a trial in other grape growing regions of the country.

Ripening is uniform, early, last week of May at Meerut, Saharanpur and Kanpur (U.P.). Quality is very good. T.S.S. 20-25%, acidity 0.5-0.6%, juice 60-65%. Cropping medium.

It is moderately susceptible to anthracnose.

## 55. HUR

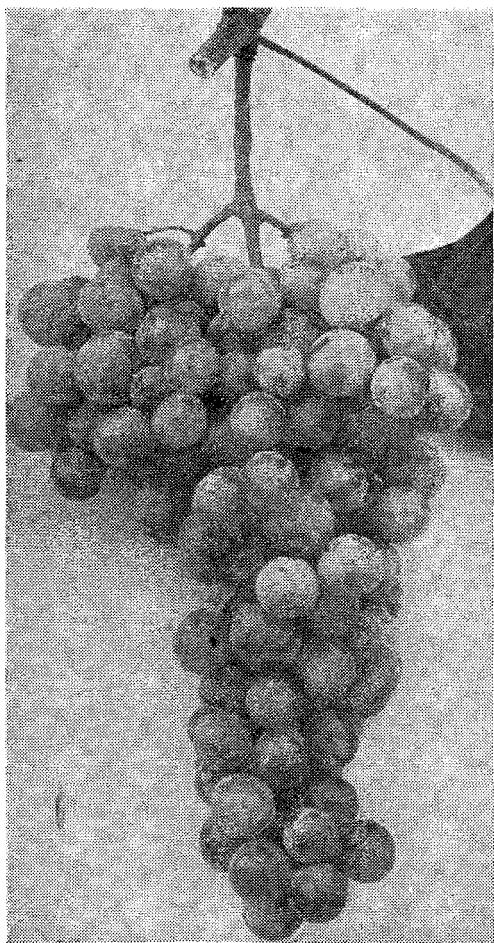


Fig. 30 Hur

*Vines* very vigorous. *Bark* loose and detaches in medium long, very thick and very rough straps. *Canes* light brown, slightly smoky on one side, medium long, thick; internodes medium long. *Buds* broad at apex, covered with brown pubescence. *Growing shoots* dark purple, glabrous or almost so. *Tendrils* green with purplish base, intermittent, bi- and tri-fid, long, glabrous. (Fig. 30)

*Unfolding leaves* variously pigmented, pubescence cob-webby above and below. *Full-grown leaves* cuneiform, 3 or 5-lobed, very large, thin, rough, glabrous above and below. Superior lateral sinus shallow, wide, V-shaped; inferior lateral sinus shallow, V-shaped; petiolar sinus wide, flat and U-shaped.

Teeth in 3-series, fair in number, broad; primary teeth narrow; secondary teeth very broad. Petiole medium long.

*Flowers* hermaphrodite, stamens reflexed, anthers at the level of stigma. *Inflorescence* appears on 5th to 7th nodes.

*Bunches* attractive, medium large to large, long, short conical to conical, irregular, winged or shouldered, well filled or compact. Peduncle green purplish on one side, medium long, thick, glabrous, herbaceous, devoid of warts. Rachis green, long, medium thick; primary branches many, long; secondary branches many, long. Pedicels arising mostly from primary and secondary branches, medium long, thick, glabrous, devoid of warts. Torus small, smooth. Brush pale white, medium long, thin.

*Berries* yellowish green or light green, spherical, medium in size, size moderately variable; bloom thin, easily removable, apex truncate, adherence weak. Skin adherent to pulp, thin, cracking, transparency medium good. Pulp firm, crisp, flavour poor, sweet, veins visible and prominent. Juice clear, greenish, sweet.

*Seeds* many (0.5; av. 2.3), medium long, medium broad, large, round, soft, tasteless, non-adherent; chalaza circular, raised and located below centre; beak medium long, incurved, rough.

Ripening is uniform, mid-season, second fortnight of June in the North and middle of March in Poona. Quality medium to good. T.S.S. 16-18%, acidity 0.5-0.6%, juice 50-60%. A medium cropper. Not susceptible to cracking.

This is a green, seeded grape of good quality and has performed very well in Delhi, Punjab and Maharashtra. The plant material of this variety has erroneously been distributed under the name Gros Colman in North India.

## 56. HUSSAINI

*Vines* vigorous. *Bark* very loose and detaches in very long, medium broad, thick, smooth and fissured straps. *Canes* long, thick; internodes long. *Buds* broad at apex, covered with brown pubescence and pink tinted. *Growing shoots* strongly pubescent. *Tendrils* green with faint purplish tinge, intermittent, bi- and tri-fid, medium thick, medium long, glabrous or so.

*Unfolding leaves* greyish green above and silvery white below, with colouration other than pink, and purplish or brownish at the margin; little older leaves have more brownish colour spread throughout the lamina; wooly above and below. *Full-grown leaves* cuneiform, 3 or 5-lobed, very large, thin, rough, leathery, glabrous above and wooly below. Superior lateral sinus shallow to medium deep, wide, V-shaped; inferior lateral sinus shallow, V-shaped; petiolar sinus medium wide, acute and V-shaped. Teeth in 3-series, medium in number, very narrow; primary teeth very narrow; secondary teeth narrow. Petiole medium long.

*Flowers* hermaphrodite, stamens upright, anthers and stigma at the same level. *Inflorescence* appears on 2nd to 8th nodes.

*Bunches* medium large, long, short conical to long conical, irregular, always branched, compact. Peduncle green, medium long, thin, glabrous, devoid of warts. Rachis light green, medium long, thin, primary branches few, short; secondary branches few. Pedicels arising mostly from primary branches, medium long, thin, less warty. Torus small, rough. Brush blood red, long, thin.

*Berries* bluish black, spherical, small, size moderately variable; bloom thin, easily removable; apex truncate, adherence medium strong. Skin adherent to pulp, medium thick, tender, transparency poor. Pulp soft, melting, musky in flavour, veins prominent. Juice clear, brownish yellow, very sweet.

*Seeds* medium in number (0-4; av. 2), very long, medium broad, large, oblong, hard, tasteless, non-adherent; chalaza circular, raised and located centrally; beak medium long, incurved, rough.

Ripening is not uniform, late, 4th week of June to 1st week of July in Delhi. Quality is good. T.S.S. 16-18%, acidity 0.5-0.65%, juice 55-60%. Medium cropper. Susceptible to cracking and rotting. Bunches spoiled by rains. Performance from other regions of the country not reported.

It has been found to be highly susceptible to rust and downy mildew and resistant to anthracnose and *Cercospora* leaf-spot.

## 57. HUSSAINI BLACK KABULI

*Vines* very vigorous. *Bark* loose and detaches in long, narrow, thin, smooth and highly fissured straps. *Canes* light brown, smoky on one side, short, thick; internodes medium. *Buds* broad at apex, covered with brown pubescence. *Growing shoots* green with dark purple streaks, glabrous or almost so. *Tendrils* green, intermittent, bi- and tri-fid, medium thick, short, nearly glabrous. (Fig. 31)

*Unfolding leaves* greyish green above and silvery white below, with colouration other than pink, and purplish or brownish at the margin; little older leaves have more brownish colour spread throughout the lamina; pubescence wooly above and below. *Full-grown leaves* cuneiform to orbicular, 5-lobed, medium large, thin, rough, leathery, glabrous above and wooly below. Superior lateral sinus shallow, wide, V-shaped; inferior lateral sinus shallow, V-shaped; petiolar sinus narrow, acute, sometimes round and U-shaped. Teeth in 3-series, medium in number, narrow; primary teeth very narrow; secondary teeth broad. Petiole green with purple shades, medium long and pubescent.

*Flowers* hermaphrodite, stamens upright, anthers at the same level or

slightly higher than stigma. *Inflorescence* appears on 2nd to 7th nodes, mainly on 3rd to 4th nodes.

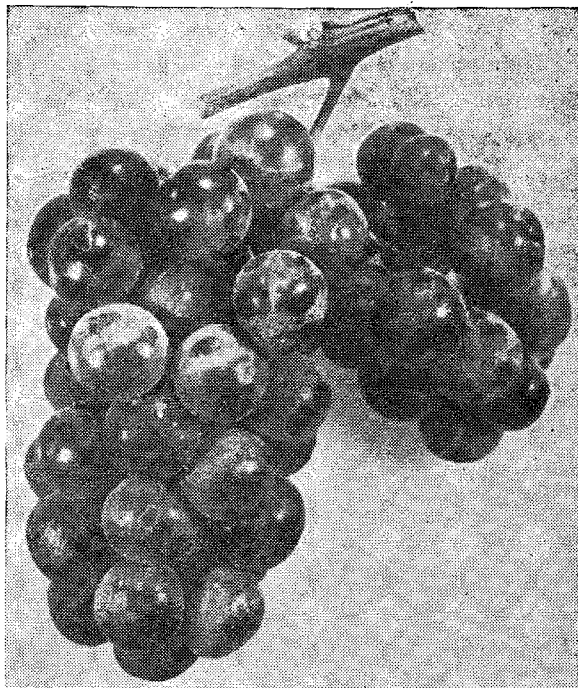


Fig. 31 Hussaini Black Kabuli

*Bunches* medium large, medium long, conical or short conical, branched, compact. Peduncle green, medium long, thin, glabrous, devoid of warts. Rachis medium long, thin; primary branches few, short. Pedicels arising mostly from primary branches, medium long, medium thick, glabrous, warty, warts few. Torus small, rough; brush purplish pigmented, long, thick.

*Berries* bluish black, spherical, large, size less variable; bloom thick, not easily removable; apex truncate, adherence strong. Skin adherent to pulp, medium thick, tough, transparency poor. Pulp firm, crisp, musky in flavour, veins prominent. Juice clear, very sweet.

*Seeds* very many (2-6; av. 3-4), long, medium broad, medium large, oblong, hard, tasteless, non-adherent; chalaza circular, raised and located centrally; beak medium long, incurved, rough.

Ripening is uniform. Bunches do not ripen fully in Delhi. Ripening time is late, 3rd week of June to 1st week of July in North India. When fully ripe, quality good, T.S.S. 19-20%, acidity 0.5%, juice 50%. A light to medium

cropper. Susceptible to cracking and rotting in North India due to rains. Performance from other regions of the country not reported.

It is highly susceptible to rust and downy mildew and resistant to anthracnose and *Cercospora* leaf-spot.

### 58. IONA

*Vines* poor in vigour. *Bark* loose and detaches in medium long, medium wide, papery thin, smooth and compact straps; bark of canes also detaches into papery thin straps. *Canes* light brown, short, thin internodes short. *Buds* broad at apex, covered with brown pubescence. *Growing shoots* green, strongly pubescent. *Tendrils* light green, slightly purplish at base, intermittent, bi- and tri-fid, medium thick, short, pubescent.

*Unfolding leaves* greyish green above and silvery white below, devoid of any pigmentation; woolly above and below. *Full-grown leaves* cuneiform, 5-lobed, medium large, thick, rough, downy above and felted below. Superior lateral sinus shallow to medium deep, narrow, V-shaped; inferior lateral sinus shallow to medium deep, V-shaped; petiolar sinus medium deep, acute, V-shaped. Teeth in 3-series, medium in number, broad, primary teeth narrow; secondary teeth broad. Petiole purplish, medium long, slightly pubescent.

*Flowers* hermaphrodite, stamens upright, anthers at the same level or slightly higher than stigma. *Inflorescence* appears on 2nd to 3rd nodes.

*Bunches* attractive, small, short, globular, sometimes shouldered, well filled. Peduncle green, medium long, thin, glabrous. Rachis short, thin; primary branches many, short; secondary branches absent. Pedicels arising mostly from primary branches, medium long, thin, glabrous, warty, warts many. Torus small, rough. Brush pale green, slightly purplish pigmented, long, thin.

*Berries* bright red to brick red, spherical, small, size less variable; bloom thin, easily removable; apex truncate, adherence medium strong. Skin adherent to pulp, thin, tender, transparency poor. Pulp tender, melting, juicy, foxy in flavour. Juice clear, very sweet.

*Seeds* many in number (2-4; av. 2), medium long, medium broad, medium large, hard, tasteless, non-adherent; chalaza oval, sunken and located below centre; beak short, straight, rough.

It is reported to be a *labrusca* and *vitifera* hybrid (Synder, 1937). According to Vaile (1939), it was originated by Mr. C. W. Grant at New York during 1855. It is good as a table grape and for wine (Bradt, 1952).

It is a red, seeded grape of very good quality. Ripening uniform, late, 1st week of July in Delhi. Quality is very good. T.S.S. 22-25%, acidity

0.7%, juice 50%. Light cropper. Not susceptible to cracking. Keeping quality good.

### 59. ISABELLA

*Vines* vigorous. *Bark* loose and detaches in long, narrow, papery thin, very smooth and highly fissured straps; bark of canes also detaches into papery thin straps. *Canes* light brown, long, thick, heavily pubescent; internodes long. *Buds* broad at apex, covered with brown pubescence and pink tinted. *Growing shoots* strongly pubescent. *Tendrils* irregular, sometimes continuous, bi-fid, thick, long, heavily pubescent, greyish green, purplish streaks obscured by heavy pubescence.

*Unfolding leaves* greyish green above and silvery white below; some pinkish tinge along the margin of the leaves above or (and) below or pink patches on the lamina surface; pubescence wooly above and below. *Full-grown leaves* cuneiform, 3-lobed, rarely 5-lobed or even entire, medium large, thin, rough, upper surface dark green, lower surface whitish green, cob-webby above and felted below. Superior lateral sinus shallow to medium deep, narrow, V-shaped; inferior lateral sinus not found; petiolar sinus wide, acute, V-shaped. Teeth in 2-series, medium in number, broad; primary teeth broad; secondary teeth broad. Petiole short.

*Flowers* hermaphrodite, stamens upright, anthers higher than stigma. *Inflorescence* appears on 1st to 5th nodes.

*Bunches* small to medium large, short, regular, globular to cylindrical, devoid of wings, loose to well filled. Peduncle light green, short, thin, pubescent, devoid of warts. Rachis light green, short; primary branches few, short. Pedicels arising mostly from rachis and primary branches, short, thin, warty. Torus small, rough. Brush pale yellow, long, thin.

*Berries* bluish black when fully ripe, mostly ellipsoidal, medium large, size moderately variable; bloom thick, easily removable; apex truncate, adherence medium strong. Skin very thick, slip skin type, tough, transparency poor. Pulp melting, leathery, juicy, foxy in flavour, veins prominent. Juice turbid, insipid in taste.

*Seeds* medium in number (1-4; av. 1-2), long, broad, very large, round, hard, tasteless, non-adherent; chalaza oval, sunken, located below centre and extending up to raphe; beak short, straight, rough.

It is considered to be a *labrusca* and *vinifera* hybrid (Mortensen and Randolph, 1940). It was obtained from Mrs. Isabella Gibbs of Brooklyn, New York, by William Prince of Long Island in 1816, and called Isabella by him. Its synonyms include Raisin du Cap, Black Cape, Constantia, Strawberry grape, Framboisier, etc.

Ripening is not uniform, very late, few berries turn colour, others remain unripe and green even till October, resulting poor in quality at

Delhi. At Hesaraghatta (Mysore) ripening is uniform from middle of March to end of March and quality is good with T.S.S. 22-24%, acidity 0.8%. It has also been tried in the hills of H.P. at elevation ranging from 3,000 to 5,000 feet during 1937 alongwith other varieties like Concord, Catawba and Pierce. The performance was good, though fruit quality was not good as that of *vinifera* type. Light cropper. Not susceptible to cracking. Keeping quality good.

It is susceptible to rust and downy mildew but resistant to powdery mildew. It was reported moderately susceptible to anthracnose from Saharanpur (U.P.) by Prasad and Nirvan (1965) but was found resistant to anthracnose at Hesaraghatta (Mysore State) by Sridhar and Sohi (1970).

## 60. ITALIAN ELEQUENA

*Vines* medium is vigour. *Bark* loose and detaches in medium long, thin, narrow, fissured straps. *Canes* dark brown, medium to long, thin; internodes medium long. *Buds* broad at apex, covered with brown pubescence and pink tinted. *Growing shoots* purple pigmented, wooly. *Tendrils* yellowish green, purple pigmented, intermittent, mostly bi-fid, smooth, short, thin, pubescent.

*Unfolding leaves* light green, greyish green above and silvery white below, wooly above and below. *Full-grown leaves* cuneiform, 5-lobed, medium large, thick, rough, wooly above and below. Superior lateral sinus medium wide, shallow, V-shaped; petiolar sinus narrow, sometimes perforate, V-shaped. Teeth in 3-series, many, broad, blunt; primary teeth narrow, medium to long; secondary teeth short, broad. Petiole deep purple, short, pubescent.

*Flowers* hermaphrodite, stamens upright, anthers at the same level as stigma. *Inflorescence* appears between 4th to 6th nodes, rarely on the 7th node.

*Bunches* medium to long, cylindrical, shouldered, sometimes branched, compact. Peduncle purplish, short, medium thick, slightly pubescent, herbaceous, tough, warty. Rachis medium long, medium thick; primary branches many, short. Pedicel arising from primary branches and rachis, short, thick, warty. Torus small, rough, warty. Brush pinkish, short, thin.

*Berries* bluish black, obovoid, medium large, size less variable; bloom present, thick, not removed easily; apex pointed, adherence strong. Skin adherent, transparency poor, medium thick, tough, taste harsh, flavour neutral. Pulp firm, sub-acid with slight musky flavour. Juice brownish, rather acid, musky, trubid.

*Seeds* few (1-4; av. 1-2), medium large, long, medium broad, oblong, soft, very harsh, slightly adherent; located above centre; chalaza oval, indistinct, even; beak medium long, smooth, straight.

Ripening somewhat uneven, mid-season. Quality medium. T.S.S. 15%

acidity 0.8-0.9%, juice 65%, bearing good. Yields from 10,000 to 12,000 Kg/ha, in Poona (Phadnis, 1965). Keeping quality good.

It is susceptible to rust and downy mildew.

### 61. JAISHI

*Vines* vigorous. *Bark* loose and detaches in medium long, wide, thick, smooth and fissured straps. *Canes* dark brown, long, thick, pubescent; internodes long. *Buds* broad at apex, covered with brown pubescence. *Growing shoots* green with dark purple shades, fairly pubescent. *Tendrils* green with faint purplish streaks, intermittent, slender, medium long, bi- and tri-fid, moderately pubescent.

*Unfolding leaves* greyish green above and silvery white below with colouration other than pink and purplish or brownish at the margin; little older leaves have more brownish colour spread throughout the lamina; wooly above and below. *Full-grown leaves* cuneiform, 5-lobed, sometimes 3-lobed, small, thick, rough, downy above and wooly below. Superior lateral sinus shallow to medium deep, narrow, U-shaped; inferior lateral sinus shallow to medium deep, U-shaped; petiolar sinus medium deep, round and U-shaped. Teeth in 3-series, medium in number, broad; primary teeth narrow; secondary teeth broad. Petiole purplish, medium long, densely pubescent.

*Flowers* hermaphrodite, stamens upright, anthers at the same level or slightly higher than stigma. *Inflorescence* appears on 2nd to 4th nodes.

*Bunches* medium large, medium long, long conical, sometimes shouldered, compact. Peduncle dark brown, long, medium thick, glabrous, devoid of warts. Rachis dark brown, short, thin; primary branches many, short; secondary branches few, short. Pedicels arising from rachis and primary branches, short, thin, glabrous, warty, warts many, very rough. Torus small, rough. Brush creamy yellow, very short, thin.

*Berries* light green, spherical, often obovoid, small, size moderately variable; bloom very thin, easily removable; apex truncate, adherence poor to medium strong. Skin adherent to pulp, medium thick, tough, transparency very good, veins below and seed visible. Pulp soft, melting, flavour wanting, sub-acidic in taste, veins prominent. Juice clear, yellowish.

*Seeds* pinkish in colour, medium in number (1-4; av. 2), medium long, medium broad, medium large, oblong, soft, astringent, adherent to pulp and located centrally; chalaza circular, raised and located centrally; beak medium long, straight, rough.

Ripening fairly uniform, mid season, 2nd week of June to middle of July in Delhi. Quality poor to medium in the North, good in Poona. T.S.S. 16-18%, acidity 0.6-0.7%, juice 50-60%. A light to medium cropper. Not

susceptible to cracking. Shot berries many. It is known as Jaishee in Maharashtra.

It is susceptible to rust and downy mildew.

## 62. JAMES

*Vines* medium in vigour. *Bark* very loose and detaches in long, medium wide, thin, smooth and almost compact straps; bark of canes also detaches into papery thin straps. *Canes* dark brown to purplish, thin, heavily pubescent; internodes medium long. *Buds* broad at apex, covered with brown pubescence and pink tinted. *Growing shoots* purple, pubescent. *Tendrils* greyish green, purplish streaks obscured by heavy pubescence, irregular, sometimes continuous, bi- and tri-fid, thick, medium long, heavily pubescent.

*Unfolding leaves* greyish green above and silvery white below; some pinkish tinge along the margin of the leaves above or (and) below or pink patches on the lamina surface; wooly above and below. *Full-grown leaves* cuneiform, 3-lobed, sometimes 5-lobed or entire, small, thin, rough, downy above and felted below. Superior lateral sinus shallow to medium deep, narrow, V-shaped; inferior lateral sinus shallow, V-shaped; petiolar sinus medium deep, acute and V-shaped. Teeth in 3-series, medium in number, broad; primary teeth broad; secondary teeth broad. Petiole short.

*Flowers* hermaphrodite, stamens upright, anthers higher than stigma. *Inflorescence* appears on 1st to 5th nodes.

*Bunches* small, short, regular, globular to short conical, neither shouldered nor winged, loose to well filled. Peduncle light green, short, thin, pubescent, devoid of warts. Rachis light green, short, thin; primary branches few, short; secondary branches absent. Pedicels arising mostly from rachis and primary branches, short, medium thick, warty. Torus small, rough. Brush pale yellow, long, thin.

*Berries* dark purple, spherical, also ellipsoidal, small, size moderately variable; bloom thin, easily removable; apex truncate, adherence medium strong. Skin very thick, slip skin type, tough, transparency poor. Pulp melting, leathery, juicy, foxy flavour, veins prominent. Juice turbid, insipid.

*Seeds* medium in number (1-3, av. 1-2), long, broad, large, oblong, hard, tasteless, non-adherent; chalaza oval, sunken, located below centre and extending up to raphe; beak medium long, straight, rough.

It is a *rotundifolia* grape (Vaile, 1939) and was introduced by B. W. James in North Carolina in 1867.

Ripening is not uniform, very late, few berries turn colour, others remain unripe and green even till October and quality poor under Delhi conditions. Ripening uniform and early in Poona. Quality medium, T.S.S. 16%, acidity 0.8-1.0%, juice 50-55%. Light cropper. Not susceptible to cracking. It is resistant to anthracnose and *Cercospora* leaf-spot.

**63. JANJAL KHARA**

*Vines* vigorous. *Bark* adherent and detaches in short, narrow straps. *Canes* medium long, thick; internodes short. *Buds* broad at apex, covered with brown pubescence. *Growing shoots* green, slightly brownish, glabrous. *Tendrils* light green, slightly purplish at base, intermittent, bi- and tri-fid, long, glabrous or nearly so.

*Unfolding leaves* variously pigmented; glabrous or nearly so above and below. *Full-grown leaves* orbicular, 5-lobed, large, medium thick, smooth, glabrous above and below. Superior lateral sinus shallow, wide; inferior lateral sinus shallow to inconspicuous; petiolar sinus wide, U-shaped. Teeth many, apical tooth broad, pointed. Petiole purplish, medium long.

*Flowers* hermaphrodite, stamens upright, anthers at higher level than stigma. *Inflorescence* appears on 3rd to 5th nodes.

*Bunches* attractive, medium large, short, globular, neither shouldered nor winged, loose to very loose. Peduncle long, medium thick. Rachis short, thick; primary branches long; secondary branches few. Pedicels arising mostly from primary branches, medium long. Torus thin, rough. Brush yellowish green with purplish tinge, medium long.

*Berries* brick red, oblate, medium large, size highly variable; bloom thin, easily removable; adherence medium, apex truncate. Skin medium thick, adherent to pulp, transparency poor. Pulp firm, juicy, pinkish yellow.

*Seeds* many (1-5; av. 2-3); medium long, broad, thick, medium large, cuneate, texture medium; chalaza oval, sunken, located in the middle; beak long.

An introduction from U.S.S.R. where it is grown as a table and raisin variety. It makes high quality raisins. Ripening uniform, mid season, 3rd week of June in Delhi and Hissar. Quality medium in Delhi (T.S.S. 18%), very good in Hissar (T.S.S. 20-22%), acidity 0.6%, juice 70%. Heavy yielder.

It is moderately susceptible to anthracnose and *Cercospora* leaf-spot, but resistant to powdery mildew.

**64. JAOS BELI**

*Vines* medium in vigour. *Bark* loose, detaches in narrow, long, compact straps. *Canes* medium long, thick; internodes short. *Buds* broad at apex, covered with brown pubescence. *Growing shoots* green, purple pigmented, downy. *Tendrils* light green, intermittent, bi- and tri-fid, long. Slightly pubescent.

*Unfolding leaves* greyish green above and silvery white below, woolly above and below. Some pinkish tinge along the border of the leaves above or (and) below or pink patches on the lamina surface. *Full-grown leaves* orbicular, 3-5 lobed, medium large, thick, rough, flat, glabrous above,

downy below. Superior lateral sinus shallow, wide; inferior lateral sinus inconspicuous to almost absent; petiolar sinus narrow, V-shaped. Teeth many, apical tooth broad, pointed.

*Flowers* hermaphrodite, stamens upright, anthers longer than stigma. *Inflorescence* appears on 4th to 6th nodes.

*Bunches* large, cylindrical to conical, well filled. Peduncle medium long, thick. Rachis medium long, thick; primary branches short; secondary branches few, arising mostly from primary branches, medium long. Torus thick, rough. Brush long, creamy.

*Berries* golden yellow, obovoid, large, size less variable; bloom thin, easily removable; adherence strong, apex truncate. Skin thin, adherent to pulp. Pulp firm, juicy. Juice greenish yellow.

*Seeds* many (1-5; av. 3), medium heavy, medium long, broad, medium thick, hard, cuneate, light brown; chalaza sunken, circular, located in the middle; beak long.

An introduction from U.S.S.R. Ripening uniform, mid season, 2nd week of June in Delhi and last week of March to first week of April at Hessaraghatta (Mysore). T.S.S. 18%, acidity 0.6-0.8%, juice 75%.

It is moderately susceptible to anthracnose but moderately resistant to powdery mildew.

## 65. KABARAVI

*Vines* medium in vigour. *Bark* adherent and detaches in short, narrow and fissured straps. *Canes* short, medium thick; internodes short. *Buds* broad at apex, covered with brown pubescence. *Growing shoots* green, downy. *Tendrils* purplish at base, intermittent, bi- and tri-fid, short, glabrous.

*Unfolding leaves* greyish green above and silvery white below, with colouration other than pink and purplish or brownish at the margin, little older leaves have more brownish colour spread throughout the lamina; woolly above and below. *Full-grown leaves* orbicular, 5-lobed, small, medium thick, smooth, glabrous above and below. Superior lateral sinus close to wide, shallow; inferior lateral sinus shallow, wide; petiolar sinus close to narrow, U-shaped. Teeth many, apical tooth medium, broad, blunt. Petiole, purplish on both sides, long.

*Flowers* hermaphrodite, stamens upright, anthers higher than stigma. *Inflorescence* appears on 3rd to 5th nodes.

*Bunches* medium large, conical, shouldered, loose. Peduncle medium long, medium thick. Rachis short, medium thick; primary branches short; secondary branches few. Pedicels arising mostly from primary branches, short. Torus medium thick, rough. Brush creamy, medium long.

*Berries* bright red, spherical, medium large, size slightly variable; bloom

thin, easily removable; apex truncate. Skin adherent to pulp, thin, transparency medium; pulp juicy, sweet.

*Seeds* few (1-3; av. 1), medium long, broad, thick, medium heavy, light brown, cuneate, medium in texture; chalaza oval, sunken, located in the middle; beak short.

An introduction from U.S.S.R. Ripening not uniform; mid season, 3rd week of June in Delhi, March-April at Hessaraghatta. Quality medium, T.S.S. 18%, acidity 0.5-0.6%, juice 75-80%. Light to medium cropper.

Resistant to anthracnose and *Cercospora* leaf-spot and moderately resistant to powdery mildew.

## 66. KAILASHPUR

*Vines* medium in vigour. *Bark* adherent and detaches in short and brittle straps. *Canes* medium long, thick; internodes short. *Buds* broad at apex, covered with brown pubescence. *Growing shoots* glabrous or almost so. *Tendrils* green with faint purplish streaks, intermittent, bi- and tri-fid, slender, medium long, glabrous or so.

*Unfolding leaves* variously pigmented, cob-webby above and below. *Full-grown leaves* cuneiform, 5-lobed, small, thin, smooth, glabrous above and below. Superior lateral sinus medium deep, narrow, V-shaped; inferior lateral sinus shallow to medium deep, V-shaped; petiolar sinus narrow, acute and V-shaped. Teeth in 3-series, fair in number, narrow; primary teeth very narrow; secondary teeth narrow. Petiole short.

*Flowers* hermaphrodite, stamens upright, anthers at the same level or slightly higher than stigma. *Inflorescence* appears on 2nd to 4th nodes.

*Bunches* medium large; medium long, short conical to long conical, neither shouldered nor winged, compact to very compact. Peduncle green, short, medium thick, glabrous, devoid of warts. Rachis green, medium long, medium thick; primary branches many, short; secondary branches absent. Pedicels arising from rachis and primary branches, medium long, thick, glabrous, warty, warts few. Torus small, rough. Brush green, long, thin.

*Berries* greenish, spherical, small, size moderately variable; bloom thin, easily removable; apex truncate, adherence weak to medium strong. Skin adherent to pulp, thick, tough, transparency poor. Pulp melting, watery, musky in flavour, veins visible, transparency very good, very sweet. Juice clear, very sweet.

*Seeds* many (1-5; av. 2-3), medium long, narrow, small, oblong, hard, tasteless, non adherent; chalaza circular, raised and located below centre; beak medium long, incurved, smooth.

Ripening is uniform, mid season, 2nd to 3rd week of June in Delhi. Quality good, T.S.S. 20%, acidity 0.5%, juice 65%. Light to medium

cropper. Not susceptible to cracking. From vegetative and fruit characters, the variety appears to be identical with Bharat Early.

It is resistant to anthracnose and *Cercospora* leaf-spot.

### 67. KALI SAHEBI

*Vines* vigorous. *Bark* loose and detaches in short, thick, broad, fissured, brittle straps. *Canes* brown with dark brown streaks, long, thick, glabrous; internodes long. *Buds* pointed at apex and covered with brown pubescence. *Growing shoots* green, sometimes light purplish, glabrous. *Tendrils* green, intermittent, bi- and tri-fid, glabrous, warty, medium long, medium thick. (Fig., 32).

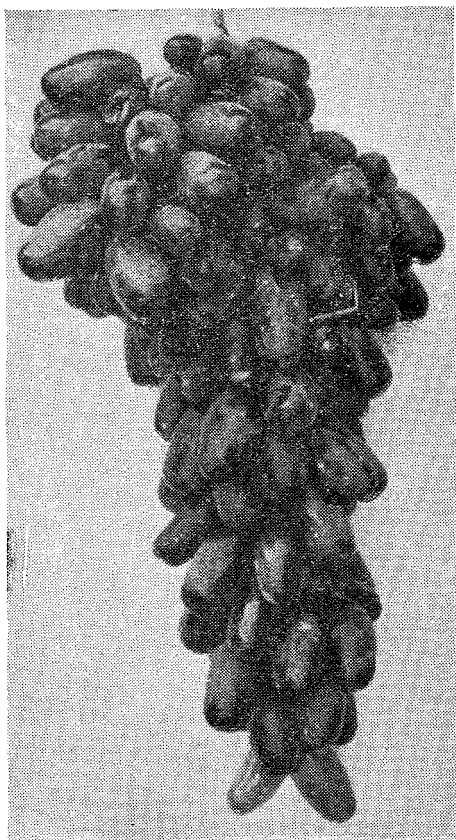


Fig. 32 Kali Sahebi

*Unfolding leaves* green above and below with coppery margins, glabrous above and below. *Full-grown leaves* orbicular, 5-lobed, large, thick, smooth, glabrous above and below. Superior lateral sinus medium wide, deep, U-shaped; inferior lateral sinus medium deep, U-shaped; petiolar sinus medium wide, medium deep, U-shaped. Teeth in 3-series, short, broad, blunt; primary teeth short, broad, blunt; secondary teeth short, very broad. Petiole yellowish green with purple dots, medium long, glabrous.

*Flowers* hermaphrodite, stamens upright, anthers at level or slightly higher than stigma. *Inflorescence* appears mostly on the 4th to 6th nodes.

*Bunches* very attractive, large, long, short conical to long conical, shouldered, well-filled to compact. Ped-

uncle green, medium long, medium thick, glabrous, tough, warts absent. Rachis light green, long, medium thick; primary branches many, short.

Pedicels arising from primary and secondary branches, long, thick, warty. Torus large, rough. Brush green with pinkish tinge, medium long, thin.

*Berries* reddish purple, falcoid or oval cylinderoidal, large, less variable; bloom present, thin, removed easily; apex depressed, adherence rather weak to medium. Skin purple, adherent, transparency medium, thin, medium tough, taste and flavour neutral. Pulp green, transparency poor, texture firm, crisp, veins prominent, taste very sweet, flavour musky. Juice straw coloured, sweet, musky, fairly clear.

*Seeds* yellowish brown, many (1-4; av. 2-3), large, long, broad, cuneate, hard, tasteless, non-adherent; chalaza slightly below centre, oval, distinct, raised; beak medium long, smooth, slightly incurved.

This variety is reported to have been introduced sometimes in the 17th century by Baba Shah Musafir from Persia under the name Habshi. It came to be known as Kali Sahebi in Poona and Nasik areas. It is a black grape and a good table variety and is cultivated in Maharashtra and Andhra Pradesh on a commercial scale. It matures rather late in the North, i.e., end of June to middle of July in Delhi and Lucknow and quality remains poor. As such, it cannot be recommended for cultivation under North Indian conditions.

Ripening is not so uniform, late. Quality very good in Maharashtra and Andhra Pradesh. T.S.S. 20-22%, acidity 0.5-0.7%, juice 50-60%. On account of its attractive bunches, thin skin and sweet pulp with high T.S.S., it is sold at a premium over Anab-e-shahi.

Yield is moderate, less than Anab-e-shahi, ranges from 12,000 to 18,000 kg/ha. It has shown good yield potential when properly trained. It responds well to long pruning, i.e., 8-10 buds. It is a good shipper and can be sent to distant markets.

It is highly susceptible to rust and downy mildew and moderately to highly susceptible to anthracnose and susceptible to powdery mildew.

## 68. KANDHARI

*Vines* medium in vigour. *Bark* very loose and detaches in very long, broad, medium thick, smooth and highly fissured straps. *Canes* light brown with dark brown streaks, medium long, thick; internodes medium long. *Buds* broad at apex, covered with brown pubescence. *Growing shoots* light green with purple shades, glabrous or almost so. *Tendrils* green with purplish tinge, intermittent, bi- and tri-fid, thick, medium in length, glabrous or nearly so. (Fig. 33).

*Unfolding leaves* variously pigmented, cob-webby above and below. *Full-grown leaves* orbicular, 5-lobed, very large, thin, smooth, glabrous above and below. Superior lateral sinus medium deep, narrow, V-shaped; inferior lateral sinus shallow, V-shaped; petiolar sinus narrow, round and V-shaped.

Teeth in 3-series, many in number, narrow; primary teeth very narrow; secondary teeth narrow. Petiole yellowish green, medium long, thick, glabrous.

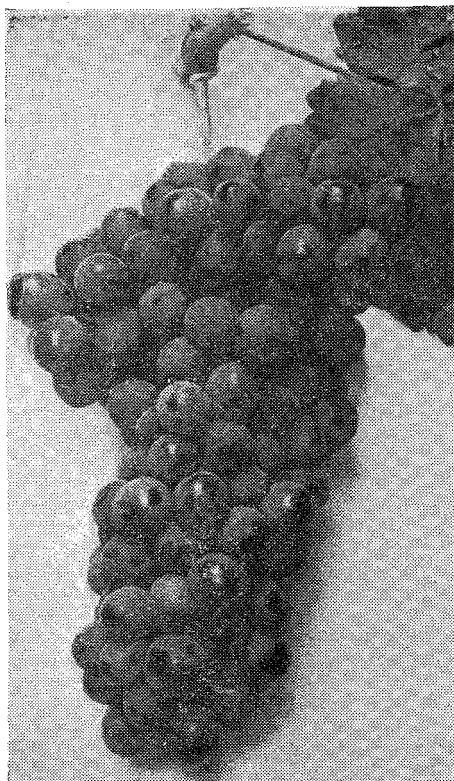


Fig. 33 Kandhari



Fig. 34 Khalili

*Flowers* hermaphrodite, stamens upright, anthers at the same level as stigma. *Inflorescence* appears on 5th to 6th nodes.

*Bunches* attractive, medium large to large, long, short conical to long conical, cylindrical, often shouldered, well-filled to compact. Peduncle green, long, medium thick, glabrous, tough and devoid of warts. Rachis green, long, medium thick; primary branches many, medium long, secondary branches few in number, short. Pedicels arising mostly from primary branches, medium long, medium thick, warty. Torus, medium thick, rough. Brush creamy yellow to brilliant red, long, thin.

*Berries* bright red to brick red, ellipsoidal elongated, medium large, size moderately variable; bloom thin, easily removable; apex pointed, adherence medium strong. Skin adherent to pulp, medium thick, tough, transparency

poor. Pulp firm, crisp, juicy, good flavoured, veins visible and prominent. Juice clear, sweet.

*Seeds* yellowish brown, medium in number (0-4; av, 1-2), very long, broad, large, oblong, hard, tasteless, non-adherent and located below centre; chalaza oval, raised and located below centre; beak medium long, straight, rough.

This is a coloured, seeded grape of good quality and has done well in North India at Delhi, Punjab, Lucknow and Kanpur (U.P.) and Punjab. It is one of the eight promising varieties recommended from Lyallpur (Singh and Singh, 1940). Experiments conducted at Coimbatore have indicated the possibilities of developing this as a promising variety for the southern region (Krishnamurthi and Madhav Rao, 1965). It is named as Khandari in South India.

Ripening is uneven in the North but uniform in Poona, mid season, middle of June to first week of July in Delhi, last week of May in Kanpur (Singh, 1965), first week to end of July in Lucknow (Kurtkoti, 1963) and Punjab and mid March in Poona. Quality medium to good, T.S.S: 18-20%, acidity 0.6-0.8%, juice 60-65%. Medium cropper. Yields on an average 15,000-20,000 kg/ha. Not susceptible to cracking, but susceptible to rotting after rains. Keeping quality good, and stands transport well. Responds well to 6-8 buds pruning and bower system of training.

It is susceptible to rust and downy mildew and moderately susceptible to anthracnose and *Cercospora* leaf-spot.

## 69. KATTA KURGHAN

*Vines* medium in vigour. *Bark* loose, detaches in long, medium wide and compact straps. *Canes* medium long, thick; internodes short. *Buds* broad at apex, covered with brown pubescence. *Growing shoots* brownish above, green below, glabrous. *Tendrils* slightly purplish at base, intermittent, tri- and tetra-fid, long, glabrous.

*Unfolding leaves* with varying degree of pigmentation, cob-webby above and below. *Full-grown leaves* orbicular, 3-5 lobed, small, medium thick, smooth, glabrous above and below. Superior lateral sinus close to perforate, shallow; inferior lateral sinus shallow to inconspicuous; petiolar sinus narrow to medium, U-shaped. Teeth many, apical tooth medium in width, blunt. Petiole purplish on both sides, long.

*Flowers* mainly pistillate and require cross pollination. *Inflorescence* appears on 3rd to 5th nodes.

*Bunches* large, broad, conical to cylindrical, shouldered, well filled to compact. Peduncle long, thick. Rachis long, thick; primary branches long; secondary branches many. Pedicels arising mostly from secondary branches, long. Torus thick, rough. Brush long, greenish white.

*Berries* whitish yellow or amber, oval, large, size slightly variable; bloom medium thick, not easily removable; apex truncate, adherence medium. Skin medium thick, adherent to pulp. Pulp firm, very juicy, sweet pleasant flavour. Juice greenish yellow.

*Seeds* light brown, medium in number (1-4; av. 2), long, broad, thick, heavy; chalaza oval, sunken, located in the middle; beak long.

An introduction from U.S.S.R. where it is a high quality table and raisin variety grown all over Uzbekistan. It has been tried in the North at Delhi and in South at Hessaraghatta (Mysore) and has done well at both the places. It has been extensively used in breeding programmes in U.S.S.R.

Ripening is uniform. Ripens in the last week of June in Delhi and February-March at Hessaraghatta. Quality is good. T.S.S. 18% in Delhi and 20% at Hessaraghatta, acidity 0.5-0.6%, juice 70-75%. Keeping quality medium. It is good for juice making.

It is resistant to *Cercospora* leaf spot, moderately susceptible to anthracnose, susceptible to powdery mildew and highly susceptible to rust and downy mildew.

## 70. KHALILI

*Vines* poor to medium in vigour. *Bark* very loose and detaches in long, thin, narrow, compact, brittle strips. *Canes* smoky on one side and brown on the other. *Buds* broad at apex, covered with brown pubescence. *Growing shoots* light brown with prominent purple streaks, long, thin, rough, glabrous. *Tendrils* yellowish green, intermittent, bi-fid, smooth, medium long, medium thick, pubescent. (Fig. 34)

*Unfolding leaves* yellowish green with pink margin, glabrous above and below. *Full-grown leaves* orbicular, 5-lobed, medium large, thin, smooth, glabrous above and below. Superior lateral sinus narrow, shallow, V-shaped; inferior lateral sinus conspicuous, narrow, shallow, V-shaped; petiolar sinus narrow to medium wide; medium deep, V-shaped. Teeth in 3-series, few in number, medium long, broad, blunt; primary teeth short, broad; secondary teeth short, broad. Petiole purplish, medium long.

*Flowers* hermaphrodite, stamens upright, anthers slightly higher than stigma. *Inflorescence* appears mostly from 4th and 6th nodes.

*Bunches* small to medium, long, short conical or pyramidal, shouldered, loose to well filled. Peduncle light green, medium long, thin, glabrous, herbaceous, tough, free from warts. Rachis green, short, medium thick; primary branches many, short. Pedicels arise from primary and secondary branches, long, thin, warty. Torus small, rough. Brush light green, short, thin.

*Berries* yellowish green, glossy, elongated, medium large, less variable; bloom present, thin, removed easily; adherence medium. Skin adherent,

medium transparency, medium thick, tough, taste and flavour neutral. Pulp yellowish green, medium transparency, soft, veins visible, taste sweet. Juice dirty yellow, sweet, flavour musky, clear.

*Seeds* medium in number (1-4; av. 2), small, short, narrow, soft, harsh, slightly adherent, location central; chalaza below centre, oval, distinct, suken; beak medium rough, straight.

This variety was first tried at Lyallpur and was found to be a good green, seeded, early ripening high quality grape. It was recommended for cultivation as early as 1940 on the basis of observations made at Lyallpur (Singh and Singh, 1940). It has a poor keeping quality on account of a weak pedicel attachment and cannot stand transportation well. Seed is very small, soft and cracks easily. The variety has not found favour due to these two defects. Moreover Perlette, ripening of which follows closely, and is more prolific bearer with good keeping quality is preferred. It has only a limited scope of commercial cultivation. It is doing well in the sub-mountainous areas of Himachal Pradesh, Haryana and Punjab.

Ripening is uniform, early, last week of May to middle of June in North, slightly earlier than Perlette. It is one of the earliest ripening seeded grape of the world.

Quality is very good, T.S.S. 18-22%, acidity 0.4-0.5%, juice 60-65%. It is a shy bearer. It is recommended for planting in home gardens and near big towns, where the fruit can be disposed of quickly.

## 71. KISHMISH BELI

*Vines* medium in vigour. *Bark* adherent and detaches in short, narrow straps. *Canes* long, thick; internodes short. *Buds* broad at apex, covered with brown pubescence. *Growing shoots* green, glabrous. *Tendrils* slightly brownish, green, intermittent, slender, short, bi- or tri-fid, glabrous or nearly so.

*Unfolding leaves* green, devoid of any pigmentation, cob-webby above and below. *Full-grown leaves* orbicular, 5-lobed, large, medium thick, smooth, glabrous above and below. Superior lateral sinus shallow, wide; inferior lateral sinus shallow to inconspicuous, wide; petiolar sinus close to narrow, U-shaped. Teeth medium in number, apical tooth medium in width, blunt. Petiole medium long.

*Flowers* hermaphrodite, stamens upright and anthers at the same level as stigma. *Inflorescence* appears on 3rd to 5th nodes from the base.

*Bunches* large, cylindrical to conical, winged, well filled to compact. Peduncle medium long, thick. Rachis long, thick; primary branches short; secondary branches many. Pedicels arising mostly from secondary branches, short. Torus thin, smooth. Brush yellowish green, short.

*Berries* yellowish green, oblate, small, size moderately variable; apex

truncate, adherence strong. Skin thin, adherent to pulp. Pulp melting, juicy, juice greenish yellow.

It is a *seedless* variety.

An introduction from U.S.S.R. where it is the leading commercial raisin variety of Uzbekistan (Randhawa, 1965). Out of Kishmish Beli and Kishmish Charni, the former is more widespread and popular in Uzbekistan.

It has been tried in the North at Delhi, Abchar and Hissar and has done well at these places. Ripening is uniform, mid season, 2nd week of June. Quality good both for table and raisin making. T.S.S. 20-22%, acidity 0.6-0.7%, juice 80%.

## 72. KISHMISH CHARNI

*Vines* medium in vigour. *Bark* adherent and detaches in short, narrow and fissured straps. *Canes* medium long, thick; internodes short. *Buds* broad at apex, covered with brown pubescence. *Growing shoots* green with purplish streaks, glabrous. *Tendrils* light green, intermittent, bi- and tri-fid, slender, short, glabrous.

*Unfolding leaves* green, devoid of any pigmentation, cob-webby above and below. *Full-grown leaves* cuneiform, 5-lobed, medium large, medium thick, smooth, glabrous above and below. Superior lateral sinus shallow, wide; inferior lateral sinus shallow, wide; petiolar sinus close to narrow, U-shaped. Teeth many, apical tooth broad, pointed. Petiole pinkish, short.

*Flowers* hermaphrodite, stamens upright, anthers higher than stigma. *Inflorescence* appears on 3rd to 5th nodes from the base.

*Bunches* large, conical, shouldered, well filled to compact. Peduncle medium long, thick. Rachis long, thick; primary branches long; secondary branches few. Pedicels arising mostly from primary branches, medium long. Torus medium thick, smooth. Brush pinkish green, medium long.

*Berries* brick red, spherical, medium large, size highly variable; bloom thin, easily removable; apex truncate, adherence medium. Skin thin, adherent to pulp. Pulp juicy, pinkish yellow, very sweet, aromatic.

### *Seedless*

It is an introduction from U.S.S.R., where it is a highly valued seedless variety of Uzbekistan. It is next only to Kishmish Beli in area and is mainly used for raisin making (Randhawa, 1965). It is also used for table consumption. In India, it has been introduced at a number of places and has done well in arid irrigated tracts of Punjab, Haryana, Delhi and Poona.

Ripening is uniform, mid-season, 3rd week of June in Hissar and Abohar, middle of March at Hessaraghatta (Mysore). Quality good, T.S.S. 20-22%, goes up to 24%, acidity 0.5-0.8%, juice 70-75%. In Russia, T.S.S. goes up to 28%, and acidity 3-4%. Yields good. Bears 20,000 to

22,000 kg/ha on bower system. It is susceptible to rust and downy mildew, moderately susceptible to anthracnose and *Cerospora* leaf-spot, but moderately resistant to powdery mildew.

### 73. KISHMISH RED

*Vines* medium in vigour. *Bark* loose and detaches in medium long, medium wide, thin, smooth and highly fissured straps; bark of canes also detaches into papery thin straps. *Canes* medium long, thick; internodes short. *Buds* broad at apex, covered with brown pubescence. *Growing shoots* glabrous or almost so. *Tendrils* green, sometimes purplish at base, intermittent, bi- and tri-fid, medium thick, medium long, glabrous or nearly so (Fig. 35).

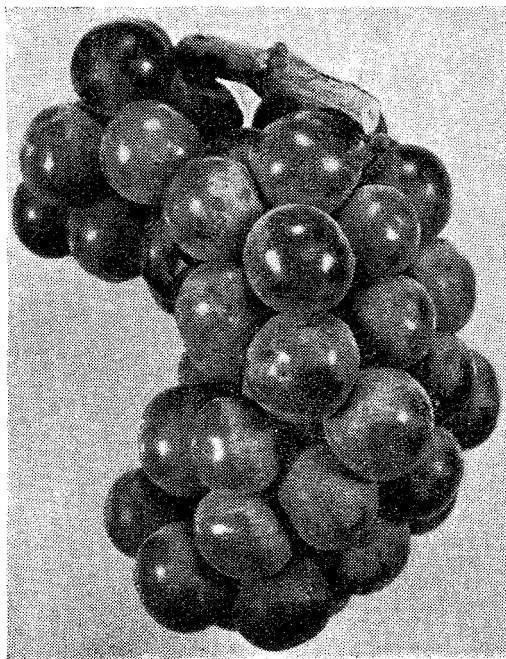


Fig. 35 Kishmish Red

*Unfolding leaves* greyish green above and silvery white below, with colouration other than pink, and purplish or brownish at the margin; little older leaves have more brownish colour spread throughout the lamina; wooly above and below. *Full-grown leaves* cuneiform, 5-lobed, medium large, thin, rough, leathery, glabrous above and cob-webby to wooly below. Superior lateral sinus shallow, narrow, V-shaped; inferior lateral sinus

shallow, V-shaped; petiolar sinus narrow, acute, U-shaped. Teeth in 3-series, medium in number, narrow; primary teeth very narrow; secondary teeth narrow. Petiole medium long.

*Flowers* hermaphrodite, stamens upright, anthers higher than stigma. *Inflorescence* appears on 2nd to 6th nodes.

*Bunches* medium large, short, short conical, branched, compact to very compact. Peduncle light green, short, thin, glabrous, herbaceous, devoid of warts. Rachis light green, short, thin; primary branches many, short; secondary branches few and short. Pedicels arising from rachis and primary branches, medium long, thin, glabrous, warty. Torus small, rough. Brush green with purplish tinge, long, thick.

*Berries* bluish black, spherical to obovoid, small, size less variable; bloom thick, not easily removable; apex truncate or pointed, adherence medium strong. Skin adherent to pulp, thick, tough, transparency poor. Pulp firm, crisp, musky in flavour, veins prominent. Juice clear, very sweet.

*Seeds* many (1-5; av. 2-3), long, medium broad, medium large, oblong, hard, astringent, non-adherent; chalaza circular, raised and located centrally; beak medium long, straight, rough.

Ripening late, 4th week of June to 1st week of July, and uneven; bunches do not ripen fully. Quality medium, T.S.S. 18-19%, acidity 0.35-0.45%, juice 60-65%. Susceptible to cracking and rotting. Shot berries many.

It is highly susceptible to rust and downy mildew.

#### 74. LAHORE 33

*Vines* vigorous. *Bark* slightly adherent and detaches in short, narrow and highly fissured strips. *Canes* long, thick; internodes medium long. *Buds* broad at apex, covered with brown pubescence and pink tinted. *Growing shoots* slightly pubescent. *Tendrils* green, deep purplish at base, intermittent, bi-fid, slender, medium long, moderately pubescent (Fig. 36).

*Unfolding leaves* greyish green above and silvery white below with colouration other than pink and purplish or brownish at the margin; little older leaves have more brownish colour spread throughout the lamina, woolly above and below. *Full-grown leaves* pentagonal, 5-lobed, small, thin, smooth, glabrous above and downy below. Superior lateral sinus medium deep, narrow, V-shaped; inferior lateral sinus shallow to medium deep, V-shaped; petiolar sinus medium wide, round and V-shaped. Teeth in 3-series, fair in number, narrow; primary teeth very narrow; secondary teeth narrow. Petiole medium long.

*Flowers* hermaphrodite, stamens upright, anthers higher than stigma. *Inflorescence* appears on 3rd to 5th nodes.

*Bunches* medium large, medium long, short conical to cylindrical.

branched, very compact. Peduncle green, short, thin, slightly pubescent, devoid of warts. Rachis green, short, thin, no primary or secondary branches. Pedicels arising from the rachis, medium long, thin, green in colour, warty, warts few. Torous small, rough, warty. Brush deep pinkish or blood red, medium long, thin.

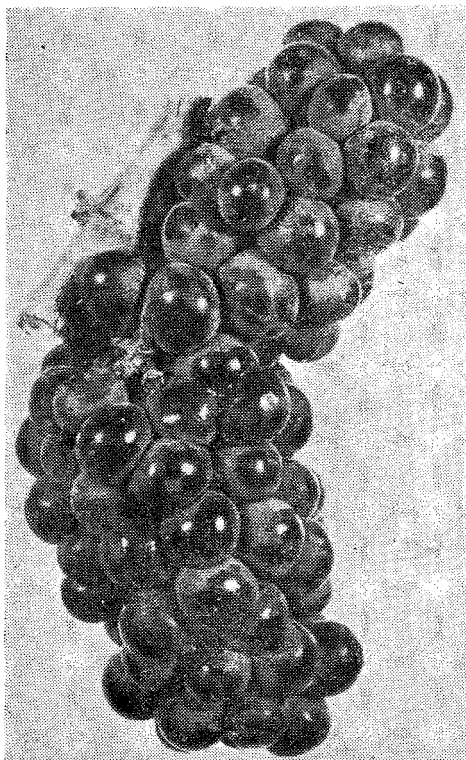


Fig. 36 Lahore 33

cropper. Not susceptible to cracking. Performance from other regions of the country not reported.

It is resistant to anthracnose and to *Cercospora* leaf-spot.

*Berries* deep red to almost black, spherical, often obovoid to obovoid-elongated, small, size moderately variable; bloom thick, easily removable; apex truncate, adherence weak. Skin adherent to pulp, thick, tough, transparency poor. Pulp firm, crisp, flavour mild, veins not prominent. Juice clear, sweet.

*Seeds* medium in number (0.4; av. 1.2), medium long, medium broad, medium large, round, soft, tasteless, badly adherent; chalaza circular, raised and located centrally; incurved and rough.

Ripening is fairly uniform, mid season, 2nd to 3rd week of June in Delhi. Quality medium, T.S.S. 16%, acidity 0.8%, juice 60%. Light to medium

## 75. LAHORE 36

*Vines* medium in vigour. *Bark* slightly adherent and detaches in medium long, wide, thin and slightly fissured strips. *Canes* long; internodes medium long. *Buds* broad at apex, covered with brown pubescence and pink tinted. *Growing shoots* slightly pubescent. *Tendrils* green, deep purplish at base, intermittent, bi-fid, slender, medium long, moderately pubescent.

*Unfolding leaves* greyish green above and silvery white below with colouration other than pink and purplish or brownish at the margin; little older leaves have more brownish colour spread throughout the lamina; woolly above and below. *Full-grown leaves* pentagonal, 5-lobed, small, thin, smooth, glabrous above and downy below. Superior lateral sinus medium deep, narrow, sometimes perforate, V-shaped; inferior lateral sinus medium deep, V-shaped; petiolar sinus narrow, round and V-shaped. Teeth in 2-series, medium in number, broad; primary teeth narrow; secondary teeth broad. Petiole medium long.

*Flowers* hermaphrodite, stamens upright, anthers higher than stigma. *Inflorescence* appears on 2nd to 5th nodes.

*Bunches* medium large, medium long, short conical to cylindrical, branched, compact to very compact. Peduncle light green with brownish patches, medium long, medium thick, pubescent, tough, devoid of warts. Rachis light green, medium long, medium thick; primary branches few, medium long; secondary branches few or absent. Pedicels arising mostly from primary branches or rachis, medium long, thin, warty, warts few. Torus small, rough, warty. Brush pinkish in colour, medium long, thin.

*Berries* deep red to almost black, spherical, often obovoid to obovoid-enlongated, small, size highly variable; bloom thick, easily removable; apex truncate, adherence weak. Skin adherent to pulp, medium thick, tough, transparency poor. Pulp firm, crisp, flavour mild, veins not prominent. Juice clear, sweet.

*Seeds* medium in number (1-3; av. 1-2), medium long, medium broad, medium large, round, hard, tasteless, adherent; chalaza circular, sunken and located below centre; beak short, incurved, rough.

Ripening fairly uniform, mid season, 2nd to 3rd week of June in Delhi. Quality medium, T.S.S. 16%, acidity 0.80%, juice 45-50%. Medium cropper. Not susceptible to cracking.

It is moderately susceptible to anthracnose and *Cercospora* leaf-spot.

## 76. LAKE EMERALD

*Vines* medium in vigour. *Bark* loose and detaches in long, broad, thin, smooth and compact straps. *Canes* long, thin; internodes medium long. *Buds* broad at apex, covered with brown pubescence and pink tinted. *Growing shoots* strongly pubescent. *Tendrils* green, purplish streaks from base upward, intermittent, bi-fid, often tri-fid slender, shorter, heavily pubescent.

*Unfolding leaves* greyish green above and silvery white below, devoid of any pigmentation, woolly above and below. *Full-grown leaves* cuneiform, 3-lobed, small, thick, rough, downy above and woolly below. Superior lateral sinus shallow, wide, V-shaped; inferior lateral sinus not found; petiolar sinus, narrow, acute, V-shaped. Teeth in 3-series, may in number, broad; primary teeth narrow; secondary teeth broad. Petiole short.

*Flowers* hermaphrodite, stamens upright, anthers higher than stigma. *Inflorescence* appears on 3rd to 5th nodes.

*Bunches* small, medium long, short conical or cylindrical, sometimes branched, well filled. Peduncle green, long, medium thick, glabrous, devoid of warts. Rachis green, medium long, medium thick; primary branches few, small; secondary branches absent or few. Pedicels arising from the rachis and primary branches, short, thin, glabrous, warty. Torus small, rough. Brush green, medium long and thin.

*Berries* yellowish green, spherical, small, size less variable; boom very thin, easily removable; apex truncate, adherence medium strong. Skin thick, slip skin type, tough, transparency poor. Pulp firm, melting, juicy, foxy flavour, veins visible but not prominent. Juice tur bid, acidic.

*Seeds* very many (1-5; av. 3-4), short, narrow, medium large, oblong, hard, tasteless, non-adherent, extending up to raphe; beak short, incurved, smooth.

An introduction from U.S.A. Ripening is uniform, late, 4th week of June to 1st week of July in Delhi. Quality medium, T.S.S. 18%, acidity 0.8-0.9%, juice 40%. Medium to heavy cropper. Not susceptible to cracking. Performance from other regions of the country not reported.

## 77. LARGE WHITE

*Vines* vigorous. *Bark* very loose and detaches in long, wide, papery thin, very smooth and slightly fissured straps; bark of canes also detaches into papery thin straps. *Canes* long, thick; internodes medium long. *Buds* broad at apex, covered with brown pubescence. *Growing shoots* strongly pubescent. *Tendrils* greyish green in colour, purplish tinge around the base obscured by white pubescence, irregular, thick, medium long, bi- and tri-fid, heavily pubescent.

*Unfolding leaves* greyish green above and silvery white below; some pinkish tinge along the border of the leaves above or (and) below or pink-patches on the lamina surface, wooly above and below. *Full-grown leaves* truncate, 3-lobed, sometimes 5-lobed, very large, thin, rough, cob-webby above and felted below. Superior lateral sinus shallow, narrow, V-shaped; inferior lateral sinus not found; petiolar sinus medium wide, acute and V-shaped. Teeth in 3-series, medium in number, broad; primary teeth broad; secondary teeth broad. Petiole medium long.

*Flowers* hermaphrodite, stamens upright, anthers higher than stigma. *Inflorescence* appears on 1st to 4th nodes.

*Bunches* small, short, regular, globular to short conical, neither shouldered nor winged, loose. Peduncle light green, short, thin, pubescent, devoid of warts. Rachis light green, short, thin; primary branches few, short; secondary branches absent. Pedicels arising mostly from rachis and primary

branches, short, medium thick, warty. Torus small, rough; Brush purple pigmented when berries ripe, long thin.

*Berries* deep purple, spherical, often ellipsoidal, small, size moderately variable; bloom thin, easily removable; apex truncate, adherence medium strong. Skin very thick, slip skin type, tough, transparency very poor. Pulp leathery, melting, foxy in flavour, veins visible but not prominent. Juice turbid, insipid in taste.

*Seeds* medium in number (1-4; av, 1-2), medium long, broad, large, round, hard, tasteless, non-adherent; chalaza oval, sunken, located below centre and extending up to raphe; beak short, straight, rough.

Ripening not uniform, very late and few berries turn colour, others remain unripe and green even till October, so quality is poor in North India. Light cropper. Not susceptible to cracking. Performance not reported from other regions of the country.

The variety is moderately susceptible to rust and downy mildew and resistant to anthracnose and *Cercospora* leaf-spot. According to Prasad and Nirvan (1965), the variety is moderately susceptible to anthracnose under Saharanpur conditions.

## 78. LOMANTO

*Vines* poor in vigour. *Bark* loose and detaches in short, narrow, thin, smooth and slightly fissured straps; bark of canes also detaches into papery straps. *Canes* long, thick; internodes medium long. *Buds* broad at apex, covered with brown pubescence and pink tinted. *Growing shoot* fairly pubescent. *Tendrils* purplish throughout, intermittent, bi-fid, rarely tri-fid, medium thick, short, moderately pubescent.

*Unfolding leaves* greyish green above and almost pink below; margin above is beautifully lined pink; pubescence wooly above and below. *Full-grown leaves* cordate, 3 or 5-lobed, rarely entire, small, thick, rough, leathery, glabrous above and wooly below. Superior lateral sinus shallow, wide, V-shaped; inferior lateral sinus not found, petiolar sinus medium wide, flat, U-shaped. Teeth in 2-series, fair in number, broad; primary teeth narrow; secondary teeth very broad. Petiole short.

*Flowers* hermaphrodite, stamens upright, anthers higher than stigma. *Inflorescence* appears on 3rd to 6th nodes.

*Bunches* small, short, short conical to cylindrical, neither shouldered nor winged, loose to well filled. Peduncle slightly brownish green in colour, short, thin, glabrous, tough, devoid of warts. Rachis short, thin; primary branches few, short; secondary branches absent. Pedicels arising from rachis and primary branches, short, thin, glabrous, warty, warts few. Torus small, rough. Brush blood red in colour, medium long and thin.

*Berries* bluish black, spherical, small, size moderately variable; bloom

thick, easily removable; apex truncate or depressed, adherence weak. Skin thick, slip skin type, tough, transparency poor. Pulp tender, melting, flavour mild, veins visible and prominent after removal of skin; juice purple coloured, acidic.

*Seeds* very many (1-5; av. 3-4), very short, very narrow, small, round, hard, tasteless, non-adherent; chalaza oval, sunken, located below centre and extending up to raphe; beak short, incurved, smooth.

It is reported to be a complex hybrid between *V. champini* × *V. labrusca* × *V. vinifera* × *aestivalis bourquiniae* (Vaile, 1939). According to Mortensen and Randolph (1940) it is considered to be a hybrid only between *vinifera*, *champini* and *labrusca* species. It is reported to be evolved by Mr. T. V. Munson in Texas, U.S.A. during 1902.

Ripening is uniform, mid-season, 2nd to 3rd week of June in North India. Quality medium, T.S.S. 16%, acidity 0.8%, juice 45%. Light to medium cropper. Not susceptible to cracking. Performance from other regions of the country not reported. It is used for juice and wine making in other countries and has deep purple coloured juice which is of value for blending. It does well on trellis system when cane pruned.

It has been found to be resistant to anthracnose and *Cercospora* leaf-spot.

## 79. LOMINT TOKAY

*Vines* medium in vigour. *Bark* adherent and detaches in short, narrow, fissured straps. *Canes* medium long, medium thick; internodes medium long. *Buds* broad at apex, covered with brown pubescence. *Growing shoots* green with purplish streaks, glabrous. *Tendrils* green, purplish at base, intermittent, bi- and tri-fid, long, glabrous.

*Unfolding leaves* with varying degree of pigmentation, cob-webby above and below. *Full-grown leaves* orbicular, 5-lobed, medium large, medium thick, smooth, glabrous above and below. Superior lateral sinus shallow, wide; inferior lateral sinus shallow, wide; petiolar sinus narrow, U-shaped. Teeth medium in number, apical tooth narrow, blunt. Petiole pinkish, long.

*Flowers* hermaphrodite, Stamens upright, anthers longer than the stigma. *Inflorescence* appear on 4th to 6th nodes.

*Bunches* conical, medium large, shouldered, loose to well filled. Peduncle long, thin. Rachis short, medium thick, primary branches short; secondary branches many. Pedicels arising mostly from secondary branches, medium long. Torus medium thick, rough. Brush long, yellowish green.

*Berries* yellowish green, ellipsoidal, medium large, size highly variable; bloom thin, easily removable; apex truncate, adherence strong. Skin thin, adherent to pulp. Pulp juicy, juice greenish yellow.

*Seeds* many (1-4; av. 2), heavy, medium long, broad, medium thick, cuneate, hard; chalaza circular, sunken, located in the middle; beak long.

Ripening is uniform, late, last week of June in Delhi. Quality poor in North. T.S.S. does not go beyond 14%, acidity 0.6-0.8%, cropping poor.

It is susceptible to rust and highly susceptible to downy mildew.

## 80. MADELEINE ANGEVINE

*Vines* medium in vigour. *Bark* loose and detaches in medium long, medium wide, papery thin, smooth and fissured straps; bark of canes also detaches into papery straps. *Canes* smoky, long, thick; internodes short. *Buds* broad at apex, covered with brown pubescence and pink tinted. *Growing shoots* purple, slightly pubescent. *Tendrils* light green with purple streaks around base, intermittent, bi- and tri-fid, slender, medium long, slightly pubescent.

*Unfolding leaves* greyish green above and silvery white below; some pinkish tinge along the margin of the leaves above or (and) below or pink patches on the lamina surface; woolly above and below. *Full-grown leaves* orbicular, 5-lobed, small or medium large, thin, smooth, glabrous above and woolly below. Superior lateral sinus medium deep, perforate, sometimes narrow, U-shaped; inferior lateral sinus shallow to medium deep, U-shaped; petiolar sinus medium wide, round, U-shaped. Teeth in 3-series, many in number, very narrow; primary teeth very narrow; secondary teeth narrow. Petiole medium long.

*Flowers* hermaphrodite, stamens upright, anthers higher than stigma. *Inflorescence* appears on 2nd to 6th nodes.

*Bunches* small to medium, medium long, short conical, short pyramidal, neither shouldered nor winged, loose to well filled. Peduncle generally red, medium long, thin, glabrous, tough, devoid of warts. Rachis green, short, medium thick; primary branches many, medium long; secondary branches few, short. Pedicels arising from rachis and primary branches, medium long, medium thick, glabrous, warty, warts few. Torus small, rough. Brush green, medium long, thick.

*Berries* light or yellowish green, spherical or slightly ovoid, small, size moderately variable; bloom thin, easily removable; apex slightly depressed, adherence weak. Skin adherent to pulp, thin, tough, leathery, transparency good, seeds and veins visible. Pulp soft, melting, flavour mild or wanting, sweet to very sweet, veins visible. Juice clear, greenish.

*Seeds* brownish yellow, many in number (1-5; av. 2-3), short, narrow, medium large, oblong, soft, tasteless, slightly adherent; chalaza circular, raised and located centrally; beak short, straight, smooth.

According to Perold (1927), it is one of the earliest varieties. Raised out of mixed seeds, it bore fruit for the first time in 1861. This is being grown in Tunisia as an early table grape for export. It is also being grown in Austria

for table purposes (Winkler, 1962). This was introduced at Lyallpur nearly three decades back and was the earliest ripening variety in the collection. It has performed very well even under Delhi conditions as an early ripening grape of good quality.

Ripening is uniform, very early, 4th week of May to 1st week of June in Delhi. Quality good, T.S.S. 18%, acidity 0.5%, juice 50%. Light to medium cropper. Not susceptible to cracking. Shot berries many. Too soft for long transport. Bears well with long pruning. It can be tried for local markets.

It is susceptible to anthracnose and downy mildew and resistant to *Cercospora* leaf-spot and rust.

### 81. MADELEINE ROYALE

*Vines* vigorous. *Bark* loose and detaches in long, medium wide, papery thin, smooth and fissured straps; bark of canes also detaches into papery straps. *Canes* long, medium thick; internodes short. *Buds* broad at apex, covered with brown pubescence and pink tinted. *Growing shoots* glabrous or almost so. *Tendrils* slightly purple pigmented around base, intermittent, bi- and tri-fid, sometimes tera-fid, slender, short, slightly pubescent.

*Unfolding leaves* greyish green above and silvery white below; some pinkish tinge along the margin of the leaves above or (and) below or pink patches on the lamina surface; woolly above and below. *Full-grown leaves* orbicular, 5-lobed, sometimes 7-lobed, small, thin, smooth, glabrous above and below. Superior lateral sinus medium deep to deep, perforate, U-shaped; inferior lateral sinus medium deep, U-shaped; petiolar sinus narrow, round and U-shaped. Teeth in 2-series, many in number, broad; primary teeth narrow; secondary teeth broad. Petiole long.

*Flowers* hermaphrodite, stamens upright, anthers higher than stigma. *Inflorescence* appears on 2nd to 4th nodes.

*Bunches* small to medium large, short, globular, neither shouldered nor winged, compact to very compact. Peduncle typically green, extremely short or almost wanting, thick, glabrous or nearly so, tough, devoid of warts. Rachis green, short, thin; primary branches few, short; no secondary branches. Pedicels arising from rachis and primary branches, medium long, medium thick, glabrous, warty, warts many. Torus small, rough. Brush, creamy green, long, thin.

*Berries* whitish green, becoming yellow at maturity, spherical or sometimes obovoid or oblate due to compactness, small, size moderately variable; bloom thin, easily removable; apex truncate, ahdrence medium strong. Skin adherent to pulp, thin, tender, transparency good, seeds and veins below visible. Pulp soft, melting, juicy, flavour slightly musky, sweet, veins prominent. Juice greenish, clear, sweet.

*Seeds* many (0.5; av. 2-3), short, narrow, small, oblong, hard, tasteless, slightly adherent; chalaza circular, raised and located centrally; beak medium long, incurved, rough.

This variety was introduced into the trade by M. Robert of Angers in 1851 (Winkler, 1962). Alongwith Madeleine Angevine, this is also grown in Tunisia as an early table grape. It was introduced in India from Yugoslavia.

Ripening is uniform, very early, last week of May to 1st week of June in Delhi. Quality very good, T.S.S. 20%, acidity 0.7%, juice 60%. Light cropper. Susceptible to cracking. It is a soft grape and keeping quality is poor. Performance from other regions of the country not reported.

It is resistant to rust and anthracnose, susceptible to downy mildew and moderately susceptible to *Cercospora* leaf-spot.

## 82. MOTIA

*Vines* medium in vigour. *Bark* loose and detaches in medium long, medium wide, thin, smooth and slightly fissured strips. *Canes* long, thin, internodes short. *Buds* broad at apex, covered with brown pubescence. *Growing shoots* glabrous or almost so. *Tendrils* green, irregular, usually tri-fid, sometimes bi-fid, thick, medium long, glabrous or nearly so. (Fig. 37).

*Unfolding leaves* greyish green above and silvery white below; some pinkish tinge along the margin of the leaves above or (and) below or pink patches on the lamina surface; pubescence wooly above and below. *Full-grown leaves* cuneiform, 5-lobed, small, thin, smooth, glabrous above and downy below. Superior lateral sinus shallow to medium deep, narrow to perforate, V-shaped; inferior lateral sinus shallow, V-shaped; petiolar sinus medium wide, flat, U-shaped. Teeth in 3-series, medium in number, narrow; primary teeth very narrow; secondary teeth narrow. Petiole medium long.

*Flowers* hermaphrodite, stamens upright, anthers at the same level or slightly higher than stigma, long. *Inflorescence* appears on 1st to 5th nodes.

*Bunches* medium large, medium long, short conical to long conical, neither shouldered nor winged, well filled to compact. Peduncle light green, short, thin, glabrous, tough, devoid of warts. Rachis green, short, thin; primary branches few; secondary branches many. Pedicels arising from rachis and primary branches, medium long, medium thick, glabrous, warty, warts profuse. Torus small, very rough. Brush green, long, thin.

*Berries* light green to golden yellow, ellipsoidal, often spherical and obovoid, small, size moderately variable; bloom thin, easily removable; apex truncate; adherence medium strong. Skin adherent to pulp, thin, tender, transparency very good, seeds and veins below very prominent. Pulp melting, watery, slightly aromatic, slightly insipid, transparency excellent. Juice clear, greenish, slightly insipid in taste.

*Seeds* many (1-4; av. 2-3), short narrow, small, round, hard, tasteless, non-adherent; chalaza circular, raised, located below centre and extending up to raphe; beak short, incurved and rough.

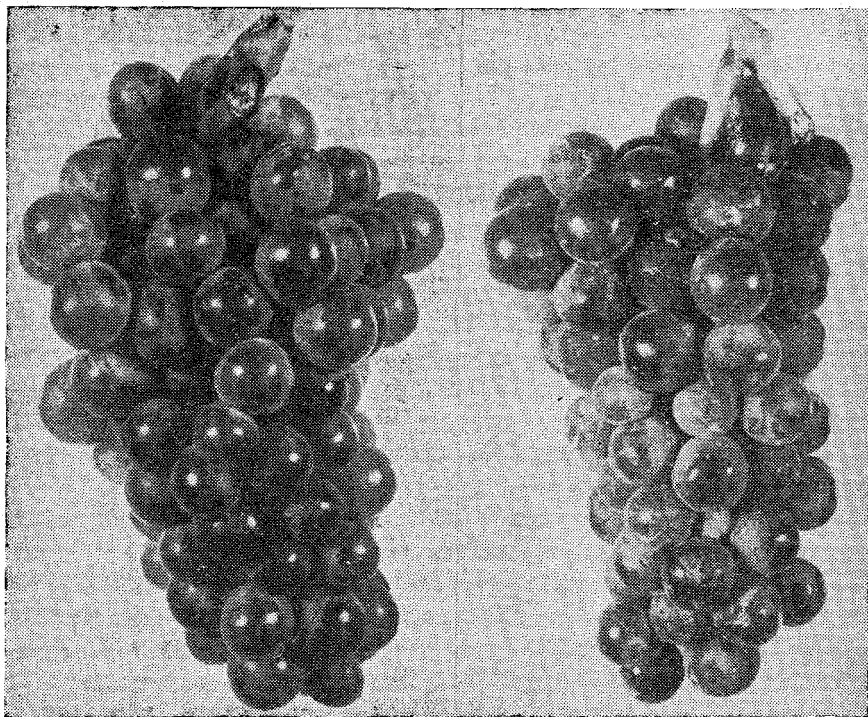


Fig. 37 Motia

Fig. 38 Muscat

Ripening is uniform, mid-season, 3rd to 4th week of June in Delhi and last week of May to middle of June in Saharanpur and first fortnight of March at Hesaraghatta (Mysore). Does not attain good quality under Delhi conditions, where T.S.S. remains from 13-14%. It has been reported to attain a T.S.S. of 20-21% at Saharanpur and Kanpur (Prasad and Nand, 1964, Singh, 1963) and is considered to be a promising variety for Uttar Pradesh. It also attains a T.S.S. of 20% at Hesaraghatta. It is a heavy cropper.

It has been reported to be highly susceptible to antracnose at Saharanpur (Prasad and Nirvan, 1965), while resistant to this disease at Hesaraghatta (Sridhar and Sohi, 1970). It is susceptible to powdery mildew.

## 83. MUKH CHILANI

*Vines* medium in vigour. *Bark* adherent and detaches in short, narrow, fissured straps. *Canes* long, thick; internodes medium long. *Buds* broad at apex, covered with brown pubescence. *Growing shoots* brownish green, cob-webby. *Tendrils* light green, intermittent, bi- and tri-fid, long, glabrous.

*Unfolding leaves* yellowish green, devoid of any other pigmentation, cob-webby above and below. *Full-grown leaves* cuneiform, 3-lobed, medium large, medium thick, smooth, glabrous above and below. Superior lateral sinus shallow, wide; inferior lateral sinus almost absent; petiolar sinus narrow, U-shaped. Teeth many, apical tooth medium broad, pointed. Petiole, green, purple pigmented, medium long.

*Flowers* hermaphrodite, upright, anthers at the same level as stigma. *Inflorescence* appears on 3rd to 5th nodes.

*Bunches* medium large, globular to conical, loose. Peduncle long, medium thick. Rachis short, medium thick; primary branches medium long; secondary branches many, long. Pedicels arising mostly from primary and secondary branches, medium long. Torus thick, rough. Brush greenish white, long.

*Berries* bright red, cylindrical, large, size less variable; bloom thin, easily removable; apex truncate, adherence medium. Skin medium thick, adherent to pulp. Pulp firm, juicy. Juice pinkish yellow.

*Seeds* many (1-4; av. 2), medium heavy, long, broad, thick. Texture medium, dark brown; chalaza circular, sunken, located in the centre; beak long, round.

An introduction from U.S.S.R. Ripening uniform, mid season, 2nd to 3rd week of June in Delhi. Quality medium, T.S.S. 15%, acidity 0.6%, juice 60-70%.

It is moderate to highly susceptible to anthracnose and resistant to *Cercospora* leaf-spot.

## 84. MUSCAT

*Vines* medium in vigour. *Bark* adherent and detaches in short, narrow and fissured straps. *Canes* short, thin; internodes short. *Buds* broad at apex, covered with brown pubescence and pink tinted. *Growing shoots* green with purplish streaks above, glabrous or almost so. *Tendrils* light green, intermittent, bi- and tri-fid, slender, short, glabrous. (Fig. 38.)

*Unfolding leaves* greyish green above and silvery white below, with colouration other than pink, and purplish or brownish at the margin; little older leaves have more brownish colour spread throughout the lamina; woolly above and below. *Full-grown leaves* orbicular, 5-lobed, medium large, medium thick, glabrous above and below. Superior lateral sinus close to

perforate, shallow to medium; inferior lateral sinus shallow, wide; petiolar sinus close, V-shaped. Teeth many, apical tooth medium broad, blunt.

*Flowers* hermaphrodite, stamens upright, anthers at the same level as stigma. *Inflorescence* appears on 3rd to 6th nodes.

*Bunches* medium large, medium long, short conical to cylindrical, neither shouldered nor winged, compact. Peduncle light green, medium long, thin, glabrous or nearly so, devoid of warts. Rachis light green, short, medium thick; primary branches few, short; secondary branches few. Pedicels arising from the rachis and primary branches, short, thin, glabrous, warty, warts many. Torus small, rough. Brush green with pinkish tinge, medium long, thin.

*Berries* brick red or deep purple, spherical, small, size moderately variable; bloom thin, easily removable; apex pointed, adherence weak to medium strong. Skin adherent to pulp, thick, tough, transparency poor. Pulp greenish, melting, juicy, musky flavour, veins not prominent. Juice clear, greenish, sweet.

*Seeds* many (0.4; av. 2.3), very short, very narrow, very small, oblong, soft, tasteless, non-adherent; chalaza circular, raised, located below centre and extending up to raphe. Beak short, incurved, smooth.

An introduction from U.S.S.R., it is a *vinifera* grape (Mortensen and Randolph, 1940). Ripening is uniform, mid-season, 2nd to 3rd week of June in Delhi. Quality good, T.S.S. 18 to 20%, acidity 0.6-0.8%, juice 60-70%. Medium cropper. Not susceptible to cracking.

It has been reported to be moderately susceptible to anthracnose from Saharanpur (Prasad and Nirvan, 1965). It was found resistant to this disease at Abohar (Jeyarajan *et al.*, 1969) and Hessaraghatta, Mysore (Sridhar and Sohi, 1970). It is moderately susceptible to *Cercospora* leaf-spot, but moderately resistant to powdery mildew.

## 85. MUSCAT DE ADDA

*Vines* medium in vigour. *Bark* adherent and detaches in very narrow but compact straps. *Canes* medium long, thin; internodes medium long. *Buds* broad at apex, covered with brown pubescence and pink tinted. *Growing shoots* glabrous or almost so. *Tendrils* green, purplish streaks at base, intermittent, medium thick, short, bi-, tri- and often tetra-fid, glabrous or nearly so.

*Unfolding leaves* greyish green above and silvery white below; some pinkish tinge along the margin of the leaves above or (and) below or pink patches on the lamina surface; wooly above and below. *Full-grown leaves* pentagonal, 5-lobed, medium large, thin, smooth, glabrous above and downy below. Superior lateral sinus medium deep to deep, perforate, U-shaped; inferior lateral sinus medium deep, U-shaped; petiolar sinus medium wide,

round, U-shaped. Teeth in 3-series, many in number, very narrow; primary and secondary teeth very narrow. Petiole medium long.

*Flowers* hermaphrodite, stamens upright, anthers at the level of the stigma. *Inflorescence* appears on 2nd to 5th nodes.

*Bunches* small, long, cylindrical or short conical, loose to well filled. Peduncle light green, medium long, thin, glabrous, tough, slightly warty. Rachis medium long, thin; primary branches few, short; no secondary branches. Pedicels arising from rachis and primary branches, short, thin, warty. Torus small, rough, warty. Brush blue black, medium long, thin.

*Berries* bluish black, spherical, small, size moderately variable; bloom thin, easily removable; apex pointed, adherence weak. Skin adherent to pulp, thick, tough, transparency poor. Pulp tender, melting, musky flavour, venis not prominent. Juice turbid, sweet.

*Seeds* many (1-6; av. 3), short, very narrow, small, oblong, soft, tasteless, non-adherent; chalaza oval, sunken, located centrally, extending up to raphe; beak short, straight, rough.

Ripening more or less uniform, mid season, 2nd to 3rd week of June in Delhi, middle of March—end of March at Hesaraghatta (Mysore). Quality medium. T.S.S. 17%, acidity 0.6-0.7%, juice 50%. Not susceptible to cracking. Medium cropper.

It is resistant to anthracnose, but susceptible to powdery mildew.

## 86. MUSCAT OF ALEXANDRIA

*Vines* vigorous. *Bark* adherent and detaches in short, rough and brittle straps. *Canes* light brown, slightly smoky on one side, medium long, thin; internodes medium long. *Buds* broad at apex, covered with brown pubescence. *Growing shoots* green, slightly pubescent. *Tendrils* light green with purple streaks, intermittent, usually tri-fid, but bi- and tetra-fid also found, slender, short, glabrous or nearly so. (Fig. 39.)

*Unfolding leaves* greyish green above and silvery white below, with colouration other than pink, and purplish or brownish at the margin; little older leaves have more brownish colour spread throughout the lamina; woolly above and below. *Full-grown leaves* cuneiform, 5-lobed, sometimes 3-lobed, small, thick, rough, leathery, downy above and below. Superior lateral sinus shallow to deep, narrow, V-shaped; inferior lateral sinus shallow to medium deep, U-shaped; petiolar sinus narrow, round, U-shaped. Teeth in 3-series, medium in number, broad; primary teeth narrow; secondary teeth very broad. Petiole pink, medium long, thick, pubescent.

*Flowers* hermaphrodite, stamens upright, anthers higher than stigma. *Inflorescence* appears on 2nd to 5th nodes.

*Bunches* medium large to large, long, short conical to long conical, shouldered and well filled. Peduncle green, long, medium thick, glabrous,

herbaceous, devoid of warts. Rachis green, medium long, thin, primary branches many, short; secondary branches few, short. Pedicels arising from primary and secondary branches, long, medium thick, glabrous, devoid of warts. Torus small, rough, warty. Brush green, long, thick.

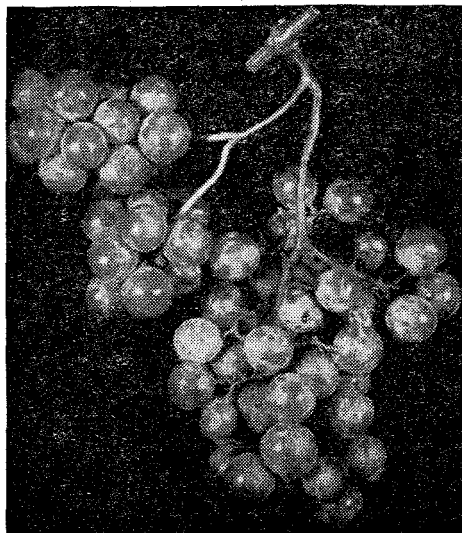


Fig. 39 Muscat of Alexandria

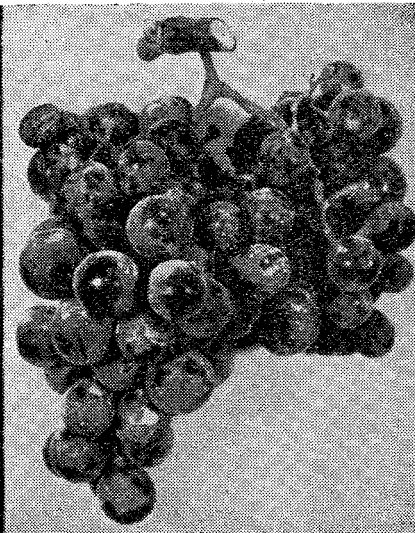


Fig. 40 Muscat Bailey

*Berries* dull green to golden yellow, obovoid, medium large, size moderately variable; bloom thick, easily removable; apex truncate, adherence weak to medium strong. Skin adherent to pulp, medium thick, medium tough, transparency poor to medium. Pulp soft, tender, melting, strongly musky flavour, very sweet, veins visible. Juice clear, yellowish, sweet.

*Seeds* brownish green, medium number (0.5: av. 2). short, medium broad, medium large, oblong, soft, astringent, non-adherent to pulp and located centrally; chalaza circular, raised and located centrally; beak short, incurved, rough.

Muscat of Alexandria is a very old variety of North African origin. Like Thompson Seedless, it can also be put to varied uses. In Spain and California, it is used for raisin making. As a table grape, it is highly esteemed for home gardens and local markets. As a wine grape, it is extensively used for muscatel, a dessert wine.

In India, the variety does not seem to have been given a fair trial. It has been tried in North at Lyallpur and later in Delhi and has given good quality fruit with excellent taste and aroma.

Ripening is uniform, mid-season, 2nd to 3rd week of June in Delhi. Quality good. T.S.S. 20%, acidity 0.6-0.8%, juice 65-70%.

A medium cropper. Responds well to head or cordon pruning.

It is highly susceptible to downy mildew and resistant to rust. It is moderately susceptible to anthracnose at Hesaraghatta (Sridhar and Sohi, 1970) and resistant to anthracnose and *Cercospora* leaf-spot at Abohar Punjab (Jeyarajan *et al.*, 1969).

### 87. MUSCAT BAILEY

*Vines* of medium vigour. *Bark* slightly adherent and detaches in long, narrow straps. *Canes* short, thin; internodes short. *Buds* broad at apex, covered with brown pubescence and pink tinted. *Growing shoots* green with purplish streaks, strongly pubescent. *Tendrils* purplish throughout, intermittent, bi- and tri-fid, pubescent. (Fig. 40.)

*Unfolding leaves* greyish green above and silvery white below, devoid of any pigmentation, woolly above and below. *Full-grown leaves* orbicular, 3 to 5-lobed, medium large, thick; cob-webby above and downy below. Superior lateral sinus shallow, wide; inferior lateral sinus inconspicuous or almost absent; petiolar sinus narrow to close, U-shaped. Teeth many, apical tooth medium broad, blunt. Petiole purplish, short.

*Flowers* hermaphrodite, stamens upright, anthers at the same level as stigma. *Inflorescence* appears on 3rd to 5th nodes.

*Bunches* small, short, conical to globular, sometimes branched, well filled. Peduncle green, short, thin, glabrous, herbaceous, devoid of warts, Rachis short, thin; primary branches many, short; secondary branches few. Pedicels arising from primary branches, medium long, thin, glabrous, warty, warts few. Torus small, rough. Brush slightly pinkish, short, extremely thin.

*Berries* bluish black, spherical, small, size highly variable; bloom thick, not easily removable; apex truncate, adherence weak. Skin adherent to pulp, medium thick, tough, transparency poor. Pulp soft, melting, musky flavour, veins prominent. Juice turbid, sweet.

*Seeds* few (1-4; av. 1-2), medium long, medium broad, medium large, oblong, soft, tasteless, adherent to pulp and located centrally; chalaza circular, sited and located centrally; beak medium long, incurved, rough.

Ripening uniform; mid-season to late, 4th week of June to 1st week of July. Quality medium. T.S.S. 17-18%, acidity 0.5-0.7%, juice 70-75%. Not susceptible to cracking. Medium cropper.

### 88. MUSCAT HAMBURG

*Vines* vigorous. *Bark* adherent and detaches in short, narrow, very brittle and compact straps. *Canes* light brown, darker at nodes, long, medium thick;

internodes short. *Buds* broad at apex, covered with brown pubescence. *Growing shoots* green with purple tint, glabrous or almost so. *Tendrils* light green with fine purplish streaks, intermittent, bi-fid, slender, short, glabrous. (Fig. 41.)

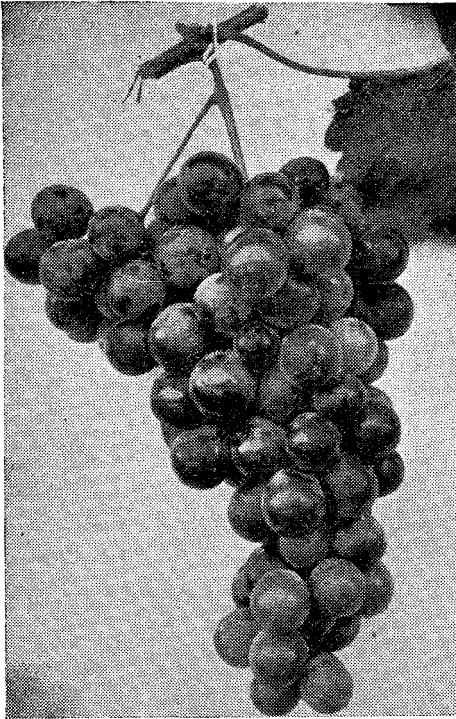


Fig. 41 Muscat Hamburg

nodes, mainly on 3rd to 5th nodes.

*Bunches* attractive, medium large, medium long, short conical to cylindrical, neither shouldered not winged, loose to well filled. Peduncle yellowish green, short, thin, glabrous, tough, devoid of warts. Rachis medium long, medium thick; primary branches few, long; secondary branches, few, short. Pedicels arising from rachis and primary branches, medium long, thin, warts few or absent. Torus small, slightly warty. Brush green, slightly purple pigmented, medium long, thick.

*Berries* dark, reddish purple to black, spherical, small, size moderately variable; bloom thin, easily removable; apex pointed, adherence weak, Skin adherent to pulp, thick, tough, transparency poor. Pulp greenish, melting, juicy, musky in flavour, veins visible but not prominent. Juice clear, greenish, acidic.

*Unfolding leaves* greyish green above and silvery white below; some pinkish tinge along the margin of the leaves above or (and) below, or pink patches on the lamina surface; woolly above and below. *Full-grown leaves* cuneiform, 5-lobed, medium large, thin, smooth, glabrous above and downy below. Superior lateral sinus medium deep, V-shaped; inferior lateral sinus shallow to medium deep, V-shaped; petiolar sinus narrow, acute, U-shaped. Teeth in 3-series, many in number, narrow; primary teeth very narrow; secondary teeth narrow. Petiole medium long.

*Flowers* hermaphrodite, stamens upright, anthers higher than stigma. *Inflorescence* appears on 2nd to 7th

*Seeds* brown, many (1-4; av. 2-3), long, narrow, medium large, oblong, hard, tasteless, slightly adherent; chalaza oval, raised, located below centre and extending up to raphe; beak medium long, incurved, smooth.

Its synonyms include Snow's Muscat Hamburg, Red Muscat of Alexandria, Black Muscat of Alexandria and Muscat Hambro. It is a very old grape variety. It has been grown in England under the name Black Muscat of Alexandria. It is suspected to be natural cross between Muscat of Alexandria and Red Muscadell or some other dark Muscat variety (Perold, 1927).

Ripening fairly uniform, mid season, 2nd to 3rd week of June in Delhi, first fortnight of March at Hessaraghatta (Mysore) and early in Poona. Quality medium. T.S.S. 17-18%, goes up to 20% at Hessaraghatta, acidity 0.6-0.7%, juice 60-65%. Berries not susceptible to cracking. Keeping quality medium. Responds well to short pruning, but if shot berries occur, light pruning may be helpful (Perold, 1927).

It is highly susceptible to rust and downy mildew, susceptible to powdery mildew and resistant to anthracnose.

## 89. MUSCAT OLIVER

*Vines* medium in vigour. *Bark* adherent and detaches in narrow and brittle strips. *Canes* long, thick; internodes short. *Buds* broad at apex, covered with brown pubescence and pink tinted. *Growing shoots* glabrous or almost so. *Tendrils* light green, intermittent, slender, short, bi-fid, glabrous.

*Full-grown leaves* orbicular, 5-lobed, small, thin, smooth, glabrous above and below. Superior lateral sinus medium deep, perforate, U-shaped; inferior lateral sinus medium deep, U-shaped; petiolar sinus medium wide, flat, U-shaped. Teeth in 3-series, many in number, narrow; primary teeth very narrow; secondary teeth narrow. Petiole medium long.

*Flowers* hermaphrodite, stamens upright, anthers higher than stigma. *Inflorescence* appears on 3rd to 4th nodes.

*Bunches* small, long, short conical or long conical, shouldered, loose to well filled. Peduncle light green, medium long, thin, glabrous, devoid of warts. Rachis green, long, thin, devoid of warts; primary branches many, medium long; secondary branches few, short. Pedicels arising from primary branches, medium long, medium thick, glabrous, warty, warts few. Torus small, rough. Brush yellowish green, medium long, thin.

*Berries* yellowish green, spherical, small, size moderately variable; bloom thin, easily removable; apex truncate, adherence strong. Skin adherent to pulp, medium thick, tender, transparency good, veins beneath visible. Pulp soft, watery, musky in flavour, very sweet, veins very prominent. Juice clear, greenish, sweet.

*Seeds* medium in number (0.4; av. 2), short, medium broad, small,

round, hard, tasteless, adherent; chalaza circular, raised, located below centre and extending upto raphe; beak short, incurved, rough.

Ripening is uniform, early, 4th week of May to 1st week of June in Delhi. Quality is very good, T.S.S. 20-22%, acidity 0.5-0.6%, juice 45-50%. Light cropper. Not susceptible to cracking.

This is a green, seeded, high quality early ripening grape with pronounced muscat flavour and has given good performance under Delhi conditions. It has been reported to be susceptible to rust and downy mildew.

## 90. MUSCAT WHITE

*Vines* vigours. *Bark* slightly adherent and detaches in medium long, wide, thick, rough and fissured strips. *Canes* long, thick; internodes medium long. *Buds* broad at apex, covered with brown pubescence. *Growing shoots* glabrous or almost so. *Tendrils* green, purplish at base, intermittent, bi- and tri-fid, tetra- and penta-fid also common, medium thick, long, glabrous or so.

*Unfolding leaves* greyish green above and silvery white below, with colouration other than pink, and purplish or brownish at the margin; little older leaves have more brownish colour spread throughout the lamina, woolly above and below. *Full-grown leaves* cuneiform, 5-lobed, large, thin, rough, leathery, glabrous above and woolly below. Superior lateral sinus shallow, wide, V-shaped; inferior lateral sinus shallow, V-shaped; petiolar sinus narrow, acute to round, U-shaped. Teeth in 3-series, medium in number, narrow; primary teeth very narrow; secondary teeth narrow. Petiole medium long.

*Flowers* hermaphrodite, stamens upright, anthers at the same level or slightly higher than stigma. *Inflorescence* appears on 1st to 5th nodes.

*Bunches* medium large, medium long, short conical to cylindrical, branched, well filled to compact. Peduncle light green, medium long, medium thick, tough, devoid of warts. Rachis green, short, thin; primary branches few and small; secondary branches absent; pedicels arising from rachis and primary branches, short, medium thick, warty. Torus small, rough. Brush light green with pinkish tinge, long, thin.

*Berries* bluish black, spherical, small, size moderately variable; bloom thick, easily removable; apex truncate, adherence weak or medium strong. Skin adherent to pulp, thick, tough, transparency good. Pulp soft, melting, musky in flavour, veins prominent, Juice clear, sweet.

*Seeds* many (1-4; av. 2-3), very long, medium broad, large, oblong, hard, tasteless, non-adherent; chalaza circular, raised and located centrally; beak medium long, incurved, rough.

Ripening is not uniform and bunches do not ripen fully, late, 4th week of June to 1st week of July in Delhi and Lucknow. Quality poor to medium.

Medium cropper. Susceptible to cracking and rotting. Bunches spoiled by rains. Performance from other regions of the country not reported.

It is susceptible to rust and downy mildew, moderately susceptible to anthracnose and resistant to *Cercospora* leaf-spot.

### 91. MUZZAFAR NAGAR NO. 1

*Vines* vigorous. *Bark* slightly adherent and detaches in wide, thick, rough, tough and slightly fissured straps. *Canes* medium long, thick; internodes long. *Buds* broad at apex and covered with brown pubescence. *Growing shoots* glabrous or almost so. *Tendrils* green, slightly purplish in colour, intermittent, bi-fid, sometimes tri-fid, medium thick, long, glabrous or nearly so.

*Unfolding leaves* greyish green above and silvery white below, with colouration other than pink, and purplish or brownish at the margin; little older leaves have more brownish colour spread throughout the lamina; wooly above and below. *Full-grown leaves* cuneiform, 5-lobed, sometimes 3-lobed, large, thin, rough, leathery, glabrous above and wooly below. Superior lateral sinus shallow, wide, V-shaped; inferior lateral sinus shallow, V-shaped; petiolar sinus narrow, round, U-shaped. Teeth in 2-series, medium in number, very narrow; primary teeth very narrow; secondary teeth narrow. Petiole medium long.

*Flowers* hermaphrodite, stamens upright, anthers at the same level or slightly higher than stigma. *Inflorescence* appears on 2nd to 5th nodes.

*Bunches* medium large, medium long, short conical, branched, compact. Peduncle green, medium long, thin, glabrous, tough, devoid of warts. Rachis green, short, thin; primary branches many, short; secondary branches few and short. Pedicels arising from primary branches, medium long, thick, glabrous, warty, warts few, dark brown. Torus small, rough, warty. Brush green, often with purplish tinge, long, thick.

*Berries* bluish black, spherical, obovoid or oblate due to compactness in the bunch, small, size moderately variable; bloom thick, not easily removable; apex truncate or pointed, adherence strong. Skin adherent to pulp, medium thick, tough, transparency poor. Pulp soft, melting, musky in flavour, veins prominent. Juice clear, sweet.

*Seeds* many (1-4; av. 2-3), very long, broad, large, oblong, hard, tasteless, non-adherent; chalaza circular, raised and located centrally; beak medium long, incurved, rough.

Ripening is not uniform, and bunches do not ripen fully under Delhi conditions, late, 4th week of June to 1st week of July in Delhi. Quality good, T.S.S. 20%, acidity 0.6%, juice 50-55% when bunches fully ripe. Medium to heavy cropper. Susceptible to cracking and rotting. Bunches spoiled by rain.

It is susceptible to rust and downy mildew and resistant to anthracnose and *Cercospora* leaf-spot.

92. **ONTARIO**

*Vines* vigorous. *Bark* loose and detaches in long, narrow straps. *Canes* medium long, medium thick; internodes short. *Buds* broad at apex, covered with brown pubescence. *Growing shoots* greyish green, wooly. *Tendrils* irregular; greyish green with purplish tinge, mostly bi- and tri-fid, long, heavily pubescent.

*Unfolding leaves* greyish green above and silvery white below; border of the leaf beautifully pigmented; wooly above and below. *Full-grown leaves* cordate, entire to 3-lobed, medium large, thick, flat, rough, cob-webby above and wooly below. Superior lateral sinus shallow to inconspicuous, wide; inferior lateral sinus almost absent; petiolar sinus wide, V-shaped. Teeth many, apical tooth medium broad, blunt. Petiole greyish green with purplish streaks, long.

*Flowers* hermaphrodite, stamens upright, anthers higher than stigma. *Inflorescence* appears on 3rd to 5th nodes.

*Bunches* small, short globular, neither shouldered nor winged, well filled. Peduncle short, thin. Rachis short, medium thick; primary branches short; secondary branches few. Pedicels arising mostly from primary branches, medium long. Torus medium thick, rough. Brush greenish white, medium long.

*Berries* yellowish green, spherical, medium large, size slightly variable; bloom thin, easily removable, adherence strong, apex truncate, Skin thick, slip skin type. Pulp melting, juice greenish yellow.

*Seeds* many (1-5; av. 3), heavy, medium long, medium broad, medium thick, cuneate, light brown; chalaza circular, sunken, located below the centre; beak medium long.

An introduction from U.S.A. and is a complex hybrid between *labrusca* × *vinifera* × *aestivalis* species. According to Slate *et al.*, (1962), it is a cross between varieties Winchell and Diamond.

Ripening is not uniform, mid season, second week of June in Delhi. Quality is medium, T.S.S. 15%, acidity 0.4-0.5%, juice 75%.

93. **OVAL WHITE**

*Vines* medium in vigour. *Bark* slightly adherent and detaches in medium long, medium wide, papery thin, very smooth and slightly fissured straps. *Canes* long, thick; internodes medium long. *Buds* broad at apex, covered with brown pubescence. *Growing shoots* strongly pubescent. *Tendrils* greyish green, purplish tinge around base obscured by white hair, irregular, bi-fid, sometimes tri-fid, thick, medium long, heavily pubescent.

*Unfolding leaves* greyish green above and silvery white below; some pinkish tinge along the margin of the leaves above or (and) below or pink

patches on the lamina surface; wooly above and below. *Full-grown leaves* cuneiform, 3-lobed, sometimes 5-lobed, medium large, thin, rough, downy above and felted below. Superior lateral sinus shallow, narrow, V-shaped; inferior lateral sinus absent; petiolar sinus narrow, acute, V-shaped. Teeth in 2-series, medium in number, broad; primary teeth broad; secondary teeth very broad. Petiole short.

*Flowers* hermaphrodite, stamens upright, anthers higher than stigma. *Inflorescence* appears on 2nd to 4th nodes.

*Bunches* small, short, regular, globular to short conical, neither shouldered nor winged, loose. Peduncle light green, short, thin, pubescent, devoid of warts. Rachis light green, short, thin; primary branches few, short; secondary branches absent. Pedicels arising mostly from rachis and primary branches, short, thin, rough, Torus small, rough. Brush purple pigmented when berries ripe, long, thin.

*Berries* spherical, small, size moderately variable; bloom very thin, easily removable; apex truncate, adherence strong. Skin very thick, slip skin type, tough, transparency poor. Pulp melting, leathery, juicy, foxy in flavour, veins prominent. Juice turbid, insipid.

*Seeds* medium in number (1-3; av. 1-2), long, medium broad, large, oblong, hard, tasteless, non-adherent; chalaza oval, sunken, located below centre and extending up to raphe; beak medium long, straight, rough.

Bunches do not ripen under Delhi conditions even till October. Light cropper. Not susceptible to cracking.

It is susceptible to rust and downy mildew and resistant to antracnose and *Cercospora* leaf-spot.

#### 94. PAKHODI

*Vines* medium in vigour. *Bark* slightly adherent and detaches in medium long, wide, thick, rough, brittle and highly fissured straps. *Canes* long, branching medium, internodes long. *Buds* broad at apex, covered with brown pubescence. *Growing shoots* glabrous or almost so. *Tendrils* green, slightly purplish at base, intermittent, bi-fid, slender, short, glabrous or so.

*Unfolding leaves* greyish green above and silvery white below, with colouration other than pink, and purplish or brownish at the margin; little older leaves have more brownish colour spread throughout the lamina; wooly above and below. *Full-grown leaves* cuneiform, 5-lobed, large, thin, rough, leathery, glabrous above and wooly below. Superior lateral sinus shallow, narrow, V-shaped; inferior lateral sinus shallow, V-shaped; petiolar sinus narrow, acute, V-shaped. Teeth in 3-series, many in number, narrow; primary teeth very narrow; secondary teeth broad. Petiole medium long.

*Flowers* hermaphrodite, stamens upright, anthers slightly higher than stigma. *Inflorescence* appears on 3rd to 7th nodes.

*Bunches* medium large, medium long, short conical, branched, compact. Peduncle green, short, thin, glabrous, herbaceous, devoid of warts. Rachis short; primary branches many; secondary branches few and short. Pedicels arising from rachis and primary branches, short, thin, warty. Torus small, rough, warty. Brush pinkish, short, thin.

*Berries* bluish black, spherical, often obovoid, small, size less variable; bloom thick, not easily removable; apex truncate, adherence medium strong. Skin adherent to pulp, thick, tough, transparency poor. Pulp tender, melting, musky in flavour, veins prominent, Juice clear, sweet.

*Seeds* medium in number (1-4; av. 2), long, medium broad, medium large, oblong, tasteless, non-adherent and located centrally; chalaza circular, raised and located centrally; beak medium long, straight, rough.

Ripening late, 4th week of June to 1st week of July, not uniform, bunches do not ripen fully. Medium to heavy cropper. Susceptible to cracking and rotting. Bunches spoiled with rains in the North.

It is highly susceptible to rust and downy mildew and resistant to anthracnose and *Cercospora* leaf-spot.

## 95. PALOMINO

*Vines* vigorous. *Bark* slightly adherent and detaches in short, medium wide, thin, smooth, brittle and fissured straps. *Canes* light brown, long, thick, glabrous; internodes medium long. *Buds* broad at apex, covered with brown pubescence. *Growing shoots* dark purple, fairly pubescent. *Tendrils* bi-fid, sometimes tri-fid, light green with fine purple streaks around base, intermittent, medium thick, medium long, glabrous or nearly so.

*Unfolding leaves* greyish green above and silvery white below, devoid of any pigmentation, wooly above and below. *Full-grown leaves* cuneiform, 5-lobed, medium large, dark green on upper, light green on lower surface, thick, smooth, glabrous above, wooly below. Superior lateral sinus medium deep, narrow to perforate, V-shaped; inferior lateral sinus shallow, V-shaped; petiolar sinus narrow, acute to round, V-shaped. Teeth in 3-series, medium in number, broad; primary teeth narrow; secondary teeth broad. Petiole purple, medium long.

*Flowers* hermaphrodite, stamens upright, anthers slightly higher than stigma. *Inflorescence* appears on 2nd to 5th nodes.

*Bunches* medium large, long, short conical to long conical, shouldered on both the sides, loose to well filled. Peduncle light green, long, medium thick, pubescent, devoid of warts. Rachis green, medium long, medium thick; primary branches many, medium long; secondary branches few, short. Pedicels arising from rachis and primary branches, short, medium

thick, glabrous, warty, warts many, prominent, dark brown. Torus small, rough, warty. Brush light green, medium long, thin.

*Berries* light green, spherical, small, size moderately variable; bloom thin, easily removable; apex truncate, adherence medium strong. Skin adherent to pulp, thin, tender, transparency poor. Pulp tender, melting, watery, slightly musky in flavour, sweet, transparency very good, veins visible and prominent. Juice clear, sweet.

*Seeds* yellowish brown, medium in number (0.4; av. 2-3), short, narrow, small, oblong, tasteless, slightly adherent; chalaza circular, raised, located below centre and extending up to raphe; beak short, straight, smooth.

In some parts of California, the Palomino is erroneously called Golden Chasselas. It is Principal sherry grape of Jerez (Spain) and is widely adaptable to various soils and climate. It makes an inferior dry wine (Winkler, 1965). In India, it has performed moderately well in Delhi and Poona.

Ripening is uniform, mid season, 2nd to 3rd week of June in Delhi, early in Poona. Quality medium and better in Poona than Delhi. T.S.S. 16-18%, acidity 0.7-0.8%, juice 50-60%. A medium to heavy cropper. Keeping quality good. Not susceptible to cracking. Shot berries many.

It is susceptible to rust and downy mildew.

#### 96. PANDHARI SAHEBI

*Vines* vigorous. *Bark* loose and detaches in short, thick, narrow, fissured straps. *Canes* green with dark purple stripes, long, thick, slightly pubescent; internodes long. *Buds* broad at apex, purple tinted, pubescent. *Growing shoots* green with purple patches, glabrous or almost so. *Tendrils* greenish yellow, intermittent, tri-fid, smooth, medium long, medium thick, glabrous. (Fig. 42)

*Unfolding leaves* light green with purplish tinge on the margins, cobwebby to downy. *Full-grown leaves* orbicular, 5-lobed, large, medium thick, smooth, glabrous above and below. Superior lateral sinus medium wide, also perforate, deep, O-shaped; inferior lateral sinus prominent, medium wide, deep, U-shaped; petiolar sinus narrow, almost closed. Teeth in 3-series, medium in number, narrow, pointed; primary teeth medium long, narrow, pointed; secondary teeth short, narrow. Petiole greenish yellow with purplish shade, medium long, thick, glabrous.

*Flowers* hermaphrodite, stamens reflexed, anthers at a lower level than the stigma. This variety is partially male sterile. *Inflorescence* appears on 4th to 6th nodes.

*Bunches* attractive, medium large, long, conical, well filled to compact. Peduncle green, medium long, yellowish green, medium thick, slightly pubescent, tough, free from warts. Rachis long, medium thick; primary branches many, medium long. Pedicels arising from primary branches, long, thin, smooth warty. Torus large, rough. Brush yellowish green, short, thin.

*Berries* pale green, obovoid elongate, large, size less variable; bloom present, thin, removed easily; apex rounded, adherence medium strong. Skin green, adherent, transparency medium, thick, tough, taste and flavour natural. Pulp green, transparency medium, firm, veins not so prominent, taste sweet, flavour lacking. Juice light brownish, sweet, musky, clear.

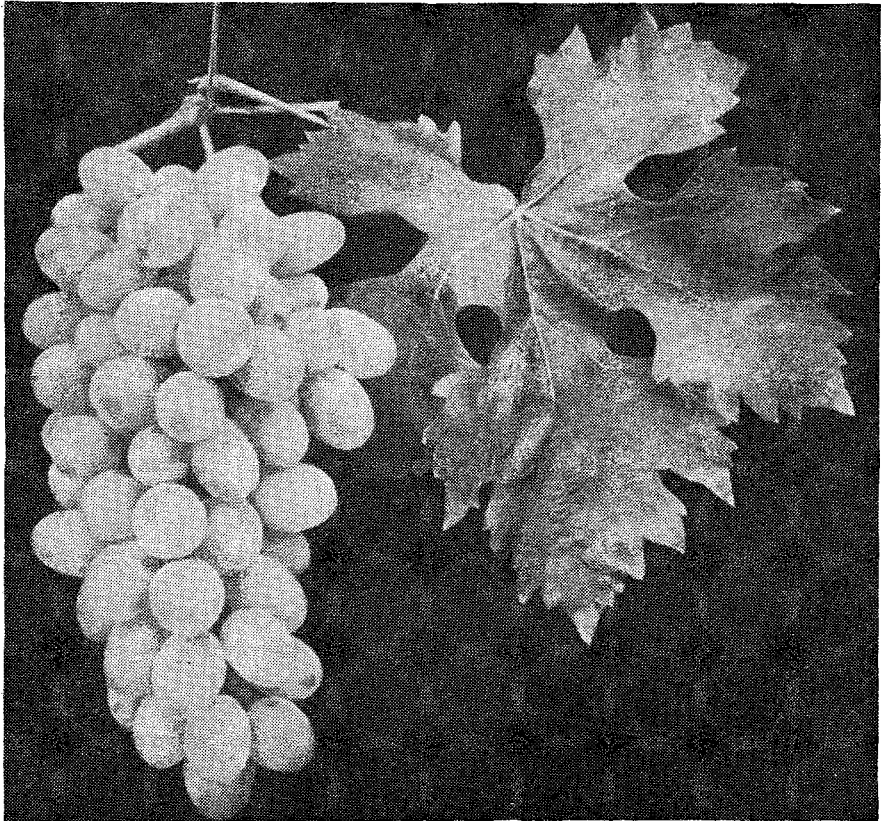


Fig. 42 Pandhari Sahebi

*Seeds* dark brown, medium in number (1-3; av. 2), large, medium long, medium broad, oblong, hard, harsh, adherent; chalaza below centre, oval, distinct, even to slightly raised; beak short, broad, rough, straight.

This variety was introduced in the Deccan in 1338 under the name Sahebi. From the Deccan, it was introduced to Nasik and Poona, where this variety came to be known as Pandri Sahebi. It is one of the best table variety of grape under cultivation in the Deccan. It could not gain popularity as a commercial variety on account of its poor yield averaging from 7,500-10,000

kg/ha. The variety fails to set fruit properly unless adequately pollinated by some other variety (Deshmukh, 1924). This was necessitated on account of reflexed stamens which were shorter than the stigma. Cheema (1928) observed that the self sterility in this variety was to some extent due to climatic conditions of the Deccan in as much as the same variety when grown in the Punjab and Sind was found to be far more self fertile. Open pollinated seedlings of this variety have resulted in two promising varieties, namely, Selection 7 and Selection 94.

Ripening is uniform, medium late, 3rd week of June in North. A very high quality grape known as Deccan's Superb. T.S.S. 18-20%, acidity 0.5-0.7%, juice 60-65%. Quality is medium in North India. It has a good keeping quality. Shot berries are common owing to its sterility. It does better on over head bower. It needs to be planted side by side with pollen fertile varieties like Bhokri. Medium to heavy cropper when grown with self fertile varieties.

It is highly susceptible to rust and downy mildew.

## 97. PEARL OF CSABA

*Vines* poor in vigour. *Bark* slightly adherent and detaches in medium long, narrow, thick, rough and fissured straps. *Canes* medium long, thin; internodes short. *Buds* broad at apex, covered with brown pubescence and pink tinted. *Growing shoots* glabrous or almost so. *Tendrils* light green with faint purple streaks around base, intermittent, bi- and tri-fid, slender, short, glabrous or so. (Fig. 43)

*Unfolding leaves* variously pigmented, downy above and below. *Full-grown leaves* cuneiform, 3-lobed, sometimes 5-lobed, small, thin, smooth, glabrous above and below. Superior lateral sinus medium deep, perforate, V-shaped; inferior lateral sinus shallow to medium deep, V-shaped; petiolar sinus medium wide, round, sometimes flat, U-shaped. Teeth in 3-series, medium in number, narrow; primary teeth very narrow; secondary teeth broad. Petiole short.

*Flowers* hermaphrodite, stamens upright, anthers higher than stigma. *Inflorescence* appears on 2nd to 5th nodes.

*Bunches* small, medium long, short conical, shouldered, well filled. Penduncle green, medium long, thin, glabrous, devoid of warts. Rachis yellowish green, short, thin; primary branches few, short; secondary branches few or absent. Pedicels arising from primary branches, medium thin, rough, warty. Torus small, rough. Brush green, medium long, thin.

*Berries* light green or yellowish green, spherical, small, size moderately variable; bloom thin, easily removable; apex truncate, adherence medium strong. Skin adherent to pulp, medium thick, tender, transparency good, veins and seed beneath visible. Pulp tender, melting, slightly musky in

flavour, very sweet, veins visible but not prominent. Juice clear, greenish.

*Seeds* many (1-4; av. 2-3), short, narrow, small, oblong, soft, tasteless, adherent to pulp and located centrally; chalaza circular, raised and located centrally; beak medium long, incurved, rough.

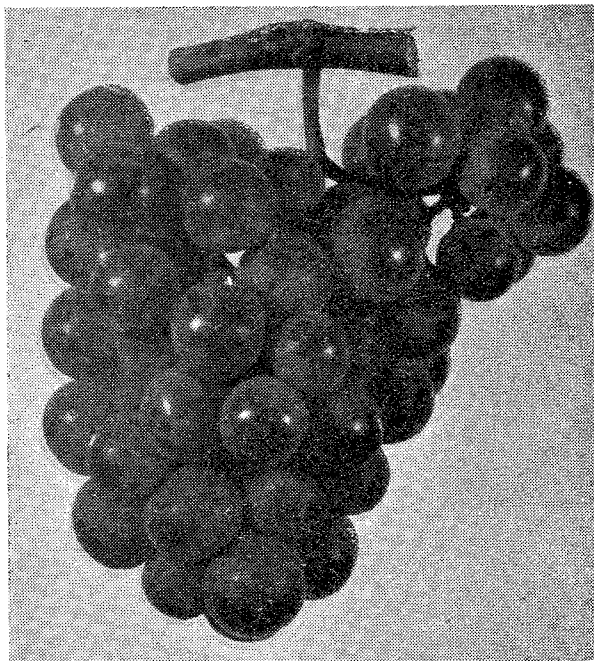


Fig. 43 Pearl of Csaba

It is a *vinifera* grape (Vaile, 1939) and is commonly cultivated for domestic markets in Austria and Hungary.

It has been tried at Delhi, Kanpur (U.P.), Punjab and Haryana and is the earliest variety so far known in North India which ripens by the 3rd week of May to 1st week of June in Delhi and by middle of May in Kanpur (Singh, 1965). It ripens from last week of February to first week of March at Hessaraghatta (Mysore). Ripening is uniform. It has an excellent quality. T.S.S. 23-24%, often goes up to 26%. Acidity 0.6-0.7%. It is a light cropper and not susceptible to cracking. Due to its low yield, poor vigour, small bunches with high seed content, it does not have much scope as a commercial variety. It can, however, be used in hybridization programme for inducing earliness and sweetness.

It is susceptible to rust and downy mildew, moderately susceptible to anthracnose and resistant to *Cercospora* leaf-spot. It has been found resis-

tant to anthracnose and moderately resistant to powdery mildew under Hesaraghatta conditions.

### 98. PERLETTE

*Vines* vigorous. *Bark* adherent and detaches in short, narrow and brittle straps. *Canes* light brown, short, thin; internodes short. *Buds* pointed, glabrous and without any tint. *Growing* shoots green, glabrous or almost so. *Tendrils* green with purplish tinge around base, intermittent, usually tri-fid, bi- and tetra-fid also found, thin, short, glabrous. (Fig. 44)

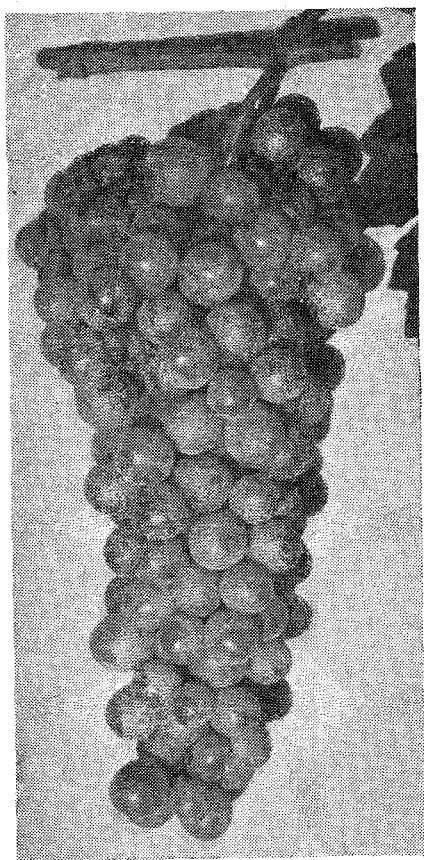


Fig. 44 Perlette

*Unfolding* leaves yellowish green, devoid of any other pigmentation, glabrous or almost so on both the surfaces. *Full-grown* leaves cuneiform, 5-lobed, medium large, thick, leathery, glabrous above and below. Superior lateral sinus shallow, perforate. V-shaped; inferior lateral sinus shallow, V-shaped; petiolar sinus medium wide, and U-shaped. Teeth in 3-series, medium in number, narrow; primary teeth very narrow; secondary teeth broad. Petiole short, green with pink tinge.

*Flowers* hermaphrodite, stamens upright, anthers higher than stigma. *Inflorescence* appears on 3rd to 4th nodes.

*Bunches* medium large, long conical, shouldered, compact to very compact. Peduncle green, long, thick, glabrous, devoid of warts. Rachis medium long, thin; primary branches medium in number, long; secondary branches few. Pedicels arising from rachis

and primary branches, medium long, thin, smooth, glabrous, warts almost absent or few. Torus small, rough. Brush green, medium long, thin.

*Berries* attractive, yellowish green, glossy, spherical to slightly ellipsoidal due to compactness, small, size moderately variable; bloom thin, easily removable; apex truncate, adherence weak. Skin adherent to pulp, thin, tough, transparency poor. Pulp firm, crisp, juicy, mild flavour, veins prominent, very sweet. Juice clear, greenish.

*Seedless*, a few rudimentary seeds often found.

This variety was evolved at the University of California, Davis by Dr. H. P. Olmo. It is a hybrid of Scolokertek hiralynoje  $26 \times$  Sultanina marble and resulted from a cross made in 1936. The vine first fruited in 1940. Because of the translucence of the mature fruit being its most striking feature, a name describing this character was sought. The French name 'Perlette' signifying 'little pearl' was selected. This variety has a definite place in grape variety situation because of its being earliest maturing seedless variety in existence (Olmo, 1948 b).

This variety has performed well in North India and is now an established grape variety of Punjab, Haryana and Delhi areas of North. It is also being considered as a promising variety for Uttar Pradesh. It has done well even in the submontane regions of Himachal Pradesh.

Ripening is uniform, early, 3rd week of May to 3rd week of June depending upon the region of cultivation in the North. Quality is medium. T.S.S. 16-18%, 22% recorded in Kanpur (Singh, 1965). Acidity 0.5-1.0%, juice 60%. It is mature and palatable at a very low sugar content. Keeping quality is good.

It is very productive variety, yielding about twice as much as the Thompson Seedless though it cannot compete Thompson Seedless in quality as a table grape. However, in the North these varieties ripen with a difference of fortnight. Yields up to 35,000 ka/ha have been obtained in many commercial vineyards in North.

It gives highest yields on overhead bower and telephone systems, though it has performed well even on head system. Cane pruning is neither necessary nor desirable.

One of its major defect is the compactness of clusters. The defect increases thinning costs. This defect is reported to have been overcome by seed irradiation resulting in the new strain named Loose Perlette. As a result of compactness, it cannot be used as a good raisin variety. Raisins made in California though resemble those of seedless Sultana but lack mealiness and are low in sugar content. Berries split and do not retain a good colour during processing.

The variety has not yet been tried commercially in other grape growing regions of the country.

It is susceptible to rust and downy mildew. It has been found to be moderately susceptible to *Cercospora* leaf-spot moderately to highly susceptible to anthracnose, but moderately resistant to powdery mildew.

## 99. PIERCE

*Vines* vigorous. *Bark* loose and detaches in long, wide, papery thin, smooth and fissured straps; bark of canes also detaches into papery thin straps. *Canes* long, thick; internodes medium long. *Buds* broad at apex, covered with brown pubescence and pink tinted. *Growing shoots* strongly pubescent. *Tendrils* greyish green, purplish tinge around base obscured by white hair, irregular, bi- and tri-fid, heavily pubescent, slender, short.

*Unfolding leaves* greyish green above and silvery white below; some pinkish tinge along the margin of the leaves above (or) and below or pink patches on the lamina surface; wooly above and below. *Full-grown leaves* cuneiform, 3-lobed, sometimes entire or 5-lobed, medium large, thin, rough, cob-webby to downy above and felted below. Superior lateral sinus absent; petiolar sinus medium wide, acute, V-shaped. Teeth in 2-series, medium in number; primary teeth narrow; secondary teeth very broad. Petiole short.

*Flowers* hermaphrodite, stamens upright, anthers higher than stigma. *Inflorescence* appears on 1st to 4th nodes.

*Bunches* small, short, regular, globular to short conical, devoid of wings, loose. Peduncle yellowish green, short, pubescent, devoid of warts. Rachis yellowish green, short, thin; primary branches few, short; secondary branches absent. Pedicels arising mostly from rachis and primary branches, short, thin, warty. Torus small, rough. Brush purple pigmented when berries ripe, long, thin.

*Berries* dark purple when fully ripe, spherical, small, size moderately variable; bloom thin, easily removable; apex truncate, adherence strong. Skin very thick, slip skin type, tough, transparency poor. Pulp melting, leathery, juicy, foxy flavour, veins prominent. Juice turbid, insipid.

*Seeds* medium in number (1-3; av. 1-2), medium long, medium broad, large, round, hard, tasteless, non-adherent; chalaza oval, sunken, located below centre and extending up to raphe; beak short, straight, rough.

It is a *labrusca* and *vinifera* hybrid. It is grown in California under the name California Concord (Winkler, 1962). It does not ripen under Delhi conditions. Only few berries turn colour when bunches are left on the vine even up to September-October. Berries crack in rainy season. It was introduced along with six other varieties mainly *labrusca* × *vinifera* hybrids in Simla Hills at Berti (Kandaghat) at elevation between 4,000-5,000 ft. during 1937. On the basis of performance of this and other varieties for a decade or so it was concluded that American grapes could thrive in such climates very easily. Yields obtained on all varieties were fairly good but fruit quality was not as good as of *vinifera* varieties available in the market.

It is resistant to anthracnose and *Cercospora* leaf-spot.

100. **PIROVANO**

*Vines* medium in vigour. *Bark* loose and detaches in medium long, medium wide, papery thin, smooth, brittle and almost compact straps. *Canes* medium long, thin; internodes medium long. *Buds* broad at apex, covered with brown pubescence and pink tinted. *Growing shoots* glabrous or almost so. *Tendrils* light green with purple streaks at base, intermittent, bi- and tri-fid, slender, short, glabrous.

*Unfolding leaves* variously pigmented, downy above and below. *Full-grown leaves* pentagonal, 5 to 7-lobed, small, thin, smooth; glabrous above and below. Superior lateral sinus medium deep to deep, narrow. V-shaped; inferior lateral sinus medium deep, V-shaped; petiolar sinus narrow, round, U-shaped. Teeth in 3-series, medium in number, narrow; primary teeth very narrow; secondary teeth broad. Petiole medium long.

*Flowers* hermaphrodite, stamens upright, anthers higher than stigma. *Inflorescence* appears on 2nd to 5th nodes.

*Bunches* small, medium long, cylindrical to short conical, neither shouldered nor winged, well filled or compact. Peduncle light green, medium long, thin, glabrous, smooth, devoid of warts. Rachis medium long, thin; primary branches medium in number, short; no secondary branches. Pedicels arising from main stem and primary branches, medium long, thin, glabrous, warty, warts many. Torus small, rough. Brush yellowish green, purplish pigmented, medium long, thin.

*Berries* deep purple, spherical, small, size moderately variable; bloom thin, easily removable; apex pointed, adherence weak to medium strong. Skin adherent to pulp, medium thick, tough, transparency poor. Pulp greenish, melting, juicy, musky in flavour, veins visible but not prominent. Juice clear, greenish, sub-acidic.

*Seeds* many (1-4; av. 2-3), short, narrow, small, oblong, soft, tasteless, non-adherent; chalaza oval, raised and located below centre; beak short, incurved, rough.

Ripening is fairly uniform, mid season, 2nd to 3rd week of June. Quality medium, T.S.S. 16%, acidity 0.6%, juice 50-55%. Susceptible to rotting. Bunches spoiled with rains. Performance from other regions of the country not reported.

It is resistant to anthracnose and *Cercospora* leaf-spot.

101. **PORTUGUESE BLUE**

*Vines* poor in vigour. *Bark* adherent and does not detach easily. *Canes* short, thin; internodes short. *Buds* broad at apex, covered with brown pubescence and pink tinted. *Growing shoots* glabrous or almost so. *Tendrils* light green, intermittent, bi-fid, medium thick, short, glabrous.

*Unfolding leaves* greyish green above and silvery white below devoid of any pigmentation, wooly above and below. *Full-grown leaves* pentagonal, 5-lobed, sometimes 3-lobed, small, thin, smooth, glabrous above and downy below. Superior lateral sinus medium deep, narrow. U-shaped; inferior lateral sinus medium deep, U-shaped; petiolar sinus medium wide, round, U-shaped. Teeth in 3-series, medium in number, very broad; primary teeth very broad; secondary teeth very broad. Petiole long.

*Flowers* hermaphrodite, stamens upright, anthers at the same level or slightly higher than stigma. *Inflorescence* appears on 2nd to 3rd nodes.

*Bunches* small to medium, short, short conical to cylindrical, sometimes shouldered, very compact. Peduncle green, almost wanting, short, thin, glabrous or so, warts absent. Rachis green, short, thin; primary branches few, short; secondary branches absent. Pedicels arising from main stem and primary branches, medium long, medium thick, glabrous or so, warty, warts many. Torus small, very rough, warty. Brush pinkish, medium long, thin.

*Berries* bluish black, spherical, ovoid due to compactness, small; bloom thick, not easily removable; apex depressed, adherence weak to medium strong. Skin adherent to pulp, thick, tough, transparency poor. Pulp tender, melting, slightly aromatic, veins not visible. Juice turbid, sub-acidic.

*Seeds* many (1-5; av. 2-3), short, narrow, small, oblong, soft, tasteless, slightly adherent; chalaza circular, raised and located centrally, beak short, incurved, rough.

An early ripening variety, which, according to Viala Vermoral, has been grown from time immemorial in Austria and Hungary. It produces a very dark red wine, which is thin and poor in tannin and acid. It is also known as Blauer Portugiesier or Portugais Blue (Period, 1927).

In Delhi, ripening is fairly uniform and early, 1st week of June. Quality is medium. T.S.S. 18-19%, acidity 0.4-0.5%, juice 25-30%. Medium cropper. Not susceptible to cracking. Berries shrivel if kept long on the vine

It is resistant to anthracnose and *Cercospora* leaf-spot.

## 102. PRESIDENT

*Vines* medium in vigour. *Bark* loose and detaches in medium long, medium thick, rough and highly fissured straps. *Canes* long, thick; internodes long. *Buds* broad at apex, covered with brown pubescence. *Growing shoots* fairly pubescent. *Tendrils* green with faint purplish streaks around base, intermittent, bi-fid, thick, medium long, slight to moderately pubescent. (Fig. 45)

*Unfolding leaves* greyish green above and silvery white below, devoid of any pigmentation, wooly above and below. *Full-grown leaves* cuneiform, 5-lobed, small, thin, smooth and glabrous above, rough and wooly below.

Superior lateral sinus medium deep, narrow, V-shaped; inferior lateral sinus medium deep, V-shaped; petiolar sinus medium wide, round, V-shaped. Teeth in 3-series, medium in number, narrow; primary teeth very narrow; secondary teeth broad. Petiole short.

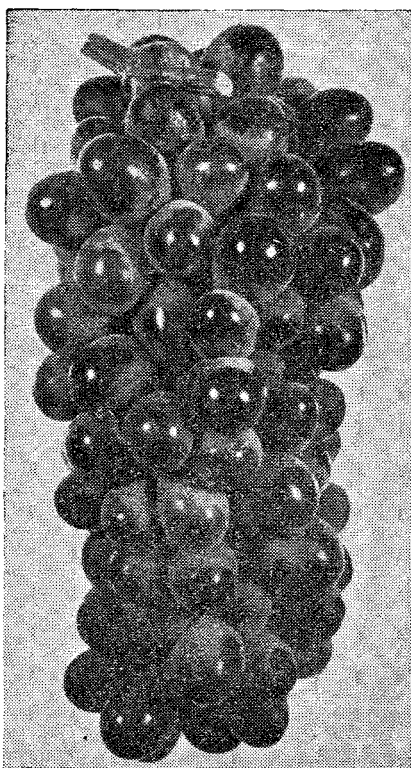


Fig. 45 President

*Flowers* hermaphrodite, stamens upright, anthers slightly higher than stigma. *Inflorescence* appears on 1st to 4th nodes.

*Bunches* medium large, medium long, regular, cylindrical, neither shouldered nor winged, very compact. Peduncle green, short, medium thick, glabrous, devoid of warts. Rachis green, short, medium thick; no primary or secondary branches. Pedicels arising from the rachis, medium long, thin, warty. Torus small, rough. Brush slightly pinkish pigmented, long, thin.

*Berries* deep red to almost black, ellipsoidal elongated, small, size highly variable; bloom thick, easily removable; apex slightly pointed, adherence weak to medium strong. Skin adherent to pulp, medium thick, medium tough, transparency poor. Pulp firm, crisp,

juicy, good flavoured, veins visible only after removal of skin. Juice clear, greenish, sweet.

*Seeds* medium in number (0-3; av. 1-2), long, medium broad, large, cuneate, soft, tasteless, adherent; chalaza circular, raised and located centrally; beak medium long, incurved, rough.

It is a *labrusca* × *vinifera* hybrid (Vaile, 1939). Ripening is uniform, mid season, 2nd to 3rd week of June in Delhi. Quality medium. T.S.S. 18-19%, acidity 0.4-0.5%, juice 60%. Medium cropper. Not susceptible to cracking. It is used for production of high quality wine (Bradt, 1952). Keeping quality is poor.

Highly susceptible to rust and downy mildew, susceptible to powdery

mildew and resistant to *Cercospora* leaf spot. It has been found to be moderately susceptible to anthracnose at Abohar (Jeyarajan *et al.*, 1969) but resistant at Hesaraghatta (Sridhar and Sohi, 1970).

### 103. PUSA SEEDLESS

*Vines* vigorous. *Bark* adherent and detaches in short, very narrow, thin, rough and tough straps. *Canes* medium long, thin; internodes medium long,

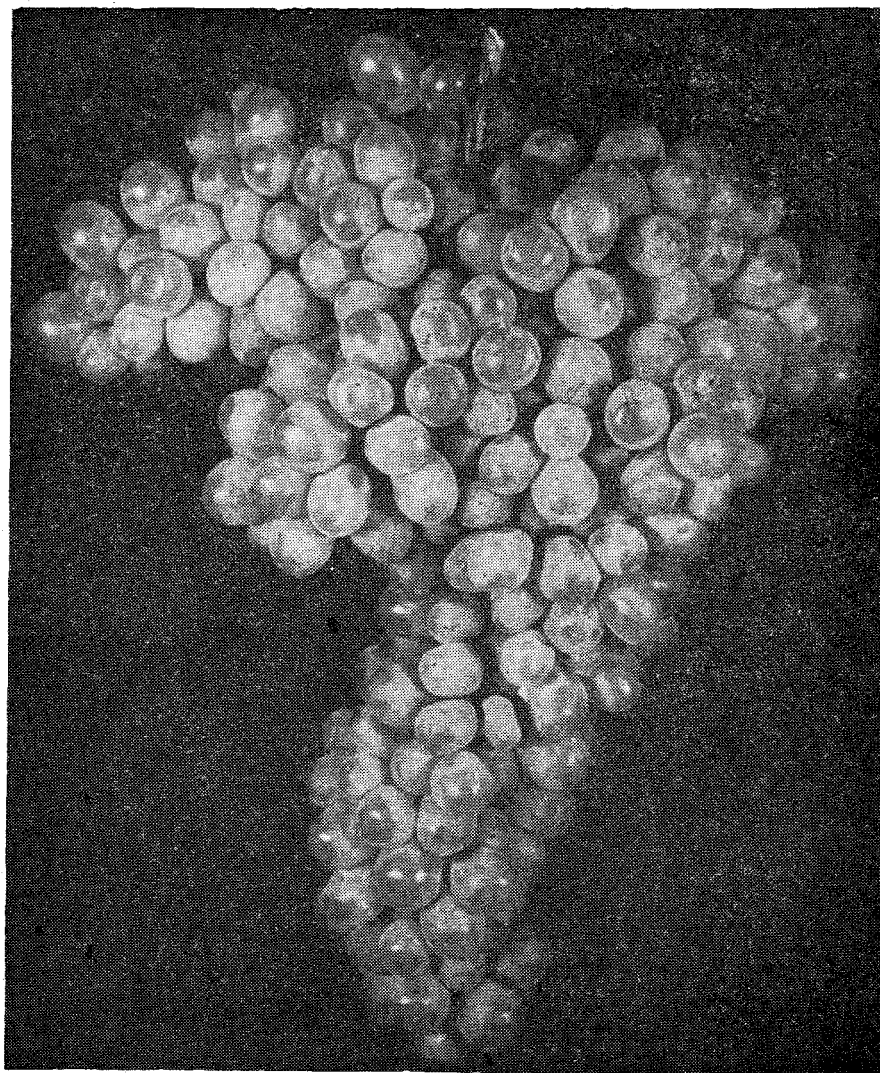


Fig. 46 Pusa Seedless

*Buds* broad at apex, covered with brown pubescence. *Growing shoots* glabrous or almost so. *Tendrils* intermittent, bi- and tri-fid, slender to medium thick, short, glabrous or nearly so. (Fig. 46)

*Unfolding leaves* yellowish green, devoid of any other pigmentation, glabrous or almost so on both the surfaces. *Full-grown leaves* reniform, 5-lobed, small, thin, smooth, glabrous above and below. Superior lateral sinus shallow to medium deep, narrow, V-shaped; petiolar sinus narrow, acute, U-shaped. Teeth in 3-series, medium in number, broad; primary teeth narrow; secondary teeth broad. Petiole short.

*Flowers* hermaphrodite, stamens upright, anthers at the same level as stigma. *Inflorescence* appears on 2nd to 7th nodes.

*Bunches* large, long, long conical to cylindrical, shouldered on both the sides, compact to very compact. Peduncle green, medium long, thin, glabrous, tough, devoid of warts. Rachis medium long, medium thick, green; primary branches many, medium long; secondary branches many, long. Pedicels arising from primary branches, medium long, thin, glabrous, warts almost wanting. Torus small, rough. Brush green, long, thin.

*Berries* greenish white, ellipsoidal or ellipsoidal elongated, small, size moderately variable; bloom thin, easily removable; apex pointed, adherence medium strong. Skin adherent to pulp, thin, tough, transparency poor. Pulp melting, watery, mild in flavour, veins prominent, very sweet. Juice clear, greenish, sweet.

*Seedless*, a few rudimentary seeds often found.

A selection made at the Indian Agricultural Research Institute, from material of unknown origin. It has performed very well under Delhi conditions and in other Northern States and is now being cultivated on a limited scale in Delhi, Punjab, Haryana, Rajasthan and Uttar Pradesh. Its vegetative and fruit characters are very much identical to the well known Thompson Seedless variety and is differentiated only by the shape of the berry which is slightly more elongish in the latter case.

It ripens uniformly and at the same time as Thompson Seedless, i.e., 2nd to 3rd week of June at Delhi. At Kanpur, it has been reported to ripen by middle to May (Singh, 1965). It is sweeter and comparatively high yielding than Thompson Seedless. T.S.S. 20-22% at Delhi, Kanpur and Abohar and goes up to 24% at Hissar (Daulta, 1969), acidity 0.5%, juice 60-65%. Not susceptible to cracking. Keeping quality is very good. It does well on kniffin, telephone or overhead bower, the yields being the highest in the latter system. It is being used extensively in the hybridization programme for inducing seedlessness.

It is susceptible to rust and downy mildew, highly susceptible to anthracnose and *Cercospora* leaf-spot.

104. **REGINA DE VIGNETI (QUEEN OF THE VINEYARD)**

*Vines* medium in vigour. *Bark* adherent and detaches in short, brittle straps, *Canes* short, thin; internodes medium long. *Buds* broad at apex, covered with brown pubescence. *Growing shoots* glabrous or almost so. *Tendrils* light green, purplish at base, intermittent, bi- or tri-fid, slender, short, glabrous. (Fig. 47)

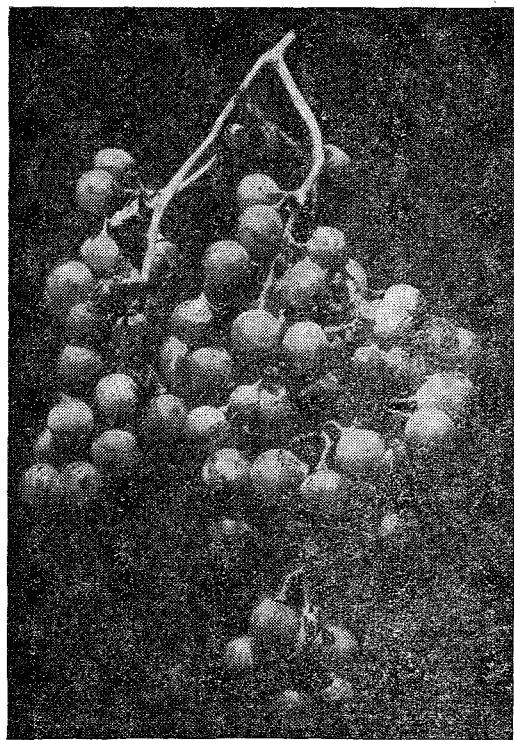


Fig. 47 Regina De Vigneti

*Unfolding leaves* variously pigmented; cob-webby above and below. *Full-grown leaves* cuneiform, 5-lobed, small, thin, smooth, glabrous above and below. Superior lateral sinus variable, shallow to deep, perforate, U-shaped; inferior lateral sinus shallow to medium deep, V-shaped; petiolar sinus medium wide, round, U-shaped. Teeth in 3-series, medium in number, narrow; primary teeth narrow; secondary teeth broad. Petiole medium long.

*Flowers* hermaphrodite, stamens upright, anthers at the level of stigma. *Inflorescence* appears on 3rd to 5th nodes.

*Bunches* medium large, medium long, short conical to long conical,

shouldered, well filled or compact. Peduncle light green, medium long, thin, glabrous, smooth, devoid of warts. Rachis light green, medium long, thin; primary branches few, medium long; secondary branches few. Pedicels arising from primary branches, medium long, medium thick, glabrous, warty, warts few. Torus small, rough, warty, dark brown. Brush yellowish green, long, thin.

*Berries* yellowish green, often golden yellow, obovoid, also oblate due to compactness of the bunch, small, size less variable; bloom thin, easily removable; apex depressed in many cases, adherence weak or medium strong. Skin adherent to pulp, thin, tender, transparency medium. Pulp soft, melting, watery, musky flavour, sweet to very sweet, veins slightly visible beneath the skin, but not prominent. Juice clear, greenish, sweet.

*Seeds* many (1-4; av. 2-3), short, narrow, small, oblong, hard, tasteless, non-adherent; chalaza oval, raised and located below centre; beak medium long, incurved, smooth.

Ripening is uniform, mid season, 3rd to 4th week of June in Delhi and second fortnight of March at Hessaraghatta (Mysore). Quality medium, T.S.S. 18%, (T.S.S. 20-22% at Hessaraghatta), acidity 0.2-0.5%, juice 55-60%. Not susceptible to cracking. Berries shrivel if kept for long on the vine. Performance from other regions of the country not reported.

It has been found to be resistant to anthracnose and moderately resistant to powdery mildew.

### 105. **RIBIER**

*Vines* vigorous. *Bark* slightly adherent and detaches in thick, brittle and fissured straps. *Canes* medium long, thick; internodes medium long. *Buds* broad at apex, covered with brown pubescence. *Growing shoots* glabrous or almost so. *Tendrils* green in colour, purplish tinge at base, intermittent, sometimes irregular, thick, medium long, bi- and tri-fid, glabrous or nearly so.

*Unfolding leaves* greyish green above and silvery white below, with colouration other than pink, and purplish or brownish at the margin; little older leaves have more brownish colour spread throughout the lamina; woolly above and below. *Full-grown leaves* cuneiform, 5-lobed, large, thick, rough, leathery, glabrous above and woolly below. Superior lateral sinus medium deep, narrow, V-shaped; inferior lateral sinus shallow, V-shaped; petiolar sinus narrow, round, V-shaped. Teeth in 3-series, many in number, narrow; primary teeth very narrow; secondary teeth broad. Petiole medium long.

*Flowers* hermaphrodite, stamens upright, anthers at the same level or slightly higher than stigma. *Inflorescence* appears on 1st to 5th nodes.

*Bunches* medium large, medium long, short conical to long conical or

cylindrical, usually branched, compact. Peduncle light green, short, thin, glabrous, herbaceous, devoid of warts. Rachis green, medium long, thin; primary branches few, very short; secondary branches few and short. Pedicels arising from the rachis and primary branches, medium long, medium thick, pubescent, warty, warts few or medium in number. Torus small, smooth. Brush deep blood red, medium long, thin.

*Berries* bluish black or jet black, oblate to short ellipsoidal, small, size moderately variable; bloom blue, thick, not easily removable; apex truncate, adherence medium strong. Skin adherent to pulp, medium thick, tender, transparency poor. Pulp firm, crisp, pleasant in flavour, veins prominent.

*Seeds* many (1-5; av. 2-3), very long, medium broad, medium large, oblong, hard, tasteless, slightly adherent to flesh and located centrally; chalaza circular, raised and located below centre; beak medium long, incurved and rough.

A good table grape and is synonymous to Alphonse Lavelle (Winkler, 1965). It is also considered synonymous to Gros Maroc (Perold, 1927).

Ripening late, early July in Delhi. Bunches do not ripen fully in Delhi, so quality poor due to onset of rains. Susceptible to cracking and rotting. Medium to good bearer. Responds to short pruning. Keeping quality good.

It is susceptible to rust and downy mildew, moderately susceptible to anthracnose and resistant to *Cercospora* leaf-spot.

## 106. RIESLING

*Vines* medium in vigour. *Bark* adherent, detaches in short, narrow straps. *Canes* light brown, medium thick; internodes short. *Buds* broad at apex, covered with brown pubescence. *Growing shoots* yellowish green with purplish streaks above, pubescence downy. *Tendrils* light green, purplish at base, intermittent, mostly bi- and tri-fid, short, slightly pubescent.

*Unfolding leaves* greyish green above and silvery white below; some pinkish tinge around the border of the leaves above or (and) below or pink patches on the lamina surface, wooly above and below. *Full-grown leaves* orbicular, 3-5 lobed, medium thick, smooth, small, glabrous above and wooly below. Superior lateral sinus broad and deep; inferior lateral sinus shallow, slightly marked; petiolar sinus almost closed. Teeth few, apical tooth broad, blunt. Petiole purplish, medium long.

*Flowers* hermaphrodite, stamens upright, anthers higher than stigma. *Inflorescence* appears on 3rd to 5th nodes.

*Bunches* small, short, broad, cylindrical, well filled. Peduncle short, medium thick. Rachis short, medium thick; primary branches short; secondary branches few. Pedicels arising mostly from primary branches and rachis, short. Torus medium thick, rough. Brush creamy size, white, short.

*Berries* greenish yellow, spherical, small, size moderately variable; bloom

present, white, easily removable; apex truncate, adherence strong. Skin medium thick, adherent to pulp. Pulp juicy, somewhat aromatic in flavour.

*Seeds* medium in number (1-4; av. 2), light, medium long, medium broad, medium thick, dark brown, cuneate, texture hard; chalaza circular, sunken, located in the middle; beak medium long.

It is a well known wine variety. The wines of the Rhine and Moselle valleys of Germany are made from this variety. Its wine possess a strong varietal flavour and bouquet (Winkler, 1965). It is commonly called white Riesling and is also known as Johannisberger Riesling.

Ripening is uniform, late, last week of June in Delhi and first fortnight of March at Hesaraghatta (Mysore). Quality is medium, T.S.S. 16-17% (19-20% at Hesaraghatta), acidity 0.8%, juice 70%. Produces better with cane pruning.

It is resistant to anthracnose, powdery mildew and *Cercospora* leaf-spot.

### 107. ROSE OF PEN

*Vines* vigorous. *Bark* loose and detaches in wide, thick, smooth, brittle and highly fissured straps. *Canes* long, thick; internodes medium long. *Buds* broad at apex, covered with brown pubescence. *Growing shoots* glabrous or almost so. *Tendrils* green, purplish at base, irregular, bi-fid, slender, medium long, glabrous or nearly so.

*Unfolding leaves* greyish green above and silvery white below with colouration other than pink, and purplish or brownish at the margin; little older leaves have more brownish colour spread throughout the lamina; woolly above and below. *Full-grown leaves* cuneiform, 5-lobed, sometimes 3-lobed, large, thin, rough, leathery, glabrous above and woolly below. Superior lateral sinus shallow, narrow, V-shaped; inferior lateral sinus shallow, V-shaped; petiolar sinus narrow, acute, U-shaped. Teeth in 2-series, medium in number, narrow; primary teeth very narrow; secondary teeth broad. Petiole long.

*Flowers* hermaphrodite, stamens upright, anthers at the same level or slightly higher than stigma. *Inflorescence* appears on 2nd to 6th nodes.

*Bunches* medium large to large, medium long, short conical, irregular, branched, compact. Peduncle green, short, glabrous, herbaceous, devoid of warts. Rachis light green, medium long, thin; primary branches few, short; secondary branches few. Pedicels arising mostly from primary branches, medium long, thin, warty, warts few. Torus small, rough. Brush deep red, long, thin.

*Berries* bluish black, spherical, small, size moderately variable; bloom thin, easily removable; apex truncate, adherence medium strong. Skin adherent to pulp, medium thick, tender, transparency poor. Pulp soft,

melting, musky in flavour, veins prominent. Juice clear, brownish yellow, very sweet.

*Seeds* many (1-6; av. 2-3), very long, medium broad, large, oblong, hard, astringent, non-adherent to pulp and located centrally; chalaza circular, raised and located centrally; beak medium long, incurved, rough.

Ripening late, 4th week of June to 1st week of July in Delhi and Lucknow, not uniform, bunches do not ripen fully. Quality poor to medium, T.S.S. 15-16%, acidity 0.7-0.8%, juice 60%. Medium cropper. Susceptible to cracking and rotting. Bunches spoiled with rains. Shot berries many.

It is susceptible to rust, highly susceptible to downy mildew and resistant to anthracnose and *Cercospora* leaf-spot.

### 108. ROSEA VENTURIUM

*Vines* medium in vigour. *Bark* loose and detaches in medium long, narrow, thin, brittle and fissured straps. *Canes* medium long, thin; internodes medium long. *Buds* broad at apex, covered with brown pubescence. *Growing shoots* glabrous or almost so. *Tendrils* light green with purplish streaks near base, intermittent, tri- or bi-fid, slender, medium long, glabrous or nearly so.

*Unfolding leaves* greyish green above and silvery white below, with colouration other than pink, and purplish or brownish at the margin; little older leaves have more brownish colour spread throughout the lamina; woolly above and below. *Full-grown leaves* cuneiform, 5 or 3-lobed, large, thin, smooth, glabrous above and downy below. Superior lateral sinus medium deep, narrow, sometimes perforate, V-shaped; inferior lateral sinus shallow to medium deep, V-shaped; petiolar sinus narrow, round, U-shaped. Teeth in 3-series, medium in number, narrow; primary teeth narrow; secondary teeth broad. Petiole medium long.

*Flowers* hermaphrodite, stamens upright, anthers slightly higher than stigma. *Inflorescence* appears on 3rd to 5th nodes.

*Bunches* large, long, short conical to long conical, compact. Peduncle purplish pigmented, long, thin, glabrous, smooth, warty, warts not many. Rachis medium long; primary branches many, short; no secondary branches. Pedicels arising from primary branches, medium long, thin, glabrous, warty, warts many. Torus small, rough, warty. Brush green, medium long, thin.

*Berries* light green, spherical to ellipsoidal, sometimes even obovoid, small, size less variable; bloom very thin, easily removable; apex truncate, adherence medium strong. Skin adherent to pulp, very thin, tough, transparency good, veins and seeds prominently visible. Pulp firm, flavour lacking, slightly insipid, veins prominent. Juice clear.

*Seeds* many (1-4; av. 2-3), medium long, medium broad, large, round.

soft, tasteless, non-adherent; chalaza oval, raised and located below centre; beak short, straight, rough.

Ripening is uniform, late, 4th week of June to 1st week of July in Delhi. Quality poor to medium, T.S.S. 16-17%, acidity 0.5%, juice 45-50%. Susceptible to cracking.

It is resistant to anthracnose and *Cercospora* leaf-spot.

### 109. ROSEM-T-LAHORE

*Vines* vigorous. *Bark* loose and detaches in long, broad, thick, smooth and fissured straps. *Canes* medium long, thick; internodes long. *Buds* broad at apex, covered with brown pubescence. *Growing shoots* strongly pubescent. *Tendrils* intermittent, bi- and tri-fid, medium thick, medium long, glabrous.

*Unfolding leaves* greyish green above and silvery white below, with colouration other than pink and purplish or brownish at the margin; little older leaves have more brownish colour spread throughout the lamina; wooly above and below. *Full-grown leaves* cuneiform, 5-lobed, sometimes 3-lobed, very large, thin, rough, leathery, downy above and wooly below. Superior lateral sinus shallow, wide, V-shaped; inferior lateral sinus shallow, V-shaped; petiolar sinus narrow, acute, V-shaped. Teeth in 3-series, medium number, broad; primary teeth narrow; secondary teeth very broad. Petiole medium long.

*Flowers* hermaphrodite, stamens upright, anthers higher than stigma. *Inflorescence* appears on 5th to 7th nodes.

*Bunches* medium large, medium long, short conical, branched, well filled or compact. Peduncle green, devoid of warts, short, thin, glabrous, devoid of warts. Rachis green, medium long, thin; primary branches few, short; secondary branches few and short. Pedicels arising from the primary branches and rachis, medium long, medium thick, warty, warts many. Torus small, rough. Brush green, sometimes purple pigmented, short and thin.

*Berries* spherical, small, size less variable; bloom thin, easily removable; apex truncate, adherence strong. Skin adherent to pulp, medium thick, tough, transparency poor. Pulp firm, crisp, slightly aromatic, veins prominent. Juice clear, acidic.

*Seeds* many (1-5; av. 2-3), long, broad, large, oblong, hard, astringent, non-adherent; chalaza circular, raised and located below centre; beak medium long, incurved, rough.

*Bunches* do not ripen fully under Delhi conditions. Quality poor both under Delhi and Lucknow conditions. T.S.S. does not go beyond 12% in ripe berries. Medium cropper. Susceptible to cracking and rotting. Bunches spoiled with rains. Performance from other regions of the country not reported.

It is susceptible to rust and downy mildew and resistant to anthracnose and *Cercospora* leaf-spot.

### 110. RUBINO

*Vines* medium in vigour. *Bark* loose and detaches in short, narrow, thin, smooth and slightly fissured straps. *Canes* short; thin, internodes short. *Buds* broad at apex, covered with brown pubescence. *Growing shoots* glabrous or almost so. *Tendrils* slightly purplish at base, intermittent, bi- or tri-fid, slender, short, glabrous.

*Unfolding leaves* variously pigmented; downy above and below. *Full-grown leaves* cuneiform, 5-lobed, small, thin, smooth, glabrous above and downy below. Superior lateral sinus variable, shallow to deep, narrow to perforate, V-shaped; inferior lateral sinus shallow to medium deep, V-shaped; petiolar sinus narrow to medium wide, round, U-shaped. Teeth in 2-series, many in number, narrow; primary teeth narrow; secondary teeth narrow. Petiole medium long.

*Flowers* hermaphrodite, stamens upright, anthers higher than stigma. *Inflorescence* appears on 3rd to 4th nodes.

*Bunches* small, medium long, short conical, loose or well filled. Peduncle light green, short, thin, glabrous, smooth, warty, warts few. Rachis light green, short, thin; primary branches many, short; secondary branches absent. Pedicels arising from rachis and primary branches, medium long, thin, warty, warts few, prominent. Torus small, warty, rough. Brush green, medium long, thin.

*Berries* yellowish green, spherical, small, size less variable; bloom thick, easily removable; apex truncate, adherence medium strong. Skin adherent to pulp, thick, tough, transparency poor. Pulp soft, melting, watery, flavour absent, insipid in taste, veins prominent. Juice clear and sweet.

*Seeds* medium in number (1-4; av, 2), very short, narrow, very small, round, soft, tasteless, non-adherent; chalaza circular, raised, located below centre and extending up to raphe; beak short, incurved, rough.

Ripening is uniform, mid season, ripens in 4th week of June. Quality poor, T.S.S. 14%, acidity 0.4%, juice 45-50%. Susceptible to cracking. Shot berries many.

It is resistant to anthracnose and *Cercospora* leaf-spot.

### 111. SAINT JEANNET

*Vines* vigorous. *Bark* loose and detaches in medium long, medium wide, thick, smooth, brittle and highly fissured straps. *Canes* short, thin; internodes medium long. *Buds* broad at apex, covered with brown pubescence. *Growing shoots* glabrous or almost so. *Tendrils* light green, intermittent, bi- and tri-fid, medium thick, short, glabrous or nearly so.

*Unfolding leaves* yellowish green or light green, devoid of any other pigmentation, but obscured by white pubescence, downy above and below. *Full-grown leaves* orbicular, 5 to 9-lobed, small to medium, thin, smooth, glabrous above and below. Superior lateral sinus medium deep to deep, perforate, U-shaped; inferior lateral sinus medium deep, U-shaped; petiolar sinus narrow, acute, U-shaped. Teeth in 3-series, many in number, narrow; primary and secondary teeth narrow. Petiole medium long.

*Flowers* hermaphrodite, stamens upright, anthers at the level of stigma. *Inflorescence* appears on 2nd to 5th nodes.

*Bunches* medium large, medium long, short conical, branched, compact. Peduncle medium long, thin, glabrous or nearly so, green, devoid of warts. Rachis green, short, thin; primary branches many, short; secondary branches few. Pedicels arising mostly from primary branches, medium long, thin, warty, warts few. Torus small, rough. Brush yellowish green, long thin.

*Berries* greenish yellow, spherical, small, size less variable; bloom medium thick, not easily removable; apex truncate, adherence weak. Skin adherent to pulp, thin, rough, transparency poor. Pulp soft, melting, flavour absent, subacid, veins prominent. Juice clear.

*Seeds* many (1-4; av. 2-3), very short, very narrow, small, oblong, hard, tasteless, non-adherent; chalaza circular, raised and located below centre; beak short, incurved, rough.

Ripening is uniform, late, 2nd week of July in Delhi. Quality poor to medium. T.S.S. 15-16%, acidity 0.6-0.7%, juice 60-65%. Not susceptible to cracking. Keeping quality good.

It is resistant to anthracnose and moderately susceptible to *Cercospora* leaf-spot.

## 112. SAPIRAVI

*Vines* medium in vigour. *Bark* loose, detaches in long, narrow straps. *Canes* medium long, thick; internodes short. *Buds* pointed at apex and pink tinted. *Growing shoots* green with purplish streaks, cob-webby. *Tendrils* light green, purplish at base, intermittent, mostly bi- and tri-fid, medium long, glabrous or almost so.

*Unfolding leaves* greyish green above and silvery white below. Some pinkish tinge along the border of the leaves above or (and) below or pink patches in the lamina surface, thick, flat, rough, small, glabrous above and downy below. Superior lateral sinus, shallow, wide; inferior lateral sinus almost absent; petiolar sinus, narrow, U-shaped. Teeth few, apical tooth broad, pointed. Petiole medium long, pinkish on both sides.

*Flowers* hermaphrodite, stamens upright, anthers higher than stigma. *Inflorescence* appears on 3rd to 5th nodes.

*Bunches* cylindrical to conical, shouldered, medium large, well filled

to compact. Peduncle short, medium thick. Rachis short; primary branches short; secondary branches few. Pedicels arising mostly from primary branches and rachis, medium long. Torus thin, rough. Brush pinkish, short.

*Berries* bluish black, spherical, medium large, size less variable; bloom thick, not easily removable, adherence medium, apex truncate. Skin medium thick, slip skin type. Pulp melting; juice brick red.

*Seeds* medium in number (1-4; av. 1-2),; medium large, medium long, medium broad, thick, light brown, cuneate; texture medium; chalaza oval, raised, located below centre; beak medium long.

An introduction from U.S.S.R. Ripening is uniform, late, last week of June in Delhi. Quality medium. T.S.S. 18%, acidity 0.7-0.8%, juice 80%. Medium cropper.

It is resistant to anthracnose, and moderately resistant to powdery mildew.

### 113. SCARLET

*Vines* medium in vigour. *Bark* adherent and does not detach from the stem. *Canes* short, thin; internodes short. *Buds* broad at apex, covered with brown pubescence and pink tinted. *Growing shoots* slightly pubescent. *Tendrils* green, intermittent, slender, short, bi-fid, pubescent. (Fig. 48)

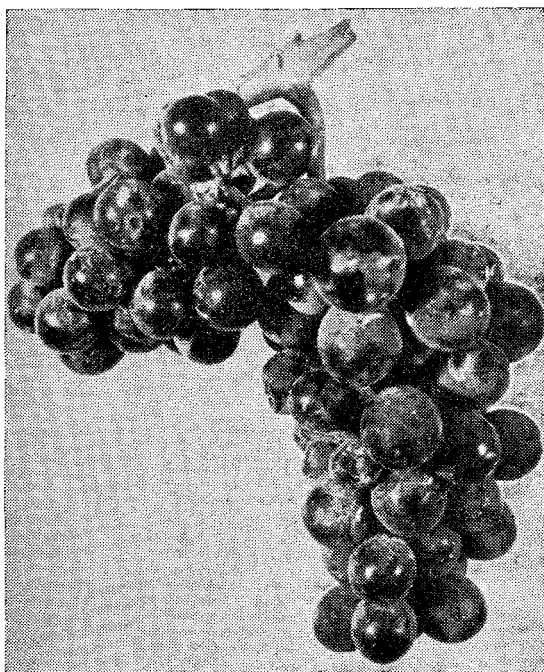


Fig. 48 Scarlet

*Unfolding leaves* greyish green above and silvery white below; some pinkish tinge along the margin of the leaves above or (and) below or pink patches on the lamina surface; pubescence wooly above and below.

*Flowers* hermaphrodite, stamens upright, anthers at the level of stigma. *Inflorescence* appears on 2nd to 5th nodes.

*Bunches* small, short, short conical, branched, well filled to compact. Peduncle light green, short, thin, pubescent, devoid of warts. Rachis light green, short, thin; primary branches few, short; secondary branches absent. Pedicels arising from rachis and primary branches, short, thin, glabrous, devoid of warts. Torus small, smooth. Brush deep pinkish, short, thin.

*Berries* bluish black, ellipsoidal, small, size less variable; bloom thick, not easily removable; apex, pointed, adherence medium strong. Skin adherent to pulp, thick, tough, transparency poor. Pulp tender, melting, slightly aromatic, veins not visible. Juice turbid, acidic.

*Seeds* medium in number (1-4; av. 2), very short, very narrow, very small, cuneate, soft, tasteless, non-adherent; chalaza oval, raised and located below centre; beak short, incurved, rough.

Ripening is uniform, mid season, 3rd week of June in Delhi. Quality is poor. T.S.S. 13-14%, acidity 0.7-0.8%, juice 40-45%. Not susceptible to cracking.

#### 114. SELECTION 7 (CHEEMA SAHEBI)

*Vines* vigorous. *Bark* slightly adherent and detaches in medium long, narrow, papery thin, smooth and almost compact straps. *Canes* light brown with deep brown streaks, medium long, thick; internodes medium long. *Buds* broad at apex, covered with brown pubescence. *Growing shoots* green, glabrous or almost so. *Tendrils* green, purplish at base, intermittent, bi-fid, medium thick, long, smooth, glabrous or nearly so. (Fig. 49)

*Unfolding leaves* greyish green above and silvery white below; some pinkish tinge along the margin of the leaves above or (and) below or pink patches on the lamina; wooly above and below. *Full-grown leaves* cuneiform, 5-lobed; thin, smooth, upper surface dark green, under surface light green, glabrous above and below. Superior lateral sinus medium deep, narrow, V-shaped; inferior lateral sinus shallow, narrow, V-shaped; petiolar sinus narrow, round, V-shaped. Teeth in 2-series, many in number, narrow, primary teeth narrow; secondary teeth broad. Petiole green, purplish at base, medium long.

*Flowers* hermaphrodite, stamens upright, anthers higher than stigma. *Inflorescence* appears on 1st to 4th nodes.

*Bunches* medium large, long, short conical or conical, symmetrically shouldered, well filled. Peduncle light green, short, thin, glabrous, devoid of warts. Rachis medium long, thin, dark brown; primary branches many,

medium long; secondary branches few, short. Pedicels arising from primary branches, medium long, thin, glabrous, warty, warts numerous. Torus small, very rough. Brush creamy white, medium long, thin.

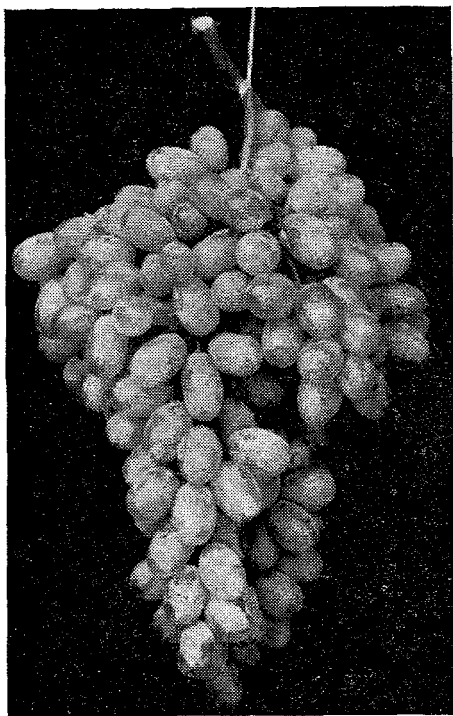


Fig. 49 Selection 7

*Berries* pale yellow, oval cylindrical, small, size highly variable; bloom moderate, easily removable; apex truncate, adherence medium strong. Skin adherent to pulp, thin, tender, transparency good, veins below visible. Pulp firm, crisp, very juicy, neutral flavour, sweet in taste, veins prominent. Juice clear, greenish, insipid in taste.

*Seeds* many (1-5; av. 2-3), medium long, medium broad, medium large, oblong, soft, astringent, adherent to pulp and located centrally; chalaza oval, raised, located below centre and extending up to raphe; beak short, incurved and rough.

This variety is a selection made by Dr. G. S. Cheema of Maharashtra

Department of Agriculture from an open pollinated progeny of Pandhari Sahebi raised at Ganesh Khind Garden, Poona. Recently, it has been renamed as Cheema Sahebi. Though this seedling was selected during 1927, it remained in the varietal collection unnoticed till it was tried by the late G. C. Shembekar in his vineyard at Baramati Maharashtra, where it gave a bumper crop. Then on, the reputation of this variety has spread all over the grape growing areas of Maharashtra.

It has also been tried in Northern regions where it is vigorous in growth but has not performed well due to its late ripening i.e. last week of June to first week of July which coincides with onset of rainy season and poor keeping quality. Ripening is uniform and medium late under Poona conditions.

Quality is poor in the North. T.S.S. varies from 12-14% in Delhi, Hissar (Daulta, 1969) and Lucknow (Kurtkoti, 1963). In Poona, quality is

better than Bhokri and Anab-e-Shahi, T.S.S. being 20-21.5%, acidity 0.5%, juice 75%. However, keeping quality is rather poor as the attachment of the berries to the pedicels is not firm. As such, during packing and transport, 8-10% of berries get detached. It is not susceptible to cracking.

Prolific bearer, yields better than Bhokri and produces up to 37,000 kg/ha. It is susceptible to rust; highly susceptible to downy mildew and anthracnose; and moderately susceptible to *Cercospora* leaf-spot.

### 115. SELECTION 94

*Vines* vigorous. *Bark* slightly adherent and detaches in short, thin, almost compact straps. *Canes* reddish brown, long, medium thick, glabrous; internodes medium long. *Buds* broad at apex, covered with brown pubescence and pink tinted. *Growing shoots* green with purplish streak, glabrous or almost so. *Tendrils* green, purplish at base, intermittent, bi-fid, thick, long, smooth, glabrous or nearly so.

*Unfolding leaves* greyish green above and silvery white below, with colouration other than pink, and purplish or brownish colour spread throughout the lamina; wooly above and below. *Full-grown leaves* pentagonal, 5-lobed, large, thin, smooth; glabrous above and below. Superior lateral sinus medium deep, narrow, V-shaped; inferior lateral sinus medium deep, V-shaped; petiolar sinus narrow, round and U-shaped. Teeth in 2-series, many in number, broad; primary and secondary teeth broad. Petiole green with purple patches, long.

*Flowers* hermaphrodite, stamens upright, anthers at the level of stigma. *Inflorescence* appears on 2nd to 4th nodes.

*Bunches* attractive, large, medium long, conical to cylindrical, very compact. Peduncle light green, short, thick, glabrous, devoid of warts. Rachis light green, medium long, thick; primary branches many, long; secondary branches few, short. Pedicels arising mostly from primary branches, medium long, thick, glabrous, warty. Torus small, very rough. Brush creamy white, long, thin.

*Berries* greenish yellow, ellipsoidal or ovoid, small, size moderately variable; bloom thin, easily removable; apex truncate, adherence medium strong. Skin adherent to pulp, medium thick, tough, transparency good. Pulp soft, melting, flavour mild or absent, slightly acidic, transparency good, veins prominent. Juice clear, greenish, slightly insipid.

*Seeds* yellowish brown, medium in number (1.4; av. 2), medium long, medium broad, medium large, soft, astringent, non-adherent to pulp and located centrally; chalaza oval, raised, located below centre and extending up to raphe; beak medium long, incurved, rough.

It is a selection made from open pollinated progeny of Pandhari Sahebi

by Dr. G. S. Cheema, Department of Agriculture, Maharashtra at Ganesh Khind Garden, Poona.

Ripening uniform, late, 4th week of June to 1st week of July and quality poor in Delhi, Punjab, Haryana and Uttar Pradesh. In Poona also, late ripener, but quality good. T.S.S. 16-19%, acidity 0.6-0.7%, juice 50-60%. It is a very high yielding variety with 30,000 to 37,000 kg/ha. Responds well to short pruning. It does not ship well due to soft pulp. Susceptible to rotting due to compactness.

It is highly susceptible to rust and downy mildew.

### 116. **SENECA**

*Vines* medium in vigour. *Bark* adherent, detaches in short straps. *Canes* short, medium thick; internodes short. *Buds* broad at apex, covered with brown pubescence. *Growing shoots* greyish green, wooly. *Tendrils* light green or greyish, intermittent, tri-fid, also bi-fid, slender, short, heavily pubescent.

*Unfolding leaves* greyish green above and silvery white below; some pinkish tinge along the border of the leaves above or (and) below; pink patches on the lamina surface, wooly above and below. *Full-grown leaves* cuneiform, 3-lobed, thick, rough, flat, small, glabrous above and downy below. Superior lateral sinus deep, wide; petiolar sinus medium, U-shaped. Teeth medium in number, apical tooth medium broad, blunt. Petiole greyish green with purplish streaks, long.

*Flowers* hermaphrodite, stamens, upright, anthers at the same level as stigma. *Inflorescence* appears on 3rd to 5th nodes.

*Bunches* medium large, cylindrical, well filled to compact. Peduncle medium long, medium thick. Rachis short, medium thick; primary branches short; secondary branches few. Pedicels arising mostly from primary branches, smooth, medium long. Torus medium thick, rough. Brush greenish yellow, medium long.

*Berries* yellowish green or golden white, ellipsoidal; medium large, size highly variable; bloom thin, easily removable; adherence strong, apex truncate. Skin thick, slip skin tye. Pulp tender, melting. Juice greenish yellow.

*Seeds* medium in number (1-4; av. 1-2), medium long, medium heavy, medium broad, medium thick, cuneate, pinkish brown; chalaza circular, sunken, located below the middle; beak medium long.

An introduction from U.S.A. Ripening uneven, mid season, 3rd week of June in Delhi. Quality poor to medium. T.S.S. 15-16%, acidity 12%, juice 70-75%, yield poor. Keeping quality good.

### 117. **SHADIPUR LOCAL I**

*Vines* medium in vigour. *Bark* slightly adherent and detaches in the form of

medium long, wide, smooth and highly fissured straps. *Canes* medium long, thick; internodes short. *Buds* broad at apex, covered with brown pubescence and pink tinted. *Growing shoots* fairly pubescent. *Tendrils* almost green, irregular, bi- and tri-fid, tetra-, penta- and hexa-fid also very commonly found, medium long, moderately pubescent.

*Unfolding leaves* greyish green above and silvery white below, devoid of any pigmentation, wooly above and below. *Full-grown leaves* truncate, 5-lobed, sometimes 3-lobed, small, thin, smooth, glabrous above and downy below. Superior lateral sinus shallow to medium deep, narrow, V-shaped; inferior lateral sinus shallow, V-shaped; petiolar sinus narrow, round, V-shaped. Teeth in 3-series, medium in number, broad; primary teeth narrow; secondary teeth broad. Petiole medium long.

*Flowers* hermaphrodite, stamens upright, anthers at the level of stigma. *Inflorescence* appears on 3rd to 4th nodes.

*Bunches* large, long, conical or cylindrical, shouldered, compact or very compact. Peduncle green, long, medium thick, glabrous, herbaceous, devoid of warts. Rachis long, thin to medium thick; primary branches many, medium to long; secondary branches few; pedicels arising mostly from primary branches, short, thin, warty, warts few. Torus small, rough. Brush greenish yellow, medium long, thin.

*Berries* greenish yellow with slightly purplish tinge, spherical, small, size moderately variable; bloom thin, not easily removable; apex truncate, adherence weak. Skin adherent to pulp, thin, tender, transparency poor. Pulp firm, crisp, slightly aromatic, veins visible, prominent; juice clear, sweet.

*Seeds* medium in number (1-4; av. 2), short, narrow, medium large, oblong, hard, tasteless, non-adherent, located centrally; chalaza oval, sunken, located below centre; beak medium long, incurved, rough.

Ripening not uniform, late, 2nd week of July. Quality good. T.S.S. 24% when berries fully ripe, acidity 0.4%, juice 50%. Heavy cropper; not susceptible to cracking or rotting.

It is highly susceptible to rust and downy mildew.

## 118. SHADIPUR LOCAL II

*Vines* medium in vigour. *Bark* slightly adherent, detaches in the form of short, narrow, thin, smooth, brittle and fissured straps. *Canes* medium long, thin; internodes short. *Buds* broad at apex and covered with brown pubescence. *Growing shoots* glabrous or almost so. *Tendrils* green, intermittent, bi- and tri-fid, slender, short, glabrous or so.

*Unfolding leaves* greyish green above and silvery white below, with colouration other than pink, and purplish or brownish at the margin; little older leaves have more brownish colour spread throughout the lamina;

wooly above and below. *Full-grown leaves* cuneiform, 5-lobed, medium large, thin, smooth, glabrous above and cob-webby to downy below. Superior lateral sinus shallow, V-shaped; petiolar sinus narrow, round, U-shaped. Teeth in 3-series, fair in number, narrow; primary teeth very narrow; secondary teeth broad. Petiole medium long.

*Flowers* hermaphrodite, stamens, upright, anthers higher than stigma. *Inflorescence* appears on 3rd to 5th nodes.

*Bunches* medium large, medium long, short conical to cylindrical, neither shouldered nor winged, loose or compact. Peduncle green, short, thin, glabrous, herbaceous, devoid of warts. Rachis green, short, thin; primary branches few, short; secondary branches few and short. Pedicels arising from primary branches, medium long, thin, glabrous, warty, warts few. Torus small, rough. Brush green, often pinkish pigmented, long, thin.

*Berries* deep purple, spherical, small, size less variable; bloom thick, easily removable, apex truncate to pointed, adherence weak to medium strong. Skin adherent to pulp, medium thick, tough transparency poor. Pulp greenish, melting, juicy, musky in flavour, veins visible but not prominent. Juice clear, greenish, sweet.

*Seeds* many (0.5; av. 2.3), long, narrow, medium large, oblong, hard, non-adherent, located centrally; chalaza oval, raised, located below centre; beak medium long, straight, rough.

Ripening uniform, mid-season, 2nd to 3rd week of June. Quality medium. T.S.S. 15%, acidity 0.8%, juice 65%, medium cropper, not susceptible to cracking or rotting.

It is susceptible to rust and downy mildew.

### 119. SPIN SAHEBI WHITE

*Vines* very vigorous. *Bark* loose and detaches in short, narrow, thin, smooth, brittle and fissured straps. *Canes* long, thick; internodes medium long. *Buds* broad at apex, covered with brown pubescence. *Growing shoots* fairly pubescent. *Tendrils* green, purplish tinge at base, intermittent, bi-fid, thick, long, moderately pubescent.

*Unfolding leaves* greyish green above and silvery white below, devoid of any pigmentation, wooly above and below. *Full-grown leaves* cuneiform, 5-lobed, medium large, thin, smooth; glabrous above, cob-webby to downy below. Superior lateral sinus deep, narrow, V-shaped; inferior lateral sinus medium deep, narrow, V-shaped; petiolar sinus medium wide, acute to round, U-shaped. Teeth in 3-series, medium in number, very narrow; primary teeth very narrow; secondary teeth broad. Petiole short.

*Flowers* hermaphrodite, stamens upright, anthers slightly higher than stigma. *Inflorescence* appears on 2nd to 4th nodes.

*Bunches* medium large, medium long, regular, cylindrical, neither

shouldered nor winged, compact to very compact. Peduncle green, medium long, thick, pubescent, wooly, devoid of warts. Rachis short, medium thick, warty, warts few. Torus small, rough, warty. Brush blood red, long, thin.

*Berries* deep red to almost black, ellipsoidal elongated, small, size highly variable; bloom thick, easily removable; apex truncate, adherence weak. Skin adherent to pulp, medium thick, medium tough, transparency poor. Pulp firm, crisp, juicy, good flavoured or slightly aromatic, veins visible only after removal of skin. Juice clear, greenish, sweet.

*Seeds* medium in number (1-4; av. 1-2), long, very narrow, medium large, cuneate, soft, tasteless, slightly adherent; chalaza oval, raised and located below centre; beak medium long, straight, rough.

Ripening fairly uniform, mid-season, 2nd to 3rd week of June. Quality medium, T.S.S. 17-18%, acidity 0.7-0.8%, juice 60%. Not susceptible to cracking.

It is susceptible to rust and downy mildew.

## 120. STEUBEN

*Vines* medium in vigour. *Bark* loose and detaches in long, narrow straps. *Canes* short, medium thick; internodes short. *Buds* broad at apex, densely covered with brown pubescence. *Growing shoots* greyish green, purple pigmented, wooly. *Tendrils* greyish green with purplish streaks, intermittent, mostly bi- and tri-fid, short, slender, wooly.

*Unfolding leaves* greyish green above and silvery white below. Border of the leaf beautifully pigmented; wooly above and below. *Full-grown leaves* cordate to orbicular, 3—5-lobed to entire, thick, rough, medium large, glabrous above, downy below. Superior lateral sinus shallow, narrow, U-shaped; inferior lateral sinus almost absent or shallow, narrow, U-shaped; petiolar sinus wide, V-shaped. Teeth many, apical tooth broad, pointed. Petiole tinged light red, short, medium thick.

*Flowers* hermaphrodite, stamens upright, anthers, higher than stigma. *Inflorescence* appears on 3rd to 5th nodes.

*Bunches* attractive, medium to large, shouldered, well filled, cylindrical. Peduncle purplish, medium long, medium thick, tough, Rachis short; primary branches many, short; secondary branches few, short. Pedicels arising mostly from primary branches, medium long, medium thick, warty. Torus medium thick, large, rough. Brush creamy, pinkish pigmented, short.

*Berries* dark red to jet black, spherical, slightly elongated when bunches compact, medium large, size highly variable; bloom heavy, not easily removable; adherence medium, apex truncate. Skin thick, medium tough, slip skin type, not adhering to pulp, slightly astringent. Pulp slightly tough, juicy, greenish, translucent, not aromatic.

*Seeds* many in number (1-5; av. 2-3), medium large, medium long,

medium broad, medium thick, cuneate, dark brown, texture hard, chalaza oval, sunken, located below the middle; beak medium long.

Steuben originated from a cross made in 1925 between varieties Wayne (Mills  $\times$  Ontario) and Sheridan (Herbered  $\times$  Worden). It was selected from a population of 31 seedlings in 1931 and was named and introduced in 1947 (Slate *et al.*, 1962).

Introduced in India from U.S.A. Ripening is uniform, mid-season, 2nd to 3rd week of June in Delhi. Quality poor in Delhi. T.S.S. remains low.

## 121. SUFAIDI

*Vines* very vigorous. *Bark* loose and detaches in short, medium wide, thick, rough and compact straps. *Canes* long, thin; internodes medium long. *Buds* broad at apex, covered with brown pubescence. *Growing shoots* glabrous or almost so. *Tendrils* green with purplish streaks at base, irregular, tri-fid, often bi- and sometimes tetra-fid, thick, long.

*Unfolding leaves* greyish green above and silvery white below, with colouration other than pink, and purplish or brownish at the margin; little older leaves have more brownish colour spread throughout the lamina; wooly above and below. *Full-grown leaves* orbicular, 5-lobed, small, thin rough, leathery, glabrous above and wooly below. Superior lateral sinus medium deep, perforate, V-shaped; inferior lateral sinus medium deep, V-shaped; petiolar sinus medium wide, U-shaped. Teeth in 3-series, medium in number, narrow; primary and secondary teeth narrow. Petiole medium long.

*Flowers* hermaphrodite, stamens upright, anthers at the level of stigma. *Inflorescence* appears on 3rd to 5th nodes.

*Bunches* very large, long, short conical to conical, loose to well filled. Penduncle light green, medium long, thin, glabrous, devoid of warts. Rachis light green, long, thin; primary branches many, long; secondary branches medium in number, short. Pedicels arising mostly from primary branches and also secondary branches, medium long, medium thick, glabrous, warty, warts many. Torus small, rough. Brush light green, long, thin.

*Berries* light green, spherical, medium large, size less variable; bloom thin, easily removable; apex truncate, adherence strong. Skin adherent to pulp, thin, transparency good. Pulp soft, veins prominent. Juice clear, insipid in taste.

*Seeds* many (0.4; av. 2.3), medium long, broad, large, round, hard, tasteless, non-adherent; chalaza circular, raised and located below centre; beak medium long, straight and rough.

Bunches do not ripen under Delhi conditions. The berries remain green, hard and insipid in taste.

It is susceptible to rust and downy mildew.

**122. SUR SAHEBI RED**

*Vines* vigorous. *Bark* slightly adherent and detaches in short, narrow, thin and smooth straps. *Canes* long, medium thick; internodes short. *Buds* broad at apex, covered with brown pubescence and pink tinted. *Growing shoots* brownish, glabrous or almost so. *Tendrils* with faint purplish streaks, intermittent, bi- or tri-fid, thick, short, glabrous or so.

*Unfolding leaves* variously pigmented, cob-webby above and below. *Full-grown leaves* orbicular, 5-lobed, small, thin, smooth, glabrous above and below. Superior lateral sinus medium deep, narrow, V-shaped; inferior lateral sinus shallow, V-shaped; petiolar sinus medium wide, round, U-shaped. Teeth in 3-series, fair in number, narrow; primary teeth very narrow; secondary teeth broad. Petiole green with purple tinge on one side, medium long.

*Flowers* hermaphrodite, stamens upright, anthers at the same level as stigma. *Inflorescence* appears on 2nd to 5th nodes.

*Bunches* cylindrical to conical, large, well filled to compact. Peduncle long, medium thick. Rachis medium long, thick; primary branches medium long; secondary branches many, long. Pedicels arising mostly from secondary branches, medium long. Torus thick, rough. Brush creamy, white, long.

*Berries* brick red, obovoid, large, size moderately variable; bloom medium thick, not easily removable; adherence strong, apex truncate. Skin thin, adherent to pulp. Pulp firm, juice greenish yellow.

*Seeds* many (1-4; av. 2), short, medium broad, medium large, round, hard, tasteless, non-adherent and located centrally; chalaza circular, raised, located below centre and extending up to raphe; beak medium long, straight, rough.

Ripening is uniform, late, last week of June in Delhi. Quality medium. T.S.S. 17-18%, acidity 0.5-0.6%, juice 70 to 75%, medium cropper.

It is susceptible to rust and downy mildew.

**123. SUR SAVAI**

*Vines* vigorous. *Bark* slightly adherent and detaches in medium wide, thin, smooth, tough and slightly fissured straps. *Canes* purplish, long, thick; internodes long. *Buds* broad at apex, covered with brown pubescence. *Growing shoots* green with dark purple shade, fairly pubescent. *Tendrils* green in colour with faint purplish streaks, intermittent, bi- and tri-fid, slender, medium long, glabrous or nearly so. (Fig. 50)

*Unfolding leaves* greyish green above and silvery white below with colouration other than pink, and purplish or brownish at the margin; little older leaves have more brownish colour spread throughout the lamina; wooly above and below. *Full-grown leaves* orbicular, 5-lobed, small, medium

thick, smooth; glabrous above and below. Superior lateral sinus variable, shallow to deep, narrow, V-shaped; inferior lateral sinus variable, shallow to deep, V-shaped; petiolar sinus narrow, U-shaped. Teeth in 2-series, fair in number, broad; primary teeth narrow; secondary teeth broad. Petiole medium long.

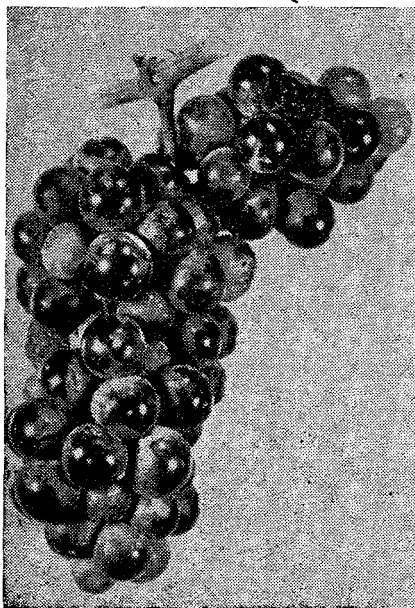


Fig. 50 Sur Savai



Fig. 51 Tas

*Flowers* hermaphrodite, stamens upright, anthers higher than stigma. *Inflorescence* appears on 2nd to 5th nodes.

*Bunches* medium large, medium long, short conical or cylindrical, branched, very compact. Peduncle green, short, medium thick, glabrous, tough, devoid of warts. Rachis green, short, medium thick; primary branches few, short; secondary branches absent. Pedicels arising from rachis and primary branches, medium long, thin, glabrous, warty, warts few. Torus small, rough. Brush often pinkish pigmented, medium long, thin.

*Berries* deep red to almost black, spherical, often ovoid elongated or even obovoid, small, size moderately variable; bloom medium thick, not easily removable; apex truncate, adherence weak or medium strong. Skin adherent to pulp, thick, tough, transparency poor. Pulp firm, crisp, mild, musky in flavour, veins visible. Juice clear, sub-acidic.

*Seeds* medium in number (1-4; av. 1-2), medium long, medium broad, medium large, oblong, hard, tasteless, adherent to pulp and located

centrally; chalaza circular, raised and located centrally; beak medium long, incurved, rough.

Ripening is fairly uniform, mid-season, 3rd week of June to first week of July in Delhi. Quality medium, T.S.S. 17-18%, acidity 0.6-0.7%, juice 60%. A light cropper. Susceptible to rotting if kept long on the vine.

#### 124. TAS

*Vines* vigorous. *Bark* slightly adherent and detaches in long, somewhat broad, thick, smooth and slightly fissured straps. *Canes* purple, long, thick; internodes medium long. *Buds* broad at apex, covered with brown pubescence. *Growing shoots* green with dark purple tinge, glabrous or almost so. *Tendrils* intermittent, bi- and tri-fid, thick, long, glabrous (Fig. 51).

*Unfolding leaves* variously pigmented, glabrous or nearly so above and below. *Full-grown leaves* orbicular, 5-lobed, large, medium thick, smooth, glabrous above and below. Superior lateral sinus shallow, wide, V-shaped; inferior lateral sinus shallow, V-shaped; petiolar sinus narrow, acute, V-shaped. Teeth in 3-series, medium in number, very broad; primary teeth broad; secondary teeth very broad. Petiole greenish purple, medium long, slightly pubescent.

*Flowers* hermaphrodite, stamens upright, anthers at the level of stigma. *Inflorescence* appears on 5th to 6th nodes.

*Bunches* large, long conical often shouldered, compact. Peduncle light green, long, medium thick, glabrous, devoid of warts. Rachis long, medium thick, light green; primary branches many, long; secondary branches few. Pedicels arising mostly from primary branches, long, medium thick, warty. Torus small, rough. Brush light green, long, thin.

*Berries* greenish white, cylindrical, large, size less variable; bloom thin, easily removable; apex pointed or truncate, adherence medium strong. Skin adherent to pulp, thin, medium tough, transparency poor. Pulp tough, firm, flavour mild or wanting, slightly insipid, veins visible. Juice clear, insipid in taste.

*Seeds* very many (1-4; av. 3), long, medium broad, medium large, oblong, hard, astringent, non-adherent; chalaza circular, raised and located below centre; beak long, incurved, rough.

Ripening is uniform, late, 1st week of July in Delhi. Quality poor. T.S.S. 12-15%, acidity 0.9%, juice 70%. A medium cropper. Not susceptible to rotting.

It is highly susceptible to anthracnose.

#### 125. TAIFI ROSOVI

*Vines* medium in vigour. *Bark* adherent and detaches in short, narrow straps. *Canes* medium long, thick; internodes short. *Buds* broad at apex, covered

with brown pubescence. *Growing shoots* brownish above, green below, glabrous. *Tendrils* pinkish at base, intermittent, mostly bi- and tri-fid, long, glabrous.

*Unfolding leaves* variously pigmented, cob-webby above and below, glabrous above and below. *Full-grown leaves* orbicular, 5-lobed, large, medium thick, smooth, large, glabrous above and below; lower surface yellowish green with pigmented veins. Superior lateral sinus deep, narrow to closed; inferior lateral sinus medium, narrow; petiolar sinus narrow, U-shaped. Teeth medium in number, apical tooth medium broad, blunt. Petiole purplish, long.

*Flowers* hermaphrodite, stamens upright, anthers at the same level as stigma. *Inflorescence* appears on 3rd to 5th nodes.

*Bunches* large, conical, shouldered, loose. Peduncle long, thick. Rachis long, medium thick; primary branches long; secondary branches many, long. Pedicels arising mostly from secondary branches, long. Torus medium thick, rough. Brush creamy white, long.

*Berries* yellowish green with prominent pink blush, cylindrical, large, size slightly variable; bloom thin, easily removable; adherence medium, apex pointed. Skin medium thick, adherent to pulp. Pulp firm; juice greenish yellow, very good flavour.

*Seeds* cuneate, light brown, many (1-5; av. 2-3), medium long, medium broad, medium thick, medium heavy; chalaza oval, sunken, located in the middle; beak long.

An introduction from U.S.S.R. Ripening is uniform, mid-season in Delhi, 3rd week of June and March-April at Hesaraghatta. Quality good. T.S.S. 18-20%, acidity 0.7%-0.8%, juice 60-70%; light cropper.

It is moderately susceptible to anthracnose, but moderately resistant to powdery mildew.

## 126. THOMPSON SEEDLESS

*Vines* medium in vigour. *Bark* adherent, detaches in short, thick, narrow, fissured and brittle straps. *Canes* light brown with dark brown streaks, medium thick, glabrous; internodes medium long. *Buds* pointed at apex, covered with brown pubescence and pink tinted. *Growing shoots* green with purple shades, glabrous. *Tendrils* light green with slightly purplish at base, intermittent, bi- and tri-fid, glabrous, smooth, medium thick. (Fig. 52)

*Unfolding leaves* yellowish green, glabrous or almost so on both the surfaces. *Full-grown leaves* orbicular, 5-lobed, medium sized, thin, smooth, glabrous above or below. Superior lateral sinus shallow, medium deep, narrow, V-shaped; inferior lateral sinus narrow, shallow, V-shaped; petiolar sinus narrow, medium deep, U- or O-shaped. Teeth in 3-series, medium in number, short, medium broad, terminal tooth long, narrow, pointed;

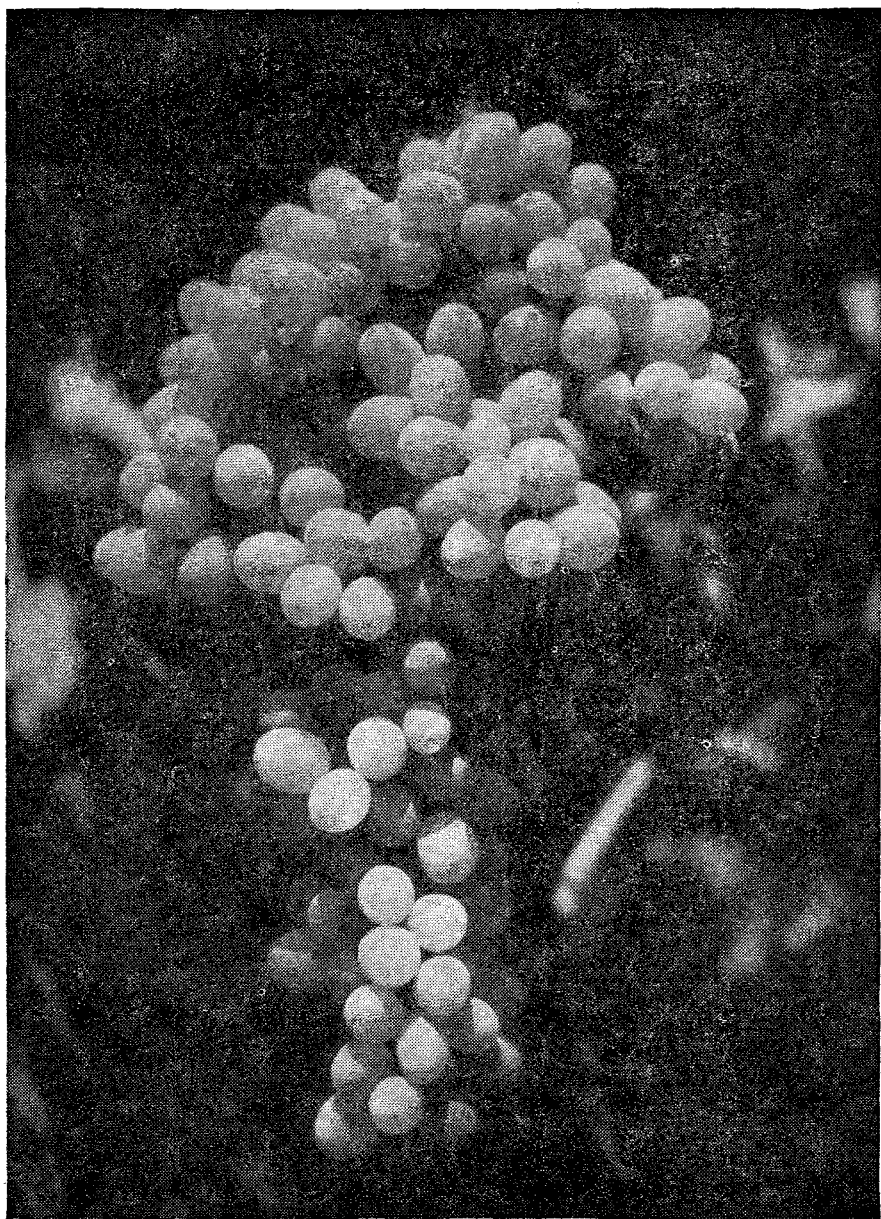


Fig. 52 Thompson Seedless

primary teeth broad, pointed; secondary teeth short, broad, blunt. Petiole medium long, green purplish near base, glabrous.

*Flowers* hermaphrodite, stamens upright, anthers at level with the stigma. *Inflorescence* appears between 5th to 7th nodes, rarely on 3rd and 4th nodes.

*Bunches* medium large, long, long conical to cylindrical, shouldered, well filled to compact. Peduncle short, medium thick, glabrous, green, tough, free from warts. Rachis light green, long, thin; primary branches many, short; secondary branches few. Pedicels arise from primary branches and secondary branches, medium long, thin, warty. Torus small, rough. Brush light green, long, thin.

*Berries* yellowish green to golden yellow when fully ripe, small, ellipsoidal elongated, less variable; bloom present, thin, removed easily; apex truncate, adherence medium. Skin adherent, poor transparency, medium thickness, adherence medium. Skin adherent, poor transparency, medium thickness, tough, taste and flavour neutral. Pulp firm, transparency medium, veins prominent, taste sweet with fair acidity, indistinct flavour. Juice straw coloured, clear, sweet, flavour indistinct.

Seedless, rudimentary seeds found rarely.

It is a *vinifera* grape, which originated in Asia Minor and was first grown in California by William Thompson near Yuba city. It is also called Oval Kishmish in the eastern mediterranean regions, and Sultana in Australia and South Africa (Winkler, 1965). It is believed to be grown in every viticultural country of the world.

It is a multipurpose grape. More than half of the world's raisins and about 95% of Californian raisins are made from this variety. Besides being a major raisin variety of the world, it is a leading table grape. Large quantities of white dessert wines are also made from this variety. However, it cannot be used for producing high quality table wine. It is much better when converted into Sherry. Its neutral flavour also recommends this variety as a base of flavoured wines (Amerine and Winkler, 1963).

In India also, it is one of the important grape varieties under cultivation. It has a wide adaptability and has performed equally well in all the grape growing regions of the country. It has not, however, attained as much importance as some other grape varieties like Anab-e-Shahi, due to its comparatively low yield. In recent years, the popularity of this variety has been growing in all regions of the country on account of quality consciousness among the consumers.

Ripening is uniform and mid-season, middle June in the North, February-April in Maharashtra, Andhra Pradesh, Tamil Nadu and Mysore.

Quality very good. T.S.S. 20-22%, acidity 0.5-0.6%, juice 70-80%. Its chief disadvantage is its neutral flavour. Attachment of pedicels somewhat weak and berries shatter in transit. Medium cropper, but keeping quality very good. It requires cane pruning for good crop. Treatment

with growth regulators (GA; 4-CPA) increases berry and bunch size. With good care, it gives from 20,000 to 25,000 kg/ha.

It is susceptible to rust and downy mildew and highly susceptible to anthracnose.

### 127. TRENTHAM BLACK

*Vines* medium in vigour. *Bark* loose and detaches in long, thin, smooth and slightly fissured straps; bark of canes also detaches into papery thin straps. *Canes* long, thick; internodes medium long. *Buds* broad at apex, covered with brown pubescence and pink tinted. *Growing shoots* strongly pubescent. *Tendrils* greyish green, purple colour at base obscured by white pubescence, irregular, bi-fid, medium thick, short, heavily pubescent.

*Unfolding leaves* greyish green above and silvery white below; some pinkish tinge along the margin of the leaves above or (and) below or pink patches on the lamina surface; wooly above and below. *Full-grown leaves* cuneiform, 5-lobed, sometimes entire or 3-lobed, medium large, thin, rough; downy above and felted below. Superior lateral sinus shallow, V-shaped, petiolar sinus medium wide, acute, V-shaped. Teeth in 2-series, medium in number, broad; primary teeth narrow; secondary teeth very broad. Petiole short.

*Flowers* hermaphrodite, stamens upright, anthers higher than stigma. *Inflorescence* appears on 2nd to 5th nodes.

*Bunches* small, short, regular, globular to short conical, neither shouldered nor winged, loose. Peduncle light green, short, thin, pubescent, devoid of warts. Rachis light green, short, thin; primary branches few, short; secondary branches absent. Pedicels arising mostly from rachis and primary branches, short, thin, warty. Torus small, rough. Brush purple pigmented when berries ripe, long, thin.

*Berries* spherical, small, size less variable; bloom thin, easily removable; apex truncate, adherence strong. Skin very thick, slip skin type, tough, transparency poor. Pulp melting, leathery, juicy, foxy flavour, veins prominent. Juice turbid, insipid.

*Seeds* medium in number (1-3; av. 1-2), short, medium broad, round, soft, tasteless, non-adherent and located centrally; chalaza oval, sunken, located below centre and extending up to raphe; beak short, straight, rough.

Ripening not uniform and only few berries turn colour, others remain unripe and green even till October in Delhi. Quality poor. Light cropper. Not susceptible to rotting.

It is resistant to anthracnose and *Cercospora* leaf-spot.

### 128. VERDEA

*Vines* medium in vigour. *Bark* adherent and detaches in short, brittle straps.

*Canes* short, thin; internodes short. *Buds* broad at apex, covered with brown pubescence and pink tinted. *Growing shoots* glabrous or almost so. *Tendrils* green, slightly purple at base, intermittent bi-fid, slender, short, glabrous or nearly so.

*Unfolding leaves* greyish green above and silvery white below, with colouration other than pink and purplish or brownish at the margin, little older leaves have more brownish colour spread throughout the lamina; wooly above and below. *Full-grown leaves* pentagonal, 5-lobed, small, thin, rough, glabrous above and wooly below. Superior lateral sinus medium deep to deep, narrow, V-shaped; inferior lateral sinus medium deep, V-shaped; petiolar sinus narrow, round, U-shaped. Teeth in 3-series, fair in number, narrow; primary teeth very narrow; secondary teeth broad. Petiole medium long.

*Flowers* hermaphrodite, stamens upright, anthers higher than stigma. *Inflorescence* appears on 4th to 6th nodes.

*Bunches* small, short, short conical, neither shouldered nor winged, well filled or compact. Peduncle slightly brownish pigmented, long, thin, glabrous, devoid of warts. Rachis light green, short, thin; primary branches few, medium long; secondary branches absent. Pedicels arising mostly from primary branches, short, thin, glabrous, devoid of warts. Torus small, smooth. Brush creamy green, short, thin.

*Berries* light green, ellipsoidal, small, size moderately variable; bloom thin, easily removable, apex truncate, adherence weak. Skin adherent to pulp, thin, tender, transparency good. Pulp tender, slightly aromatic, sub-acid, veins slightly visible. Juice clear, light green.

*Seeds* medium in number (1-3; av. 1-2), long, narrow, large, oblong hard, astringent, non-adherent; chalaza oval, raised and located below centre; beak medium long, straight, rough.

Ripening uniform, mid-season, 3rd to 4th week of June. Quality medium. T.S.S. 17%, acidity 0.6-0.7%, juice 50-55%. Production low. Not susceptible to cracking.

It is resistant to anthracnose and *Cercospora* leaf-spot.

## 129. ZINFANDEL

*Vines* medium in vigour. *Bark* adherent and detaches in very short, thin fissured straps from the stem. *Canes* dark brown, medium long, thin; internodes short. *Buds* broad at apex, covered with brown pubescence. *Growing shoots* green, purple pigmented, glabrous or almost so. *Tendrils* green, faint purple ribs at the base, intermittent, tri- and bi-fid, slender, short, glabrous or nearly so.

*Unfolding leaves* greyish green above and silvery white below, with colouration other than pink, and purplish or brownish at the margin; little

older leaves have more brownish colour spread throughout the lamina; wooly above and below. *Full-grown leaves* cuneiform, 5-lobed, medium large, thick, rough, leathery; glabrous above and wooly below. Superior lateral sinus medium deep, narrow to perforate. V-shaped; petiolar sinus medium wide, round, U-shaped. Teeth in 3-series, fair in number, narrow; primary teeth narrow; secondary teeth broad. Petiole short.

*Flowers* hermaphrodite, stamens upright, anthers higher than stigma. *Inflorescence* appears on 2nd and 5th nodes.

*Bunches* attractive, small, medium large, medium long, conical, neither shouldered nor winged, compact. Peduncle short, devoid of warts. Rachis short, thin; primary branches many, short; secondary branches absent. Pedicels arising from rachis and primary branches, medium long, thin, glabrous, warty. Torus small, rough. Brush pink, medium long, thin.

*Berries* reddish black to black, spherical, small, size moderately variable; bloom thick, not easily removable; apex truncate, adherence medium strong. Skin adherent to pulp, medium thick, tough, transparency poor. Pulp tender, melting, musky in flavour, veins prominent. Juice clear, very sweet.

*Seeds* medium in number (1-4; av. 1-2), short, narrow, medium large, round, soft, testeless, non-adherent; chalaza circular, raised, and located below centre; beak short, straight, rough.

It is a *vinifera* grape (Vaile, 1939) and is a leading grape variety of California (Winkler, 1965) and is not grown extensively in any other country. Its wine, which has a characteristic varietal flavour is of medium acidity and colour. It has been tried in Delhi where it does not attain good quality. Ripening is uniform, mid-season to late, 4th week of June to 1st week of July in the North and middle of March in Poona. Quality poor to medium. T.S.S. 14-16%, acidity 0.7-0.9%, juice 50-60%. Bunches spoiled by rains. Cropping medium. It has a tendency to raisin and sunburn. It responds well to head pruning.

It is resistant to anthracnose and *Cercospora* leaf-spot.

### 130. ZTALIA

*Vines* medium in vigour. *Bark* adherent and detaches in short, rough and brittle straps. *Canes* short, thin; internodes medium long. *Buds* broad at apex, covered with brown pubescence. *Growing shoots* glabrous or almost so. *Tendrils* light green, intermittent, bi- and tri-fid, slender, short, glabrous or nearly so.

*Unfolding leaves* greyish green above and silvery white below, devoid of any pigmentation, wooly above and below. *Full-grown leaves* orbicular, 5-lobed, medium large, thick, rough, leathery, glabrous above and downy below. Superior lateral sinus medium deep to deep, narrow to perforate, V-shaped; inferior lateral sinus medium deep, V-shaped; petiolar sinus

narrow, round and V-shaped. Teeth in 3-series, medium in number, narrow; primary teeth very narrow; secondary teeth broad. Petiole medium long.

*Flowers* hermaphrodite, stamens upright, anthers higher than stigma. *Inflorescence* appears on 3rd to 5th node.

*Bunches* medium large, medium long, short conical, shouldered, well filled or compact. Peduncle light green, thin, glabrous, smooth, devoid of warts. Rachis light green, short, thin; primary branches few, long; secondary branches few. Pedicels arising from rachis and primary branches, medium long, thick, warts few when present. Torus large, smooth. Brush creamy white, long and thin.

*Berries* yellowish green, spherical to ellipsoidal, small, size moderately variable; bloom thick, easily removable; adherence strong. Skin adherent to pulp, medium thick, tough, transparency poor. Pulp soft, watery, musky in flavour, very sweet, veins prominent. Juice clear, greenish.

*Seeds* very many (1.5; av. 3), long, medium broad, medium large, cuneate, hard, tasteless, non-adherent; chalaza circular, raised, located below centre and extending up to raphe; beak medium long, incurved and rough.

Ripening is uniform, mid-season i.e., 4th week of June in Delhi. Quality poor, T.S.S. 14%, acidity 0.5%, juice 50%. Not susceptible to cracking.

## CHAPTER 4

# CLASSIFICATION OF GRAPE VARIETIES

Whereas the classification and identification of different *Vitis* species do not present many difficulties, the classification of groups of varieties belonging to one or more species of *Vitis* and their hybrids is a difficult problem. Description and classification of varieties has been attempted by many ampelographers, but it has not been possible to work out perfect keys for classification. The reason is that the characters of different varieties are not sufficiently constant to prevent doubts and errors from occurring. Take for instance the shape of a berry, even within a bunch berries with different shapes do occur. The same happens in other characters also. This explains why an exact classification is extremely difficult, if not impossible. In the following pages, attempts have been made to formulate classification keys for the grape varieties described in the previous chapter. Efforts have been made to choose the characters carefully so that the keys can be made use of in sorting out various varieties easily.

### A. FORMULATION OF KEYS

The formation and principles of the construction of identification keys for the vine varieties is an important problem. At present, a large number of varieties are under cultivation in the country, and hundreds of varieties have been introduced from foreign countries in the recent years. However, there is no work in the country available intended for the identification of varieties under field conditions. No standard key is available in literature even on the basis of work done in foreign countries. Efforts have, therefore, been made in this chapter to classify grape varieties to a fair degree of accuracy. For this purpose, two keys, one using only fruit characters and the other using all the characters of the vine have been prepared and presented in this chapter.

Dichotomous and Polychotomous keys are in vogue for grape classification. According to Kiskin (1961), the identification guides in Russia use dichotomous principle and have been found to have substantial drawbacks. Firstly, the identification in such cases is carried out by stages using a complex or series of contradictory characters. Secondly, each identification makes use of the same initial stages and lot of time is wasted. In the absence of any one character, the variety cannot be established. The smallest error leads to an incorrect identification of the variety, and apart from that, the determinations are very cumbersome. Kiskin, is therefore, in favour of

polychotomous principle, which he considers is free of these faults. The polychotomous system of classification is distinguished by the fact that the determination is based on only as many parts as are necessary and only the most basic and constant characters are taken into account. Also, the variety can be identified even when some of the characters are missing and an error with one character does not affect the further progress of identification and variability in characters is taken into account.

The authors have also used numeral polychotomy for the classification and identification of grape varieties. By denoting the characters with figures it is possible to compare characters for similarities and differences between varieties to find synonymous varieties, to discover the principal identification characters of a variety and to establish the minimum number of characters required to identify a variety. The method of numerical polychotomy also enables one to reduce the amount of identification data and to introduce mathematical method of classification. The two keys prepared are discussed in the following pages.

### 1. Key on the Basis of Fruit Characters

The part of vine which supplies a sufficient number of distinguishing characters is the mature fruit and this is the basis of most of the systems of classification in fruit crops. Chadha (1965) made an attempt for such a key with six major characters, four of berry and two of bunch. The six diagnostic characters used were adherence of skin, uniformity of ripening, time of ripening colour, form and size of berry. There were two categories each based on adherence of skin and form of berries and three each based on uniformity and time of ripening, colour and size of berries. Thus, he divided grape varieties into two cohorts, six classes, 18 sub-classes, 54 groups, 108 sub-groups and 324 categories.

Since the time of ripening and uniformity of ripening vary from place to place, it is not possible to use these characters for classification required for use in various agro-climatic conditions. In the present classification also, six characters have been used, five of the berry, viz., adherence of skin, seediness, colour, form and size, while one of the bunch, namely, presence or absence of shoulders and wings. Since the material studied includes varieties belonging to species *V. vinifera*, *V. labrusca* and various interspecific hybrids, mainly of labruscana type, it is important to use some primary characters, which would separate varieties in the first instance into two broad categories. For this purpose, the nature of the skin, whether adherent or slip skin has been used in the first instance.

The identification in this case consists of two stages. First, the scheme outlined above makes it possible to indicate the place of a variety in the primary classification by means of a number of six digits. For example, variety Perlette would be indicated by the digits 111211, Beauty Seedless as

KEY FOR GRAPE VARIETIES BASED ON CHARACTERS  
OF THE BERRY AND BUNCH

Character	1	2	3	No. of groups
1. Adherence of skin	Adherent	Slip skin	—	2 Cohorts
2. Seediness of berry	Seedless	Seeded	—	4 classes
3. Colour of berry	White (green)	Reddish	Black	12 sub-classes
4. Nature of the bunch	Neither winged nor shouldered	Shouldered	Winged	36 groups
5. Form of berry	Round	Elongated	—	72 sub-groups
6. Size of berry	Small	Medium	Large	216 categories

113211, Tas 121223 and Bangalore Blue as 223121. This indicates that variety Perlette is to be looked for in the group of varieties with adherent skin, with seedless, round and small berries, white in colour and shouldered bunches. This would be sufficient to locate it without further description. The digits following Bangalore Blue indicate that it is a variety with slip skin, berries are seeded, bluish black, elongated, small in size and bunches are neither shouldered nor winged.

According to the method indicated above, various varieties would separate out into different categories and would find a number of associates in each group with similar characters. Reference to fuller descriptions would immediately separate these out from within this narrow group.

Difficulty in varietal classification is most often caused by variation in characters. It has been often reported that certain varieties attain different colour in different climates. For example, Bioletti (1938) reported that variety Emperor is nearly black in the north coast region, red in southern San Joaquin valley and almost without colour in the Coachella valley. In the same way, size, form, even relative time of ripening vary. With this polychotomic principle of identification, such an error can be overcome firstly, by avoiding the most variable character and secondly, by taking into account the possible effect of variation. Thus for example, the varieties in which the characters are not constant (the berries may be round to elongate), they are repeatedly placed in the appropriate categories and so guarantee the accuracy of identification. While indicating the group of such varieties, an alternate number can be given in the parenthesis, e.g. 2(3).

After a variety is placed in one or other groups, then the identification of the variety can be carried out with the help of other important characters of the leaf, bark, tendrils, etc.

In the present case, out of 216 possible categories, 130 varieties described in the preceding pages fall into the following 46 categories.

- I. 111211 : Kishmish Beli (71), Perlette (98).
- II. 111221 : Delight (42), Pusa Seedless (103), Thompson Seedless (126).
- III. 111222 : Himrod (54).
- IV. 112212 : Kishmish Charni (75).
- V. 113211 : Beauty Seedless (10).
- VI. 121111 : Bharat Early (11), Chasselas Blanco (33), Kailashpur (66), Madeleine Angevine (80), Madeleine Royale (81), Riesling (106), Rosea Venturium (108).
- VII. 121112 : Sufaidi (121), Foster's Seedling (47).
- VIII. 121121 : Motia (82), Selection 94 (115), Verdea (128).
- IX. 121122 : Anab-e-shahi (3).
- X. 121123 : Gold (48), Jaos Beli (64), Pandhari Sahebi (96).
- XI. 121211 : Bourvic (23), Buckland's Sweet Water (24), Early Muscat (44), Jaishi (61), Muscat Oliver (89), Palomino (95), Pearl of Csaba (97), Shadipur Local-I (117), Ztalia (130).
- XII. 121212 : Bangui Abyad (8), Bhokri (12), Bian Shirai (13), Dabouki (41), Hur (55).
- XIII. 121221 : Regina De Vigneti (104), Selection 7 (114).
- XIV. 121222 : Fakhri (45), Khalili (70), Lomint Tokay (79), Muscat of Alexandria (86).
- XV. 121223 : Angur Kalan (4), Kata Kurghan (69), Tas (124), Taifi Rosovi (125).
- XVI. 121311 : Golden Chasselas (49), Rubino (110), Saint Jeannet (111).
- XVII. 122111 : Cardinal (27), Muscat (84).
- XVIII. 122121 : Chasselas Violet (34).
- XIX. 122122 : Janjal Khara (63).
- XX. 122123 : Mukh Chilani (83), Sur Sahebi Red (122).
- XXI. 122211 : Flame Muscat (46), Iona (58).
- XXII. 122221 : Baily Alicante (5).
- XXIII. 122222 : Dakh (40), Kabaravi (65), Kandhari (68).
- XXIV. 122223 : Alamwick (1), Chauhan Special (35).
- XXV. 123111 : Convent Large White (38), Muscat De Adda (85), Pirovano (100), Shadipur Local II (118), Zinfandel (129).
- XXVI. 123112 : Charas (32).
- XXVII. 123121 : Black Muscat (19), Black Prince (20), Gulabi (53), President (102), Spin Sahebi White (119).
- XXVIII. 123211 : Portuguese Blue (101).
- XXIX. 123222 : Crignane (27), Castiza (28), Italian Elequina (60).

XXX.	123223 :	Kali Sahebi (67).
XXXI.	123311 :	Black Champa (14), Black Champion (15), Black Round (22), Dutch Sweet (43), Hussaini (56), (56), Muscat Baily (87), Muscat Hamburg (88), Muzzafar Nagar No.I (91), Rose of Pen (107), Rosem-T-Lahore (109).
XXXII.	123312 :	Bangalore Purple (7), Barbarossa (9), Black Hamburg (18), Black Queen (21), Convent Large Black (37), Gros Colman (52).
XXXIII.	123313 :	Hussaini Black Kabuli (57).
XXXIV.	123321	Black Cornichon Early (16), Kishmish Red (73), Lahore 33 (74), Lahore 36 (75), Muscat White (90), Pakhodi (94), Ribier (105), Scarlet (113), : Sur Savai (123).
XXXV.	123322 :	Country Bangalore (39).
XXXVI.	123323 :	Chandigarh (31).
XXXVII.	221111 :	Albany Surprise (2).
XXXVIII.	221112 :	Golden Queen (51), Ontario (92).
XXXIX.	221122 :	Golden Muscat (50).
XL.	221311 :	Lake Emerald (76).
XLI.	221322 :	Seneca (116).
XLII.	223111 :	Champanel (30), Lomanto (78), Oval White (93), Pierce (99), Trentham Black (127).
XLIII.	223112 :	Sapiravi (112).
XLIV.	223121 :	Bangalore Blue (6), Black Cornichon Late (17), Catawba (29), Concord (36), James (62), Large White (77).
XLV.	223122 :	Isabella (59).
XLVI.	223212 :	Buffalo (25), Steuben (120).

In the above classification, the adherence of the skin was taken as the first primary character for classifying 130 varieties. The varieties were, therefore, separated into two distinct groups each starting with 1 and 2 at the first place of the six digit number allotted to varieties. Thirty-six categories comprising 109 varieties and ten categories comprising 21 varieties have thus been separated. The first XXXVI categories represent varieties belonging mostly to *V. vinifera*, whereas, categories XXXVII to XLVI represent varieties belonging to *V. labrusca* or its hybrids also including some complex interspecific hybrids, namely, Champanel and Lomanto (Category XLII). As such this character proved useful in separating varieties at specific level and not between varieties belonging to the same species. The two major cohorts of varieties are discussed below:

COHORT I. As discussed above, this cohort consists of supposedly *V. vinifera*

varieties numbering 121. Of these, varieties Himrod (Cat.III), Kishmish Charni (Cat.IV), Beauty Seedless (Cat.V), Anab-e-shahi (Cat.IX), Chas-selas Violet (Cat.XVIII), Janjal Khara (Cat.XIX), Baily Alicante (Cat. XXII), Charas (Cat.XXVI), Portuguese Blue (Cat.XXVIII), Kali Sahebi (Cat.XXX), Hussaini Black Kabuli (Cat.XXXIII), Country Bangalore (Cat.XXXV) and Chandigarh (Cat.XXXVI) were singled out to individual groups on the basis of the above key. A number of varieties separated into groups of two. Amongst these, Kishmish Beli (71) and Perlette (98) fell in category I and could be separated by berry colour and compactness of bunch. Similarly, Sufaidi (121) and Foster's Seedling (47) fell in Cat. VII and could be separated by the pubescence of mature leaves. Regina De Vigneti (104) and Selection-7 (114) which fell in Cat. XIII could be separated by the nature of unfolding leaves. Cardinal (25) and Muscat (84) falling in category XVII were distinct in their unfolding leaves and berry colour. Mukh Chilani (83) and Sur Sahebi Red (122) falling in Cat. XX are different in the nature of their unfolding leaves. Flame Muscat (46) and Iona (58) falling in category XXI can be separated on the basis of berry colour and nature of pubescence of full grown leaves. Alamwick (1) and Chauhan Special (35) falling in Cat. XXIV were almost identical in all their characters.

Besides these categories of two varieties, other categories comprised more than two varieties identical in respects detailed in the key and distinct in certain other morphological or fruit characters. These categories are discussed below separately.

**CATEGORY II.** This category comprises three varieties. Of these, varieties Pusa Seedless (103) and Thompson Seedless (126) seem to be identical in respect of all characters and synonymous. These two varieties could be separated from variety Delight (42) on the basis of berry colour, which is green in Delight, while, tends to be golden yellow in the former two varieties.

**CATEGORY VI.** This category comprises seven varieties. Of these, Bharat Early (11) and Kailashpur (66) seem to be synonymous. These can, however, be distinguished from other varieties on the basis of unfolding leaves and pubescence on mature leaves.

**CATEGORY VII.** Only two varieties, namely, Sufaidi (121) and Foster's Seedling (47) fall in this group. While the mature leaves are pubescent above and below in the former, these are glabrous in the latter.

**CATEGORY VIII.** Motia (82), Selection 94 (115) and Verdea (128) fall in this category. These can be separated on the basis of pubescence and the number of lobes of the mature leaves.

**CATEGORY X.** In this category fall three varieties, namely, Gold (48), Jaos Beli (64) and Pandhari Sahebi (96). Of these, Jaos Beli can be separated from the other two varieties on the basis of pubescence of mature leaves. Pandhari Sahebi and Gold can be separated on the basis of nature of

stamens. Pandhari Sahebi has reflexed stamens, while, these are upright in the case of Gold. Moreover, the berry colour is pale green in Pandhari Sahebi, whereas it is green in Gold.

CATEGORY XI. This consists of a group of nine varieties, which can be separated on the basis of pubescence of mature leaves. In this way, Pearl of Csaba (97), Muscat Oliver (89), Early Muscat (44) and Buckland Sweet Water (24) fall in one group with leaves glabrous above and below. These varieties are also similar in the nature of their unfolding leaves and are shouldered or winged. Of these Pearl of Csaba has 3-5 lobed leaves, while all other are 5-lobed. Of the other, bunches are small in Muscat Oliver and medium large in Early Muscat and Buckland Sweet Water.

Bourvic (23), Palomino (95), Shadipur Local I (117) and Ztalia (130) have mature leaves glabrous above and pubescent below. Palomino, Shadipur Local I and Ztalia have similar unfolding leaves. Shadipur Local I has 3-5 lobed leaves, while, the other two have 5 lobed leaves and are further separated on the basis of pubescence of growing shoots. Bourvic has distinct unfolding leaves than others and has also 5-7 lobed leaves. Jaishi (61) has mature leaves which are pubescent above and below.

CATEGORY XII. It comprises five varieties, namely, Banqui Abyad (8), Bhokri (12), Bian Shirai (13), Dabouki (41) and Hur (55), all having mature leaves glabrous above and below. Of these, Dabouki can be separated from the other four varieties on the basis of unfolding leaves and nature of the tendrils. Hur has 3-5 lobed leaves and practically pistillate flowers. The remaining three varieties have 5-lobed leaves with shouldered bunches and can be separated on the basis of size of bunch, shape of berries and seed size.

CATEGORY XIV. There are four varieties in this category, namely, Fakhri (45), Khalili (70), Lomint Tokay (79) and Muscat of Alexandria (86). Of these, full grown leaves of Muscat of Alexandria are pubescent above and below, while, in the other three varieties, these are glabrous above and below. The other three varieties have 5-lobed leaves and ellipsoidal berries. While bunch size in case of Khalili and Lomint Tokay is small, it is big in case of Fakhri. However, bunches are neither shouldered nor winged in the case of Khalili, while these are shouldered in the case of Lomint Tokay.

CATEGORY XV. This category comprises four varieties, namely, Angur Kalan (4), Kata Kurghan (69), Tas (124) and Taifi Rosovi (125). The major characteristics of this category are shouldered bunches and large ellipsoidal berries. The varieties can, however, be separated on the basis of pubescence of mature leaves. Of these varieties, Angur Kalan has mature leaves pubescent above and below. Berries are golden yellow with pinkish blush. Other three varieties have leaves glabrous above and below. Of these, variety Taifi Rosovi has also distinct pink blush on the berries. Remaining two varieties can be separated on the basis of unfolding leaves.

CATEGORY XVI. Three varieties, namely, Golden Chasselas (49), Rubino

(110) and Saint Jeannet (111) fall in this category. Of these, Golden Chasselas and Saint Jeannet have full grown leaves glabrous above and below, while, these are pubescent above and below in case of Saint Jeannet. The former two varieties can be further separated on the basis of unfolding leaves.

CATEGORY XXIII AND XXIV. Five varieties, namely, Alamwick (1), Chauhan Special (35), Dakh (40), Kandhari (68) and Kabaravi (65) fall in these two categories. Of these, the first four varieties are quite identical in all morphological characters and can be separated only on the basis of berry size, which is medium large in Dakh and Kandhari, while, large in Alamwick and Chauhan Special. Kabaravi is distinct from these varieties in the nature of unfolding leaves.

CATEGORY XXV. There are five varieties in this group, namely, Convent Large White (38), Muscat De Adda (85), Pirovano (100), Shadipur Local II (118) and Zinfandel (129). At the first stage, these varieties can be separated on the basis of pubescence of mature leaves. Only Pirovano (100) has mature leaves glabrous above and below and is 5-7 lobed. Of the remaining four, Shadipur Local II (118) has pubescence both on upper and lower surface of the mature leaves. Zinfandel (129), Convent Large Black (38) and Muscat De Adda (85) have mature leaves glabrous above and pubescent below. Muscat De Adda is distinct in the nature of unfolding leaves from the other two varieties. Zinfandel and Convent Large Black can be separated from each other on the basis of number of lobes, which are 3-5 in former and 5 in the latter.

CATEGORY XXVII. There are five varieties in this group, namely, Black Muscat (19), Black Prince (20), Gulabi (53), President (102) and Spin Sahebi White (119). Of these, variety Spin Sahebi White (119) has mature leaves pubescent above and below, while, these are glabrous above and pubescent below in the other four. Black Prince (20) and President (102) are identical in most morphological characters and can be separated only on the basis of number of lobes which tend to vary from 3 to 5 in Black Prince against 5 in President. Black Muscat (10) and Gulabi (53) are also identical in major vegetative and bunch and berry characters except for the intensity of pubescence on unfolding leaves.

CATEGORY XXIX. This category comprises only three varieties, namely, Carignane (27), Castiza (28) and Italian Elequena (60). All the three varieties differ in the nature of the pubescence on mature leaves. Castiza has leaves glabrous above and below; Carignane glabrous and pubescent below and Italian Elequena pubescent above and below.

CATEGORY XXXI. This category has the largest number of varieties. The major characteristic of this and subsequent categories is the nature of the bunch which are winged. All the varieties in this group do not ripen when grown in the northern regions of the country.

Of the ten varieties in this category, two varieties, namely, Muscat Baily (87) and Rosem-T-Lahore (109) have full grown leaves pubescent above and below but are distinct in respect of the number of lobes and bunch size. In the former, bunches are small and lobes 3-5 while in the latter, bunches are large and leaves are 5-lobed.

The remaining eight varieties are identical in respect of pubescence on mature leaves which are glabrous above and pubescent below. However, Muscat Hamburg (88) can be separated from the other seven varieties on the basis of nature of unfolding leaves (which is similar in the other seven).

Of the other seven, two varieties, namely, Black Champa (14) and Black Round (22) have 5-lobed leaves, while, the other five have 3-5 lobed leaves. These two varieties are very similar and can only be separated on the basis of some seed characters.

Of the remaining five varieties, Rose of Pen (107) has irregular tendrils while in other four, these are intermittent. Black Champion (15), Dutch Sweet (43) and Muzzafar Nagar No. 1 (91) have growing shoots glabrous or so and separate only on some seed characters. Hussaini has, however, growing shoots which are pubescent.

CATEGORY XXXII. This category comprises six varieties which are mostly similar to varieties in the earlier category except berry size, which is slightly bigger. Except Black Hamburg (18) and Black Queen (21) other varieties do not ripen under North Indian conditions.

All these varieties have mature leaves glabrous above and pubescent below. Of these, Bangalore Purple (7) separates out on the basis of tendril character, while, Gros Colman (52) on the basis of nature of unfolding leaves. The other four varieties differ in the number of lobes. Black Queen (21) has leaves entire or 3-5 lobed. Barbarossa (9) and Black Hamburg (18) have 3-5 lobed leaves but are distinct in respect of pubescence of growing shoot. Convent Large Black has 5-lobed leaves.

CATEGORY XXXIV. This is another large category comprising nine varieties. These differ from the earlier two categories on the basis of berry shape.

Sur Savai (123) has leaves glabrous above and below, while, in Lahore 36 (75) leaves are pubescent above and below. Mature leaves in remaining varieties are glabrous above and pubescent below. These varieties are also identical in the nature of unfolding leaves, number of lobes and nature of tendrils. These can, however, be separated only on the basis of bunch size and seed characters.

COHORT II. This cohort consists of interspecific hybrids especially between *vinifera*  $\times$  *labrusca* group. There are in all 21 varieties in this group. Albany Surprise (2), Golden Muscat (50), Isabella (59), Lake Emerald (76) Sapiravi (112) and Seneca (116) separate out into groups of single varieties.

- Golden Queen (51) and Ontario (92) fell in category XXXVII. These

varieties have irregular, greyish green and heavily pubescent tendrils and could be separated on the basis of unfolding leaves and number of lobes of mature leaves. Similarly, Buffalo (25) and Steuben (120) fell in category XLVI. These varieties have mature leaves glabrous above and pubescent below but could be separated on the basis of unfolding leaves and growing shoots.

Five varieties, namely, Champanel (30), Lomanto (78), Oval White (93), Pierce (99) and Trenthan Black (127) fall in category XLII. All these varieties are similar in respect of pubescence of mature leaves. Of these, Lomanto has intermittent tendrils, while, others have irregular tendrils. Champanel can be separated from the rest three on the basis of unfolding leaves. The other three varieties are identical in most of the characters and can be separated only on the basis of characters: shape of berries, series of teeth, etc.

Similarly, category XLIV consists of six varieties. These varieties have irregular tendrils [except Catawba (29)], similar unfolding leaves, elongated berries and teeth in 3-series. Of these, Bangalore Blue (6), James (62) and Black Cornichon Late (17) have variable number of lobes ranging from entire or 3 to 5. These varieties can be separated only on the basis of seed size and shape. Concord (36) and Large White (77) are 3-5 lobed with teeth in 3-series. These can, however, be separated on the basis of nature of bark.

## 2. Key on the Basis of Fruit and Vegetative Characters

Besides numerical polychotomous key, a running key using all characters of the vine is given on the basis of the present studies.

All systems of classifying vines commence by dividing the vines into large groups on the basis of some characters which differ from each group. Each of these groups is then sub-divided into smaller groups on the basis of some other varying characters and these smaller groups are further sub-divided on the basis of some other varying characters and so on. The individual of each final group are differentiated by means of as complete a description of each individual as is practically possible or necessary. The detailed key for identification of varieties is given in the following pages.

In this key using all characters of the vine, primary importance again has been given to certain fruit characters, rather than to leaf or other vegetative characters. The adherence of the skin, presence or absence of seed, the colour of the berries have been used as the three primary characters. All the sub-groups thus formed have been divided into further categories using some characters of the leaf and seed. In the final stage, efforts have been made to give as complete descriptions as practically possible. The primary, secondary and tertiary characters used in this key are:

a) *Primary characters*: 1. Nature of Skin (2 types). 2. Colour of berries (3 types) and 3. Seeded or seedless nature of the berry (2 types).

b) *Secondary characters*: 1. Pubescence of full-grown leaves (3 types). 2. Nature of unfolding leaves (11 types). 3. Lobing in leaves (5 types). 4. Nature of tendrils (3 types) and 5. Size of seeds (4 types).

c) *Tertiary characters*: 1. Nature of bark (3 types). 2. Nature of tendrils (3 types) and 3. Pubescence on growing shoots (4 types).

This key is also simple and is suitable for rapid and accurate identification of vine varieties. The key is detailed below.

## KEY FOR IDENTIFICATION OF GRAPE VARIETIES

A. Skin adherent to flesh.

B. Berries seedless or with aborted and rudimentary seeds.

Bark adherent. Tendrils intermittent, glabrous. Bunches medium large, shouldered, conical to cylindrical, well filled to compact.

C. Berries green.

D. Mature leaves glabrous above and below; 5-lobed.

E. Unfolding leaves yellowish green, devoid of any other pigmentation; glabrous or almost so on both the surfaces.

F. Buds broad at apex, covered with brown pubescence. Berries green.

G. Bunches well filled to compact. Berries green, ellipsoidal to ovoid.

.. **Delight (42)**

GG. Bunches compact to very compact. Berries yellowish green, spherical to slightly ellipsoidal.

.. **Perlette (98)**

FF. Buds pointed at apex, covered with brown pubescence and pink tinted. Berries yellowish green to golden yellow.

.. **Pusa Seedless (103)**

.. **Thompson Seedless (126)**

EE. Unfolding leaves yellowish green, devoid of any other pigmentation; cob-webby above and below.

.. **Kishmish Beli (71)**

DD. Mature leaves glabrous above and pubescent below; 3-5 lobed.

Unfolding leaves greyish green above and silvery white below, devoid of any pigmentation; wooly above and below. Berries amber when fully ripe.

.. **Himrod (54)**

## CC. Berries red.

Unfolding leaves yellowish green, devoid of any other pigmentation. Cob-webby above and below. Mature leaves 5-lobed.

.. **Kishmish Charni (72)**

## CCC. Berries black.

Unfolding leaves variously pigmented; glabrous or nearly so above and below. Mature leaves 3-5 lobed.

.. **Beauty Seedless (10)**

## BB. Berries Seeded.

## C. Berries Green.

## D. Mature leaves glabrous above and below.

## E. Unfolding leaves yellowish green, devoid of any other pigmentation; glabrous or almost so on both the surfaces.

Bunches medium large, neither shouldered nor winged. Berries yellowish green, spherical. Seeds many.

.. **Foster's Seedling (47)**

## EE. Unfolding leaves yellowish or light green obscured by white pubescence; downy above and below.

## F. Bark adherent. Tendrils irregular, slightly pubescent. Mature leaves 5-lobed. Bunches neither shouldered nor winged. Berries ellipsoidal. Seeds medium in number.

.. **Gold (48)**

## FF. Bark loose. Tendrils intermittent, glabrous or nearly so. Mature leaves 5-9 lobed. Bunches winged or branched. Berries spherical. Seeds many, very short, very narrow, small, oblong.

.. **Saint Jeannet (111)**

## EEE. Unfolding leaves greyish green above and silvery white below; wooly above and below. Some pinkish tinge along the border of the leaves above or (and) below or pink patches on the lamina surface.

Bunches small to medium large, short, globular, neither shouldered nor winged. Berries whitish green, yellow at maturity, spherical to obovoid. Seeds many.

.. **Madeleine Royale (81)**

## EEEE. Unfolding leaves variously pigmented; glabrous or nearly so above and below.

Bunches large, long conical, often shouldered,

Berries greenish white, cylindrical, large. Seeds very many, long, medium broad, medium large, oblong.

.. **Tas (124)**

EEEE. Unfolding leaves variously pigmented; cob-webby or downy above and below.

F. Mature leaves 3-5 lobed.

G. Bunches neither shouldered nor winged.

H. Mature leaves 3 or 5-lobed. Bunches small to medium large. Berries greenish, spherical to oblate. Seeds many, short, very narrow, small, oblong.

.. **Bharat Early (11)**

.. **Kailashpur (66)**

HH. Mature leaves 5-lobed. Bunches small. Berries greenish white, spherical to ellipsoidal. Seeds medium in number, short, narrow, small, round.

.. **Chasselas Blanco (33)**

GG. Bunches shouldered or (and) winged.

H. Bunches small. Flowers hermaphrodite. Ripening very early.

Berries light green or yellowish green, spherical, small. Seeds many, short, narrow, small, oblong.

.. **Pearl of Csaba (97)**

HH. Bunches medium large to large. Flowers practically pistillate and require cross pollination. Ripening mid-season.

i) Berries yellowish green or light green, spherical. Seeds many.

.. **Hur (55)**

ii) Berries whitish yellow or amber, oval. Seeds medium in number.

.. **Katta Kurghan (69)**

FF. Mature leaves 5-lobed.

G. Bunches neither shouldered nor winged.

Bunches very attractive, medium large to large. Berries greenish yellow when raw, amber when fully ripe, ovoid to cylindrical. Seeds many, long, medium broad and medium large.

.. **Anab-e-shahi (3)**

GG. Bunches shouldered or (and) winged.

H. Bunches small.

I. Berries ellipsoidal, medium large.  
Ripening late. Seeds many.

.. **Lomint Tokay (79)**

II. Berries spherical, small. Ripening early. Seeds medium in number.

.. **Muscat Oliver (89)**

HH. Bunches medium large.

I. Ripening early.

Seeds many, small.

J. Berries small, golden green when fully ripe. Seeds round.

.. **Early Muscat (44)**

JJ. Berries medium large, greenish yellow. Seeds oblong.

.. **Banqui Abyad (8)**

II. Ripening mid-season or late.

J. Berries spherical.

K. Seeds small.

L. Teeth few. Seeds tasteless.

.. **Golden Chasselas (49)**

LL. Teeth medium in number. Seeds astringent.

.. **Buckland's Sweet Water (24)**

KK. Seeds medium large.

.. **Bian Shirai (13)**

JJ. Berries obovoid.

Seeds small, oblong.

.. **Regina De Vigneti (104)**

HHH. Bunches large to very large.

I. Berries spherical.

Berries medium large. Seeds medium in number, medium large, round. Ripening mid-season.

.. **Bhokri (12)**

II. Berries ellipsoidal.

J. Berries yellowish green with prominent pink blush, large with very good rose flavour.

Ripening mid-season. Seeds medium to large.

.. **Taifi Rosovi (125)**

JJ. Berries yellowish green, medium large with no flavour. Ripening late. Seeds small.

.. **Fakhri (45)**

EEEEEE. Unfolding leaves greyish green above and silvery white below, with colouration other than pink, and purplish or brownish at the margin. Little older leaves have more brownish colour spread throughout the lamina; wooly above and below.

F. Tendrils intermittent, glabrous or nearly so. Bunches compact. Berries ellipsoidal or ovoid, small. Seeds medium in number; chalaza oval.

.. **Selection 94 (115)**

FF. Tendrils irregular, pubescent. Bunches loose to well filled. Berries spherical, medium large. Seeds many; chalaza circular.

.. **Dabouki (41)**

DD. Mature leaves glabrous above and pubescent below.

E. Unfolding leaves greyish green above and silvery white below, devoid of any pigmentation; wooly above and below.

F. Mature leaves 3-5 lobed.

Growing shoots fairly pubescent. Tendrils irregular, pubescent. Bunches large, Berries with slightly purplish tinge, spherical. Seeds medium in number, short, narrow.

.. **Shadipur Local I (117)**

FF. Mature leaves 5-lobed.

G. Growing shoot glabrous or almost so. Seeds medium in number, long, broad, medium large.

.. **Ztalia (130)**

GG. Growing shoots fairly pubescent. Seeds very many, short, narrow, small.

.. **Palomino (95)**

EE. Unfolding leaves greyish green above and silvery white below; wooly above and below. Some pinkish tinge along the border of the leaves or (and) below or pink patches on the lamina surface.

F. Mature leaves 3-5 lobed.

- G. Bark adherent. Bunches small. Berries greenish yellow, spherical. Seeds many.  
     .. **Riesling (106)**
- GG. Bark loose. Bunches large. Berries golden yellow, obovoid. Seeds medium in number.  
     .. **Jaos Beli (64)**
- FF. Mature leaves 5-lobed.
  - G. Tendrils intermittent.
    - H. Bark loose and detaches in papery thin straps. Bunches small to medium, neither shouldered nor winged. Ripening early. Chalaza circular.  
 .. **Madeleine Angevine (80)**
    - HH. Bark slightly adherent. Bunches medium large, shouldered. Ripening mid-season to late. Chalaza oval.  
 .. **Selection-7 (114)**
  - GG. Tendrils irregular.
    - Bark loose. Bunches medium large, neither shouldered nor winged. Ripening mid-season. Berries light green to golden yellow. Seeds many.  
 .. **Motia (82)**
- FFF. Mature leaves 5-7 lobed.
  - Bark adherent. Growing shoots glabrous. Bunches small, short, short conical to cylindrical, shouldered. Berries light green, spherical, small. Seeds medium in number, small.  
 .. **Bourvic (23)**
- EEE. Unfolding leaves greyish green above and silvery white below with colouration other than pink and purplish or brownish at the margin. Little older leaves have more brownish colour spread throughout the lamina; wooly above and below.
  - F. Mature leaves 3-5 lobed. Bark loose. Bunches large, long. Seeds many, round.  
 .. **Rosea Venturium (108)**
- FF. Mature leaves 5-lobed. Bark adherent. Bunches small, short. Seeds medium in number, oblong.  
     .. **Verdea (128)**
- DDD. Mature leaves pubescent above and below.
  - E. Unfolding leaves variously pigmented; cob-webby or downy above and below.

F. Mature leaves entire to 3-lobed.

Bark adherent. Flowers male sterile. Bunches large. Berries golden yellow with pinkish blush. Seeds few.

.. **Angur Kalan (4)**

FF. Mature leaves 5-lobed.

Bark loose. Flowers hermaphrodite. Bunches small. Berries yellowish green. Seeds medium in number.

.. **Rubino (110)**

EE. Unfolding leaves greyish green above and below, variously pigmented; wooly above and below.

F. Mature leaves 3-5 lobed.

Bark loose. Tendrils intermittent. Bunches medium large, long conical. Berries light green, spherical. Seeds pinkish in colour, medium in number.

.. **Jaishi (61)**

FF. Mature leaves 5-lobed.

G. Bark adherent. Tendrils intermittent, glabrous or so. Bunches medium large to large. Berries obovoid. Bunches ripen in the plains of North India. Seeds medium in number, oblong. Ripening mid-season.

.. **Muscat of Alexandria (86)**

GG. Bark loose. Tendrils irregular, pubescent. Bunches very large. Berries spherical. Seeds many, round. Bunches do not ripen in the plains of North India.

.. **Sufaidi (121)**

CC. Berries Red.

D. Mature leaves glabrous above and below.

E. Unfolding leaves yellowish green, devoid of any other pigmentation; cob-webby above and below. Bark adherent. Growing shoots pubescent. Tendrils intermittent, glabrous. Mature leaves 3-lobed. Bunches medium large, globular to conical, loose. Berries bright red, large. Seeds many, medium large.

.. **Mukh Chilani (83)**

EE. Unfolding leaves variously pigmented; glabrous or nearly so above and below.

Growing shoots glabrous. Tendrils intermittent,

glabrous or nearly so. Mature leaves 5-lobed. Bunches medium large, globular, loose. Berries brick red, medium large. Seeds many, medium large.

.. **Janjal Khara (63)**

EEE. Unfolding leaves variously pigmented, cob-webby or downy above and below.

Growing shoots glabrous or so. Tendrils intermittent. Mature leaves 5-lobed. Ripening of berries in a bunch not uniform in North Indian plains.

F. Bark adherent to slightly adherent.

G. Bunches small, long conical or short conical, neither shouldered nor winged, well filled. Berries spherical, often ellipsoidal, small. Seeds medium long, medium broad, medium large.

.. **Cardinal (26)**

GG. Bunches medium large, cylindrical, compact. Berries obovoid, small. Seeds many, long, medium broad, medium large.

.. **Chasselas Violet (34)**

GGG. Bunches large, conical to cylindrical, compact. Berries obovoid, large. Seeds many, short, medium broad, medium large.

.. **Sur Sahebi Red (122)**

FF. Bark loose to very loose.

Bunches medium large to large, short or long conical. Berries bright red to brick red, oblong. Seeds medium in number, very long, broad, very large, oblong.

.. **Alamwick (1)**

.. **Chauhan Special (35)**

.. **Dakh (40)**

.. **Kandhari (68)**

EEEE. Unfolding leaves greyish green above and silvery white below with colouration other than pink and purplish or brownish at the margins. Little older leaves have more brownish colour spread throughout the lamina; wooly above and below.

F. Growing shoots glabrous or so. Bunches neither shouldered nor winged.

Berries small. Seeds many, very short, very narrow.

.. **Muscat (84)**

FF. Growing shoots slightly pubescent or downy. Bunches shouldered.

G. Berries small. Seeds many, short, narrow.

.. **Flame Muscat (46)**

GG. Berries medium large. Seeds few, medium long, broad.

.. **Kabaravi (65)**

DD. Mature leaves glabrous above and pubescent below.

Unfolding leaves greyish green above and silvery white below. Border of the leaf beautifully pigmented, wooly above and below.

Growing shoots downy. Tendrils intermittent, cobwebby. Bunches small, conical to cylindrical, shouldered, loose. Berries light red, oblate, small. Seeds medium in number.

.. **Baily Alicante (5)**

DDD. Mature leaves pubescent above and below.

Unfolding leaves greyish green above and silvery white below, devoid of any pigmentation, wooly above and below.

Growing shoots strongly pubescent. Tendrils intermittent, pubescent. Bunches small, short, globular, sometimes shouldered. Berries bright red to brick red, spherical, small. Seeds many, medium long, medium broad, medium large.

.. **Iona (58)**

CCC. Berries blue or black.

D. Mature leaves glabrous above and below.

E. Mature leaves 5-lobed.

Bunches medium large or large, shouldered or winged. Berries elongated.

F. Bark loose. Growing shoots glabrous. Bunches large, shouldered. Berries falcoid. Seeds many, large.

.. **Kali Sahebi (67)**

FF. Bark slightly adherent. Growing shoots cobwebby or fairly pubescent. Bunches medium large. Berries obovoid or elongated. Seeds medium in number, small to large.

G. Bunches shouldered. Berries light purplish, medium to large. Seeds short, narrow.

.. **Castiza (28)**

GG. Bunches branched. Berries deep red to black, small. Seeds medium long, medium broad.

.. **Sur Savai (123)**

EE. Mature leaves 5-7 lobed.

Bunches small, neither shouldered nor winged. Berries spherical.

Growing shoots glabrous or so. Bark loose. Seeds many, small, short, narrow.

.. **Pirovano (100)**

DD. Mature leaves glabrous above and pubescent below.

E. Unfolding leaves greyish green above and silvery white below, devoid of any pigmentation; wooly above and below.

F. Mature leaves 3-5 lobed.

Growing shoots glabrous or so.

G. Bunches small, sometimes shouldered, very compact.

Bark adherent and does not detach. Berries bluish black, spherical, small. Seeds many, short, narrow, small, oblong.

... **Portuguese Blue (101)**

GG. Bunches medium large, neither shouldered nor winged.

Bark loose, Berries purplish black, ellipsoidal elongated. Seeds medium in number, long, medium broad, round.

.. **Black Prince (20)**

FF. Mature leaves 5-lobed.

Growing shoots pubescent. Bunches neither shouldered nor winged.

G. Bark adherent. Bunches large, loose to well filled. Berries bluish black, oblate, medium large.

.. **Charas (32)**

GG. Bark loose. Bunches medium large, very compact. Berries deep red to almost black, ellipsoidal elongated, small.

.. **President (102)**

EE. Unfolding leaves greyish green above and silvery

white below; wooly above and below. Some pinkish tinge along the border of the leaves above or (and) below or pink patches on the lamina surface.

F. Mature leaves 3-5 lobed.

G. Growing shoots glabrous or almost so. Tendrils intermittent, glabrous. Bunches conical or cylindrical, shouldered. Berries bluish black, obovoid, often ellipsoidal. Seeds medium in number, long, narrow.

.. **Carignane (27)**

GG. Growing shoots strongly pubescent. Tendrils intermittent, moderately pubescent. Bunches short conical. Berries dark purple changing to bluish black, spherical. Seeds many, very long, medium broad.

.. **Gros Colman (52)**

FF. Mature leaves 5-lobed.

G. Bunches small. Berries bluish black, spherical. Seeds short, very narrow.

.. **Muscat De Adda (85)**

GG. Bunches medium large. Berries dark reddish, purple to black, spherical. Seeds long, narrow.

.. **Muscat Hamburg (88)**

EEE. Unfolding leaves variously pigmented; downy above and below.

Mature leaves 3 or 5 lobed. Bunches medium large, neither shouldered nor winged. Berries deep purple, spherical, small. Seeds medium in number, long, medium broad.

.. **Gulabi (53)**

EEEE. Unfolding leaves greyish green above and silvery white below with colouration other than pink and purplish or brownish at the margins. Little older leaves have more brownish colour spread throughout the lamina; wooly above and below.

F. Mature leaves entire to 3-lobed.

Growing shoots strongly pubescent. Tendrils intermittent, pubescent. Bunches medium large, conical, sometimes shouldered. Berries bluish black, spherical. Seeds many, very long.

.. **Black Queen (21)**

FF. Mature leaves 3-5 lobed.

G. Tendrils intermittent.

H. Growing shoots glabrous or so.

I. Bunches medium large, neither shouldered nor winged.

Berries deep purple, spherical.

J. Seeds long, medium broad, medium large.

.. **Black Muscat (19)**

JJ. Seeds medium long, narrow, small.

.. **Convent Large White (38)**

II. Bunches medium large, branched.

J. Seeds medium in number.

K. Berries deep purple.

.. **Dutch Sweet (43)**

KK. Berries bluish black.

.. **Black Champion (15)**

JJ. Seeds many.

K. Bark loose. Teeth in 3-series, fair in number. Seeds medium long, narrow.

.. **Black Hamburg (18)**

KK. Bark slightly adherent. Teeth in 2-series, medium in number. Seeds very long, broad.

.. **Muzzafar Nagar No.1 (91)**

HH. Growing shoots pubescent.

I. Tendrils glabrous or so. Berries bluish black. Seeds medium in number, very long, large.

.. **Hussaini (56)**

II. Tendrils pubescent. Berries purplish black. Seeds many, medium long, medium large.

.. **Barbarossa (9)**

GG. Tendrils irregular.

Growing shoots glabrous or so. Bark loose. Bunches medium large to large. Berries bluish black, spherical. Seeds many, long, very long.

.. **Rose of Pen (107)**

FFF. Mature leaves 5-lobed.

G. Tendrils intermittent. Growing shoots glabrous or slightly pubescent.

Bunches medium large, short conical or long conical.

H. Bunches neither shouldered nor winged.

Bunches small to medium large, medium long. Berries reddish black to black, spherical, small. Seeds medium in number, short, narrow, medium large, round.

.. **Zinfandel (129)**

HH. Bunches winged or branched.

I. Berries small.

J. Seeds few. Seeds long, medium broad, medium long, oblong.

.. **Black Champa (14)**

JJ. Seeds medium in number.

K. Growing shoots glabrous. Berries bluish black. Seeds long, oblong.

.. **Pakhodi (94)**

KK. Growing shoots slightly pubescent. Berries deep red to black. Seeds medium long, round.

.. **Lahore 33 (74)**

JJJ. Seeds many.

K. Bunches short.

L. Berries spherical. Seeds narrow.

.. **Black Round (22)**

LL. Berries spherical to obovoid. Seeds medium broad.

.. **Kishmish Red (73)**

KK. Bunches medium large.

L. Berries ellipsoidal.

Seeds very long, medium broad, medium long.

.. **Ribier (105)**

- LL. Berries spherical to obovoid.
- M. Bark slightly adherent. Seeds very long, medium broad, large.
- .. **Muscat White (90)**
- MM. Bark loose. Seeds long, narrow, medium large.
- .. **Black Cornichon Early (16)**
- II. Berries medium large.
- J. Bark slightly adherent. Berries spherical. Seeds medium long, medium large.
- .. **Convent Large Black (37)**
- JJ. Bark loose. Berries spherical to obovoid. Seeds medium, very long, large.
- .. **Country Bangalore (39)**
- III. Berries large.
- J. Bark slightly adherent. Berries spherical to obovoid. Seeds many, very long.
- .. **Chandigarh (31)**
- JJ. Bark loose. Berries spherical. Seeds very many, long.
- .. **Hussaini Black Kabuli (57)**
- GG. Tendrils irregular, heavily pubescent. Growing shoots strongly pubescent. Bunches medium large, branched. Berries bluish black, spherical. Seeds medium in number, long.
- .. **Bangalore Purple (7)**
- DDD. Mature leaves pubescent above and pubescent below.
- E. Mature leaves 3-5 lobed.
  - Unfolding leaves greyish green above and silvery white below, devoid of any pigmentation, woolly above and below.
  - Bunches small, short conical to globular. Berries bluish black, spherical. Seeds few, medium large.
  - .. **Muscat Baily (87)**
- EE. Mature leaves 5-lobed.

F. Unfolding leaves greyish green above, silvery white below, devoid of any pigmentation, wooly above and below.

G. Bunches neither shouldered nor winged, cylindrical. Berries small. Seeds medium in number, very narrow.

.. **Spin Sahebi White (119)**

GG. Bunches shouldered or winged, cylindrical. Berries medium large. Seeds few, medium broad.

.. **Italian Elequena (60)**

FF. Unfolding leaves greyish green above and silvery white below with colouration other than pink and purplish or brownish at the margins. Little older leaves have more brownish colour spread throughout the lamina; wooly above and below.

GG. Growing shoots glabrous or so.

Bunches medium large, neither shouldered nor winged. Berries deep purple, spherical, small. Seeds many, medium large, long, narrow.

.. **Shadipur Local II (118)**

GG. Growing shoots pubescent.

H. Bark slightly adherent. Berries spherical to obovoid. Seeds medium in number, medium large, medium long, round. Bunches ripen in North India. Ripening fairly uniform.

.. **Lahore 36 (75)**

HH. Bark loose. Berries spherical. Seeds many, large, long, oblong. Bunches do not ripen in North India.

.. **Rosem T-Lahore (109)**

AA. Skin separates from the flesh.

B. Berries Green.

C. Mature leaves glabrous above and pubescent below. Bark adherent. Growing shoots wooly. Tendrils intermittent, heavily pubescent. Unfolding leaves greyish green above and silvery white below; some pinkish tinge along the border of the leaf and pink patches on lamina surface; wooly above and below. Mature leaves 3-lobed. Bunches cylindrical; berries ellipsoidal.

.. **Seneca (116)**

CC. Mature leaves pubescent above and below.

D. Tendrils intermittent, pubescent.

Unfolding leaves greyish green above and silvery white below; devoid of any pigmentation; wooly above and below.

E. Growing shoots slightly pubescent. Mature leaves entire 3 or 5-lobed. Bunches neither shouldered nor winged. Berries ellipsoidal, elongated. Seeds medium in number.

.. **Golden Muscat (50)**

EE. Growing shoots strongly pubescent. Mature leaves 3-lobed. Bunches winged or branched. Berries spherical. Seeds very many.

.. **Lake Emerald (76)**

DD. Tendrils irregular, greyish green, heavily pubescent.

E. Unfolding leaves greyish green above and silvery white below; wooly above and below. Some pinkish tinge along the border of the leaves above or (and) below or pink patches on lamina surface.

Ripening is uniform. Mature leaves 5-lobed. Berries golden yellow to amber.

.. **Golden Queen (51)**

EE. Unfolding leaves greyish green above and silvery white below, border of the leaf beautifully pigmented; wooly above and below.

Ripening not uniform. Berries yellowish green.

F. Mature leaves orbicular, 3-5 lobed. Seeds medium in number.

.. **Albany Surprise (2)**

FF. Mature leaves cordate, entire to 3-lobed. Seeds many.

.. **Ontario (92)**

B. Berries red or black.

C. Mature leaves glabrous above and pubescent below.

D. Unfolding leaves greyish green above, silvery white below; wooly above and below.

Growing shoots green and pubescent. Mature leaves orbicular, 3-lobed. Bunches medium long, conical, shouldered.

.. **Buffalo (25)**

DD. Unfolding leaves greyish green above and silvery white below. Some pinkish tinge along the border of the leaves

above or (and) below or pink patches on the lamina surface; wooly above and below.

Growing shoots green with purplish streaks, cobwebby. Tendrils glabrous or almost so. Mature leaves cuneiform, 3-lobed. Bunches cylindrical to conical, shouldered. Seeds medium in number.

.. **Sapiravi (112)**

DDD. Unfolding leaves greyish green above and silvery white below. Border of the leaf beautifully pigmented; wooly above and below.

Growing shoots greyish green, purple pigmented, wooly. Tendrils wooly. Mature leaves cordate to orbicular, 3-5 lobed to entire. Bunches cylindrical, shouldered. Seeds many.

.. **Steuben (120)**

CC. Mature leaves pubescent above and below.

D. Tendrils intermittent, purplish throughout.

Unfolding leaves greyish green above, almost pink below; margin above is beautifully lined pink; wooly above and below. Mature leaves cordate, 3 to 5 lobed, rarely entire. Bunches small, short conical to cylindrical, neither shouldered nor winged. Juice purple coloured. Seeds very many.

.. **Lomanto (78)**

DD. Tendrils irregular.

E. Unfolding leaves greyish green above and silvery white below. Border of the leaf beautifully pigmented; wooly above and below.

Growing shoots strongly pubescent. Tendrils deep purplish. Mature leaves 3 lobed or entire, cobwebby above and felted below. Bunches small, globular to short conical, neither shouldered nor winged, do not ripen in North India. Seeds many.

.. **Champanel (30)**

EE. Unfolding leaves greyish green above and silvery white below. Devoid of any pigmentation or slight pink patches on the lamina surface; wooly above and below.

F. Leaves variable; almost entire leaves found with leaves 3-5 lobed.

Bark loose to very loose and detaches in long straps. Growing shoots strongly pubescent.

Bunches small, short, regular, globular to short conical. Seeds medium in number.

G. Berries spherical. Teeth in 2-series.

H. Superior lateral sinus medium deep. Seeds short.

.. **Trentham Black (127)**

HH. Superior lateral sinus absent. Seeds medium long.

.. **Pierce (99)**

GG. Berries elongated. Teeth in 3-series.

H. Seeds very large.

.. **Bangalore Blue (6)**

HH. Seeds large

i) Seeds oblong

.. **James (62)**

(ii) Seeds round

.. **Black Cornichon Late (17)**

FF. Leaves 3-5 lobed; no entire leaves found in the vine.

G. Teeth in 2-series.

H. Bark slightly adherent to loose. Berries spherical. Seeds large, oblong.

.. **Oval White (93)**

HH. Bark loose to very loose. Berries ellipsoidal. Seeds very large, oval.

.. **Isabella (59)**

G. Teeth in 3-series.

H. Bark loose or very slightly adherent.

.. **Catawba (29)**

HH. Bark very loose.

.. **Large White (77)**

DDD. Tendrils continuous.

Bark very loose. Growing shoots strongly pubescent. Unfolding leaves greyish green above and silvery white below; some pinkish tinge along the border of the leaves above or (and) below or pink patches on the lamina surface; wooly above and below. Mature leaves cuneiform, 3-5 lobed. Bunches small, globular to short conical; neither shouldered nor winged, do not ripen in the plains of North India. Berries spherical to ellipsoidal. Seeds medium in number, very large.

.. **Concord (36)**

## B. PICTORIAL ANALYSIS OF GRAPE VARIETIES

Techniques are now available for drawing inferences concerning phylogenetic trends from an analysis of the phenotypic traits based on variability exhibited by varieties. One such method is the presentation of morphological data in the form of pictorialized scatter diagram standardized by Anderson (1949). Anderson's technique involves the pictorial depiction of character association patterns and the quantitative scatter for different traits. It provides a simple but reliable way of studying the extent of intergression of genes from one species to another. The value of this technique has already been demonstrated in many plant genera (Stebbins, 1950; Sibby, 1954 and Stebbins and Farlan, 1956). In grapes, Iyer and Randhawa (1964) and Chadha (1965) made an attempt to assess the utility of this character in 50 and 110 varieties respectively.

The grape varieties described in these studies have also been represented with a number of qualitative and quantitative characters. Seven distinct marker characters, namely, the stamen length, bunch length, adherence of skin to pulp, intensity of pubescence on full grown leaves, nature of tendrils, nature of the bunch and adherence of bark were chosen for analysis. The first two characters, viz., stamen length and bunch length which exhibited a greater range of variation and showed clearly defined set of intermediate values were found to be extremely useful and were used on the X and Y axes respectively. The rest of the characters were conspicuously distinct and could be conveniently represented in two to three groups. Hence for each variety, the position of the glyph was first decided by the values of the character represented in the X and Y axis. On the glyph, specific positions were given for each of the rest of the variables and the value was represented by no ray, 1 by a ray of unit length and 2 by a ray twice as long as 1 on the same position. The characters chosen for the scatter diagram, the different classes of variations, their index numbers and the positions of rays on the glyph are presented on the next page.

The scatter diagram prepared on the basis of characters already described and by method presented above is given in Fig. 53. The number given below each glyph corresponds to the number of the variety it represents. An examination of the scatter diagram reveals that the varieties tended to scatter into two sides of the arbitrary line of partition drawn in the middle. As many as 122 varieties fall to the left, whereas 18 varieties to the right of the line of partition. It shall be seen that all the 18 varieties on the right are interspecific hybrids. Similarly of 122 varieties on the left side of line of partition, all varieties except those at Nos. 30, 76 and 78 belong to the species *Vitis vinifera*. The latter three are, however, interspecific hybrids. The specific status of various varieties is discussed below.

**GROUP I : *Labrusca* varieties :** This group comprises variety Concord

LIST OF CHARACTERS USED IN THE SCATTER DIAGRAM, THE INDICES OF  
VARIATION OF RAYS ON THE GLYPH

Characters		Variation	Index position and value of ray	
1.	Stamen length		X axis	
2.	Bunch length		Y axis	
3.	Adherence of skin to pulp	Skin adherent to pulp.	0	●
		Slip skin	1	●
4.	Intensity of pubescence on full grown leaves	Glabrous above and below	0	○
		Glabrous above and pubescent below	1	○
		Pubescent above and below	2	○
5.	Nature of tendrils	Intermittent	0	○
		Continuous	1	○
		Irregular	2	○
6.	Nature of the bunch	Bunches without wing	0	○
		Bunches always winged	1	○
7.	Adherence of bark	Adherent	0 -	○
		Loose	1	○

(36) which falls on the extreme right. This variety appears to have all the morphological characters of the American species (*Vitis labrusca*) as described by Hedrick (1938). There are, however, different opinions regarding its origin. Some workers have reported this variety to be a hybrid between *Vitis labrusca* and *V. vinifera*, while several others like Perold (1927), Brailow (1952), Mitsukuri and Hayashi (1953) and Anonymous (1957) have referred this variety as belonging to pure *labrusca* species. From the position of the variety in the diagram and from the phenotypic traits exhibited by this variety, it can be concluded that this belongs to *V. labrusca*.

**GROUP II ; Interspecific hybrids :** As already mentioned, this group is formed on the graph on the right side of the arbitrary partition wall except varieties Champanel (30), Lake Emerald (76) and Lomanto (78). In all, there are 20 varieties in this group.

Of these, varieties Ontario (92) and Steuben (120) lie at the bottom of the graph and are distinctly separate from other hybrids. Variety Ontario is a known complex hybrid between *labrusca*, *vinifera* and *aestivalis* species

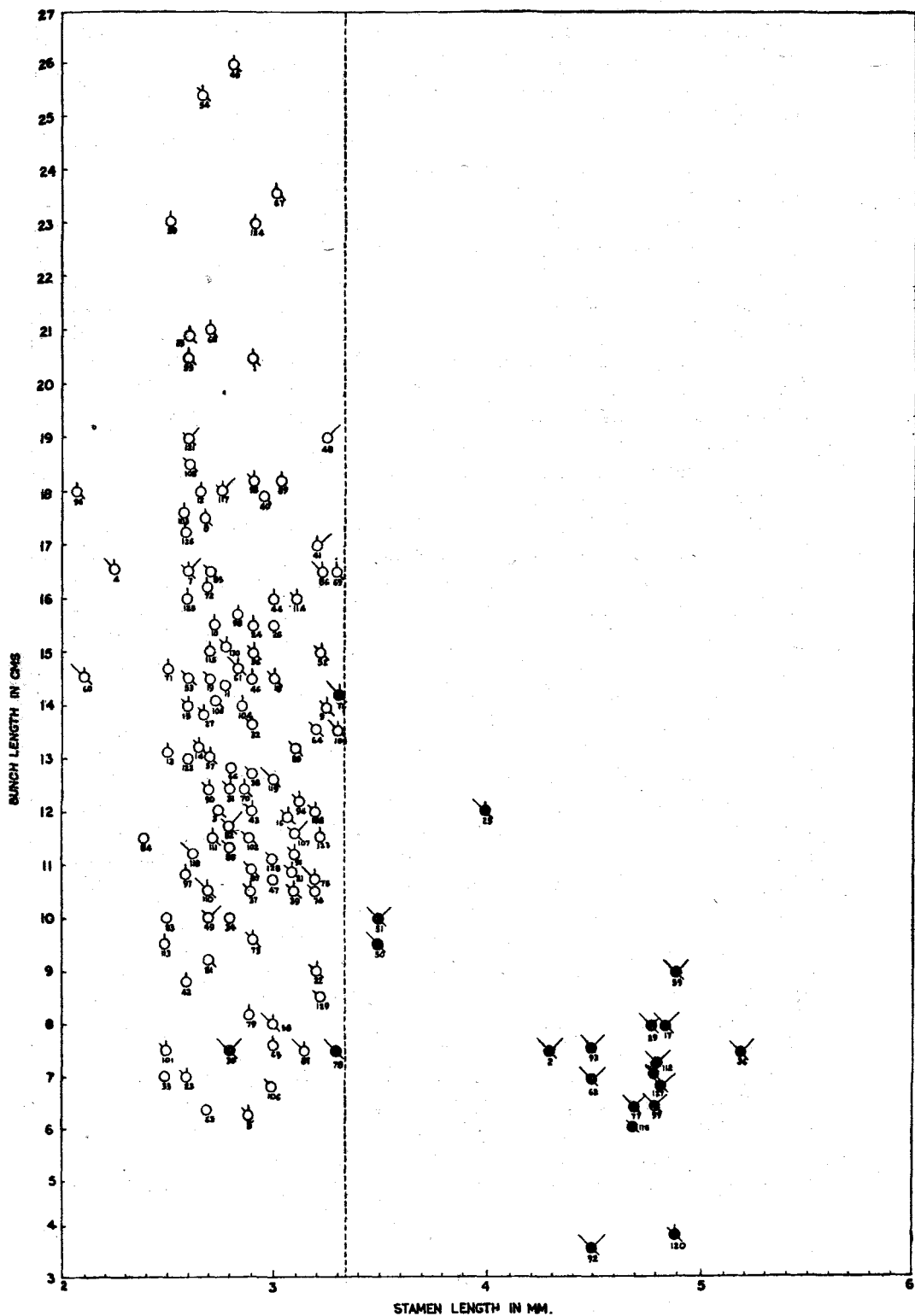


Fig. 53 Scatter diagram showing morphological variations in different grape varieties.

and is a cross between varieties Winchall and Diamond (Slate *et al.*, 1962). Variety Steuben is also a similar complex hybrid and has Ontario in its parentage. It is reported to be a cross between varieties Wayne (Mills  $\times$  Ontario) and Sheridan (Herberd  $\times$  Worden), (Slate *et al.*, 1962).

Lying at the highest point on right of the partition is variety Buffalo. This is also a complex hybrid between the above three species and is known to be a cross between varieties Herbert and Watkins (Mills  $\times$  Ontario). This differs from the other two varieties mainly in its bunch size which is longer as compared to varieties Ontario and Steuben.

The largest group of twelve varieties, namely, Albany-Surprise (2), Bangalore Blue (6), Black Cornichon Late (17), Catawba (29), Isabella (59), James (62), Large White (77), Oval White (93), Pierce (99), Saporavi (112), Seneca (116) and Trentham Black (127) occupies the position on the right side of the graph just above varieties Ontario and Steuben. Of these, varieties Catawba, Isabella and Pierce are known *labrusca*  $\times$  *vinifera* hybrids. Other varieties have also characters intermediate to the two species and can be considered as hybrids between the above two species. James is reported to be belonging to *V. rotundifolia* (Vaile, 1939).

Four varieties lying close to the partition wall on either side are varieties Golden Muscat (50), Golden Queen (51), Lake Emerald (76) and Lomanto (78). Variety Champanel (30) lies somewhat on the left. All these varieties had almost similar characteristics represented in the glyph with some differences exhibited by Lomanto (78). Lomanto was characterised by absence of pubescence on the upper surface of the full-grown leaf and the amount of pubescence on the lower surface was almost moderate as against heavy pubescence in other varieties. The unfolding leaves of this variety were typically pink on the under surface thus suggesting that the variety had blood from more than two species, viz., *labrusca* and *vinifera* contributing characters in the other varieties in this group. This speculation is duly supported by Vaile (1939), who has reported this variety to be a hybrid between *V. champini*, *V. labrusca*, *V. vinifera* and *V. aestivalis bourquiniae*. Of these, purple pigmentation in the unfolding leaves is a characteristic feature of *V. champini*.

All other varieties listed above, i.e. Champanel (30), Golden Muscat (50), Golden Queen (51) had characters similar to other *labrusca*  $\times$  *vinifera* hybrids except some minor dissimilarities in Golden Muscat (50), Golden Queen (51) and Lake Emerald (76) and are thought to have the same parentage. This is supported by reports indicating variety Golden Muscat to be a hybrid resulting from a cross between Muscat Hamburg and Diamond. Similarly, Golden Queen has been reported to be a hybrid from varieties Alicante crossed by Ferdin and de Lesseps (Perold, 1927).

Another variety which is reported to be a *labrusca*  $\times$  *vinifera* hybrid is Iona (58) Synder, 1937). However, in the present studies it showed more

characters of *Vitis vinifera*. In this the berries have adherent skin, tendrils are intermittent, stamens are comparatively short. However, mature leaves are downy above and felted below and bark is loose.

The rest of the 108 varieties falling on the left side of the partition line had characters of *V. vinifera*. The skin in these varieties is adherent to pulp, the tendrils are intermittent, stamens are comparatively short, bark is adherent or slightly loose and the leaves are usually glabrous above and glabrous or pubescent below. Some of these varieties like Barbarossa (9), Gros Colman (52), Pearl of Csaba (97) and Zinfandel (129) are known *vinifera* varieties. Of this large group, however, a number of varieties had characters distinctly different from rest of the varieties. Hussaini (56) can be taken as a typical example. These varieties are characterised by the presence of a typical wing on the bunch. The leaves are leathery, thick, 3 to 5-lobed, glabrous above and pubescent below. The varieties either do not ripen at all in North India or ripen unevenly. It is suggested that these varieties belong to some known sub-species of *V. vinifera*. If not, they can be definitely considered for according status of a sub-species under *V. vinifera*. The varieties in this group have been described at numbers 7, 9, 14, 15, 22, 37, 43, 52, 56, 91, 107 and 109.

The general pattern of distribution of characters in the scatter diagram reveals that the characters of *labrusca* species may be dominant over *vinifera* characters. This is very clear from the diagram, since all the glyphs representing hybrid varieties, possess rays of longer length as in *V. labrusca*. Some of the hybrids like Golden Queen (51) showed intermediate characters between the parental species. Three of these characters namely, slip-skin nature, felted pubescence and irregular tendrils are all typical *labrusca* characters. Further, in all the hybrid varieties, fruit ripening is either mid-season or late, and most of them either do not ripen at all or are uneven ripeners in North India. The *labrusca* species are known for their late ripening, a character which it has transmitted to the hybrids. This character prevents varieties of hybrid origin from becoming commercially important in Northern India, where only early varieties, ripening before the onset of rains can be successfully grown.

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