CULTIVATION OF GRAPES

PRESENTED BY: ANKIT VIKRAM SINGH
GRAPES

BOTANICAL NAME - VITIS VINIFERA

Scientific classification:

Kingdom: Plantae
Division: Magnoliophyta
Class: Magnoliopsida
Order: Vitales
Family: Vitaceae
Genus: Vitis L.
INTRODUCTION:

- It is a deciduous crop. Its natural habitat is temperate climate.
- It was introduced into north India from Iran and Afghanistan in 1300 AD by the Muslim invaders; and into south India in 1832 by the Christian missionaries from France.
- However, grape was known in ancient India though it was not commercially cultivated until the 14th century.
- Wild grapes grown in Himachal Pradesh were used to prepare local wine.
- Presently grape cultivation is concentrated in the peninsular India (surrounded Arabian Sea, Bay of Bangal & Indian Ocean), accounting for 90% of the total area.
- Major grape-growing states are Maharashtra, Karnataka, Andhra Pradesh, Tamil Nadu, and the north-western region covering Punjab, Haryana, Delhi, western Uttar Pradesh, Rajasthan and Madhya Pradesh.
VARIETIES:

Anab-e-Shahi:
- This variety is grown in the states of Andhra Pradesh, Punjab, Haryana and Karnataka.
- Juice is clear and sweet with TSS 14-16%.
- It is highly susceptible to downy mildew.
- Average yield is 35 t/ha

Bangalore Blue:
- This variety is grown in Karnataka.
- Berries are small sized, dark purple, ovoid, seeded with thick skin.
- Juice is purple coloured, clear and pleasantly flavoured with 16-18% TSS.
- It is resistant to anthracnose
**Thompson Seedless:**

- This variety is grown in Maharashtra, Andhra Pradesh, Tamil Nadu and Karnataka.
- The juice is straw coloured, sweet with a TSS of 20-22%.
- Variety has a good keeping quality and is used for table purpose and raisin making.
- Average yield is 20-25 t/ha

**Sharad Seedless:**

- It is a variety local to Russia called as Kishmish Chorni
- The berries are seedless, black, crisp and very sweet.
- The TSS is upto 24 Brix.
- It has a good shelf life.
- It is grown mainly as table purpose variety.
**Black Seedless Grapes:**
These grapes are seedless, Black and make very good Table and Wine Grapes.

**Red Flame Seedless Grapes:**
Are the result of a cross between Thompson, Cardinal and other grape varieties. Flame grapes are one of the most popular varieties along with Thompson grapes. These grapes are seedless, sweet-tart, and crunchy.
**AREA AND PRODUCTION:**

In terms of production, grape occupies the 7th position (only 0.02% of total fruit production) among all fruits, but it has the highest productivity among all fruits.

<table>
<thead>
<tr>
<th>Variety</th>
<th>Area (ha)</th>
<th>Production (t)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anab-e-Shahi (white, seeded)</td>
<td>3,000</td>
<td>135,000</td>
</tr>
<tr>
<td>Bangalore Blue Syn. Isabella (black, seeded)</td>
<td>4,500</td>
<td>180,000</td>
</tr>
<tr>
<td>Bhokri (white, seeded)</td>
<td>500</td>
<td>15,000</td>
</tr>
<tr>
<td>Flame Seedless (red, seedless)</td>
<td>500</td>
<td>10,000</td>
</tr>
<tr>
<td>Gulabi Syn. Muscat Hamburg (purple, seeded)</td>
<td>1,000</td>
<td>30,000</td>
</tr>
<tr>
<td>Perlette (white, seedless)</td>
<td>1,500</td>
<td>60,000</td>
</tr>
<tr>
<td>Thomson Seedless and its mutants (white, seedless)</td>
<td>22,000</td>
<td>550,000</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>33,000</strong></td>
<td><strong>980,000</strong></td>
</tr>
</tbody>
</table>
CLIMATE:

- Grapes generally require a hot and dry climate during its growth and fruiting periods.
- It is successfully grown in areas where the temperature range is from 15-40 °C.
- High temperatures above 40 °C during the fruit growth and development reduce fruit set and consequently the berry size.
- The fruitfulness of buds is influenced by light.
- Light intensity of 2,400-ft. candle is essential for optimum growth.
- It is most successfully grown at elevations ranging from 200-250m above mean sea level.
- Area with annual rainfall not exceeding 900mm well distributed throughout the year is ideal.
- However, rainfall during flowering and fruit ripening is not favourable as it leads to the spread of downy mildew disease.
Grapes can be cultivated in variety of soils including sandy loams, sandy clay loams, red sandy soils, shallow to medium black soils and red loams.

The soil should be well drained, having good water holding capacity and devoid of any hard pan or impervious layer in the top 90-cm, with water table at least 6.5m below.

Soils having pH range of 6.5-8.0 are considered ideal.

<table>
<thead>
<tr>
<th>Major Grape Growing Regions</th>
<th>Soil Types</th>
</tr>
</thead>
<tbody>
<tr>
<td>Uttar Pradesh &amp; Haryana</td>
<td>Sandy loams sandy clay loams.</td>
</tr>
<tr>
<td>Andhra Pradesh</td>
<td>Red sandy soils.</td>
</tr>
<tr>
<td>North interior Karnataka &amp; Maharashtra</td>
<td>Shallow-medium deep black.</td>
</tr>
<tr>
<td>South interior Karnataka &amp; Tamil Nadu</td>
<td>Red loams</td>
</tr>
</tbody>
</table>
PROPAGATION:

- Grapevines are propagated by seeds, cuttings, layering, budding, or grafting.
- Grape is mostly propagated by **hardwood stem cuttings**.
- The diameter of cuttings should be 8-10mm. Cuttings are mostly obtained from October pruning in the peninsula.
- Quick dip method is preferred. Cuttings after treating with IBA should be planted in the nursery or directly in the field.

Spacing: Spacing varies with variety and soil fertility. Generally under organic cultivation, spacing of 2.5 m x 1.5 m, 2.75 m x 1.50 m and 3.0 m x 1.5 m are followed.

Planting: Pits of 90 cm x 90 cm x 90 cm are dug and filled with soil and well decomposed FYM/Compost @ 55 t/ha. The pits are then irrigated in order to allow the soil to settle. Rectangular system of planting is adopted for growing grape. (The best season for planting the rooted cuttings of cultivated varieties in the main field is **September-October** whereas for rootstocks it is **February-March**).
LAND PREPARATION AND VINE ESTABLISHMENT:

The land is tilled and laid into plots of 120 m x 180 m separated by 3 m wide roads. Land within a plot is levelled perfectly to have a gradient of less than 1 percent in any direction to ensure uniform discharge of water through the emitters of drip irrigation systems.

Trenches of 75 cm width, 75 cm depth and 118 m length in a north-south direction with a gap of 3 m between trenches are opened with heavy machinery. They are closed with topsoil, up to a height of 45 cm after 15 days exposure to sun. The remaining gap is filled with a mixture of soil, cattle manure, single superphosphate, sulphate of potash and micro-nutrients. Usually, 50 kg of cattle manure, 2.5 kg of superphosphate, 0.5 kg of sulphate
IRRIGATION:

Grape requires less water during fruit bud formation and more water during berry growth. Reduced irrigations during ripening improve the quality. Drip irrigation is becoming more popular. Water requirements under drip are:

- 1-40 days after summer pruning - 48000-60,000 liters/day/ha
- 41-100- days after summer pruning - 24000-32,000/litres/day
- 101-winer pruning days after summer pruning- 15000-20,000 liters/day
- 1-45 days after winter pruning 20,000-24,000 liters/day
- 46-75 days after winter pruning -20,000-24,000 liters/day
- 76-100 days winter pruning 48,000-60,000 liters/day
- 101- harvest summer pruning 36000-48000 liters/day
Many training systems are in vogue in India, but the most popular are Bower, Telephone and Flat Roof Gable systems.

1. **Bower System**: Owing to the high productive potential, bower was a very popular system of training in the past. It is highly suited for vigorous varieties like Anab-e-Shahi, Bangalore Blue and Gulabi. But in varieties like Thompson Seedless and Tas-A-Ganesh where vine vigour and excessive foliage density affects the productivity adversely, this system is not popular.

2. **Telephone System**: T-trellis is used in this system of training. With three top wires and ‘T’ shaped supports, the trellis looks like a telephone pole and wires. This system is followed for moderately vigorous varieties like Thompson Seedless and other seedless cultivars in about 25-30 percent of the vineyard area in Maharashtra.

3. **KNIFFIN SYSTEM**: Here, 2 trellies of wires are strung supported by vertical posts. The vine is trained so that it bears 4 canes one along each wire and bearing shoots can hang freely. In this system, 2 wires are stretched horizontally at the height of 0.90m and 0.60m. Vines are planted at 2-4m. distance between 2 poles supported by sticks to allow single stem to grow with one arm horizontally to either side so that each arm having with the results into 4 arms.
Three distinct pruning practices are in vogue in relation to cropping in the three grape growing regions of the country.

In the sub-tropical region, vines are pruned only once in December and the crop is harvested once. Half of the canes are pruned to renewal spurs and the rest to fruiting canes (3-4 nodes for Perlette).

In hot tropical regions, vines are pruned twice but only one crop is harvested. All canes in a vine are pruned back to single node spurs in March-May to develop canes and the canes are forward pruned in October-November for fruiting. The number of nodes retained on a cane varies with the variety and cane thickness. There is no scope to prune earlier than October and later than November due to unfavourable weather conditions.

In the mild tropical region, vines are pruned twice and the crop is harvested twice. In varieties like Gulabi and Bangalore Blue, which are fairly resistant to rain damage and in which fruit bud differentiation is not impaired by cloudy weather and rains, pruning is done at any time of the year. As a result, five crops are harvested every two years.
THINING OF FRUITS

The removal of flower clusters before flowering or parts of such clusters after fruit set is called thinning.

Types of thinning methods:
1. Flower cluster thinning
2. Flower thinning
3. Cluster thinning
4. Berry thinning

_Thinning of fruits_

_Shoot pinching:_ Shoot pinching is done when the main shoot attains 7-8 leaf stage. During pinching the tip of the mature shoot is pinched by retaining only five nodes. As a result the terminal bud along with 1-2 laterals resumes growth. These laterals are called as sub-canes. Buds up to third node from the base on the sub-cane were found to be invariably fruitful resulting in 2-3 clusters/cane.

_Girdling:_ Girdling is removing a narrow ring of 4-5 mm width of bark entirely around some member of vine like arm or cane. It is done to improve fruit set increase berry size & advance maturation.
**MANURING:-**

Manuring is done by applying FYM at the rate of **55 t/ha**. Biofertilizers like Azatobacter, Phosphate Solubilizing Bacteria (PSB), Effective Microorganism (EM), Neem cake and vermiwash are being used to supplement the nutrient requirement of crop. Trichoderma, Azatobacter and PSB are applied at the rate of **25 g/plant**. Neem cake is applied at the rate of **1.25 t/ha**. Jeevamrut is prepared by adding **10 kg cow dung, 5 l cow urine, 2 kg black jaggery, 2 kg ground pulses powder, handful of bund soil in 200 l of water**. The solution is kept for 2 to 7 days in shade for fermentation. During the fermentation, the solution is stirred daily. To improve the quality of grapes, a solution of sugar, humic acid and coconut water is sprayed at bud development stage.

**WEEDING:-**

In the vineyards, weeding is generally done mechanically. Frequent weeding is required to allow feeder roots to absorb the nutrients and moisture without any competition. Bullock drawn or tractor drawn implements can be used for inter-cultivation and weed control. Weeding is done 3-4 times in a year.
The major pests affecting the grape crop are flea beetles, thrips, mealy bugs and leaf hoppers. The major diseases are downy mildew, powdery mildew and anthracnose. The schedule of plant protection measures are given below:

<table>
<thead>
<tr>
<th>PEST AND DISEASES</th>
<th>PLANT PROTECTION MEASURES (SPRAYING OF)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Downy mildew or powdery mildew</td>
<td>Trichoderma, 1% Bordeaux mixture + Dasparni arka + Gomutra</td>
</tr>
<tr>
<td>Mealy bug</td>
<td>Cowdung urine</td>
</tr>
<tr>
<td>Thrips</td>
<td>Dasparni arka</td>
</tr>
<tr>
<td>Anthracnose</td>
<td>Solution of acacia leaves</td>
</tr>
</tbody>
</table>
HARVESTING

- Grapes should be harvested only after ripening. The heat requirement of most of varieties ranges from 2900 to 3600 units.
- The grape berries can be kept without spoilage for 7 days at room temperature.
- Grapes can economically be stored up to 40-45 days in cold storage. The optimum storage temperature recommended is -2 to -1.5°C.
- Raisins from grapes form an important by product industry in several grape growing countries in the world.
YIELD

- **Seedless**: 15t / ha / year
- **Muscat**: 30t / ha / year
- **Pachadraksha**: 40t / ha / year
- **Anab-e-Shahi and Arka hybrids**: 20 t / ha / year

Post harvest management:

**Grading**: It is mainly done based on the size and colour of the grapes to maintain uniformly berries in a package.

**Pre-cooling**: Pre-cooling is done to reduce the field heat, moisture loss and subsequently increase the storability of grapes.

- Fruit needs to be pre-cooled to a temperature below 4.40°C within six hours after harvesting in cold rooms, forced air coolers, refrigerator cars and tunnels.
STORAGE:-

- The shelf life of grapes is only one week at room temperature.
- The storage life of grapes can be increased by employing suitable means to reduce desiccation, decay due to growth of fungi.
- Pre-cooled grapes are packed in corrugated boxes in 4.5/5/9 kgs and kept in cold storage. Boxes that are specially designed with perforations to allow cool air to pass through.
- The boxes are palletized to facilitate easy handling.

PACKAGING:-

- Table grapes meant for local market are picked and packed directly in containers in the field.
- Raisin, juice and wine grapes are subjected to suitable treatments and processed.
- Different types of containers are used for packing grapes in India.
- For the European market, bunches of grapes of approx. 300 to 700 gms. are packed in food grade plastic pouches.
TRANSPORATION:-

- Table grapes are mostly transported through roadways for local, short distance or long distance markets
- About 5% of the produce is transported by rail and the quality of produce transported through air cargo is almost negligible
- The cold chain for grapes is maintained meticulously right from pre-cooling state to selling of the same
- The produce for international market is sent through refrigerated vans by road up to the sea port and then again by sea in refrigerated containers in the ships to their respective destination
Making fine wine is an art...

THANK YOU