



Grapes

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INTRODUCTION

Botanical Name - *Vitis vinifera* L.

Family - Vitaceae

Origin - Black to Caspian Sea

Chromosome No. - $2n=38$

Fruit type - Berry

Edible Part - Placentae

Inflorescence - Panicle

Non-climacteric type



INTRODUCTION :

The Common Grapes / Table Grapes / True Grapes /European Grapes / Old World Grapes

NATURAL HABITATION OF GRAPES :

- ❖ Warm Temperate Climate.
- ❖ Deciduous Crop .

INDIA :

❑ In Undivided India It Was Introduced by Muslim Invaders In 1300 AD From Iran And Afganistan.

GRAPE

APICAL DOMINANCE = The phenomenon in the plant where apical shoot/buds have inhibitory influence on the growth of lateral shoot and buds development.

APICAL = The Point/Tip = The Point/Tip of a shoot/Stem etc.

STENOSPERMOCARPY:

- Under such mechanism fertilization is occurred properly but the embryo / endosperm will degenerates /aborts at later stages of fruit development. Hence, seedlessness in a seeded berry may occur.
- Recent developed promising seedless hybrids are viz. Flameseedless, Superior, etc.
- Skin of grape berry is covered with wax like layer which is called cutin.
- October is ideal time for planting.
- Soil P_H range 5.5 to 6.5 for grapes.
- Pruning time in North India- once- winter season (December-january).
- South India- twice-
 1. April- Back or foundation pruning
 2. October- Fruit or Forward pruning
- Bower system of traning is mostly adopted in india.
- Mg deficiency is universal in Grape.
- Calyptra a cap like structure of defective and of grape formed as a result of union of sepals and petals.

- Raisins are only processed product in india.
- Dipping berries in Soda oil containing ethyl oleate + K_2CO_3 and shade drying is most common method of preparing raisins in india.
- Grape Breeder- H.D. Olmo
- Muscat flavour in grapes due to methyl anthralate.
- Tartaric acid acid is commercially extracted from grapes.
- Good source of Vitamin –C , an essential nutrient powerful antioxidant necessary for connective tissue health.
- Also helps to reduce lower blood pressure, reduce cholestrol, diabities, cancer *etc.*
- Also help to improve memory, attention and mood.
- Grapes contain many minerals necessary for bone health , including calcium, magnecium, pottasium, magnese, phosphorus and Vitamin – K.

AREA, PRODUCTION AND PRODUCTIVITY

· India - Area (136 thousand hectares)– NHB(2017)
Production (2687 metric tonnes)

- In Hyderabad condition, Anab-e-shahi can produce, 100 tonnes / hectare which has been expressed by the crop scientists as a ' Biological Wonder'.
- The leading countries in the world – Italy, USA, France, Spain.
- In India, leading States are – Maharashtra the top followed by Karnataka, Tamil Nadu, A.P., Punjab, Haryana, U.P. (both the plains & hills)
- In Rajasthan leading districts- Hanumangarh, Shriganganagar, Sawai Madhopur.

TYPES :-

Through morphology as well as taxonomical studies, all grapes grown under different origins have been recognised into 4 distinct types :

1. European / Old World Grapes (Binomeal nomenclature: *Vitis Vinifera*)
Elongated cluster, berry adheres till after maturity to the pedicel ,etc
2. American Grapes (*Vitis labrusca*) Round shaped berry, skin of berry slips from the pulp after maturity, foxy odour, etc.
3. Muscadine Grapes (*Vitis rotundifolia*) Small cluster, after maturity berry automatically detached from the pedicel, musky odour, etc.
4. French hybrids (*Vitis vinefera* x *Wild American* species) x Muscadine Grapes. > 90 % of the world's grapes are either vinefera sp. or its hybrids.
Some species may also used as important root – stocks (viz., *V. riparia*; *V. aestivalis*; *V. berlanderi*, etc.).

CLASSIFICATION OF ECONOMIC IMPORTANCE FOR EXPORT/USES OF DIFFERENT PROMISING VARIETIES OF GRAPES :

On the basis of uses, grapes have been classified into five groups

1. TABLE GRAPES :

(Common name is 'Angoor'/ 'Drakshi'.) (20% of the total produced.78% IN India)

2. RAISIN GRAPES :

1. Munnakka / Monukka (Seeded Raisin)

(It is a French word means Dry grape') (11% of the total produced. 17 – 20 % in India)

2. Kishmish (Seedless Raisin)

3. WINE GRAPES :

1. White Wine. (68% of the total produced)

2. Red Wine.

3. Dessert Wine.

4. **JUICE GRAPES** : (1% of the total produce)

5. **CANNING GRAPES** : (Excess produced)

2 % in India is used for juice and wine manufacturing.

1. TABLE GRAPES :-

Cvs. Perlette, Thompson Seedless, Pusa Seedless, Delight, Beauty Seedless, Anab-e- Shahi, etc.

2. RAISIN GRAPES :-

1. Munnakka / Monukka (Seeded Raisin).Cvs. Anab-e- Shahi, Bhokri, Cheema Sahebi, Bangalore Blue, etc. Kishmish (Seedless Raisin) Cvs . Thompson Seedless, Black Corinth, Muscat of Alexandria, etc. These are internationally reputed varieties. Indian vars. / cvs. are—Pusa Seedless, Fiesta, Kishmish Belli, etc.

3. WINE GRAPES :-

1. White Wine: cvs.White Riesling, Pinot Blanc, Thompson Seedless, etc
2. Red Wine: Cvs. Barbera, Black Champa, Ruby Red, etc.
- 3.Dessert Wine: Cvs. Mission of Muscat, Blanc, Palomino, etc.

4. JUICE GRAPES :-

Cvs. Concord (American cv.) Beauty Seedless , Early Muscat, Champion, Black Champa, Bangalore Blue, etc.

5. CANNING GRAPES :-

Cvs. Thompson Seedless, Perlette, etc.



Raisins



Wines



Juices



Powder

RED WINES

ARE MADE WITH
BLACK GRAPES.



WHITE WINES

ARE MADE WITH
WHITE GRAPES.



PINOT NOIR



PINOT GRIS



PINOT BLANC

Ampelographers (people who study grapes) believe that the first wine grapes were black grapes and that a natural mutation created white grapes. For example, Pinot Noir, Pinot Gris and Pinot Blanc all share the same DNA.



Dilkhush



Perlette



Tas-A- Ganesh



Thompson Seedless



Anab-A- Sahi



Arka Sweta

· **Other economically important**

Processed forms of different cvs./ vars. Are:

☐ Jam, Jelly, Vinegar, Winery bi- products:- Tartres (Cream Of Tartar) Water soluble powder: Beverage, Baking Powder, Photography, Tanning.

Argols (Wine Stones) –

☐ Colourless water soluble solid, Rochelle salt Potassium Sodium salt of tartaric acid, $\text{KNaCH}_6\text{O}_6\cdot 4\text{H}_2\text{O}$ – Silvering mirror , Baking powder, Laxative Medicine.

Seed oil – Salad oil, Cosmetics.

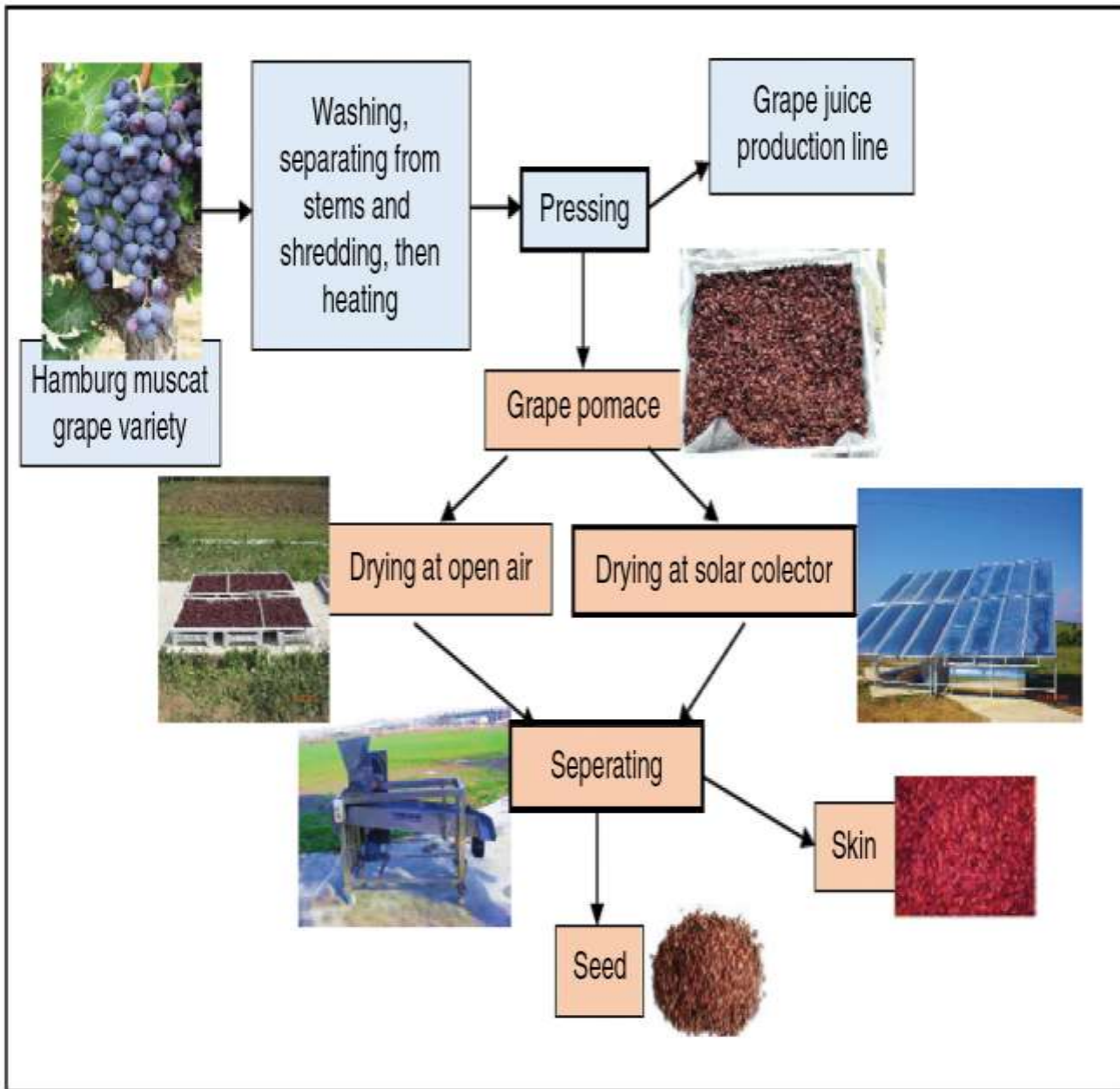
Pomace – Cakes, Cattle feed.

Tanins Catechol (Photography dying.)

Pyrogallol (Photography developer, dying, cleaning agent of wool, skin conditioner).



FIGURE 1. Grape processing, drying methods of grape by-products and the separation of grape seeds. DOI: 10.3989/gya.0341181



IMPORTANT VARIETIES / CULTIVARS:-

> 10,000 cvs. are present in the world. About 12 cvs. are commercially grown in India.

➤ White Seeded Anab - e - Shahi, Bhokri, Dilkush (a clone of Anab-e- Shahi), etc.

➤ White Seedless Perlette, Pusa Seedless, Thompson Seedless and its clones Tas-e-Ganesh, Sonaka, Manik Chaman, etc.

➤ Coloured Seeded Bangalore Blue (Black Seeded), Gulabi, Muscat (Purple Seeded), etc. Coloured Seedless Beauty Seedless, Sharad Seedless.

Other varieties:

Sultana

Manik chaman

Sharad

Cheema

Dilkhush

Sahebi

S.NO.	Hybrid	Parents	Characters
1.	Arkavati	Black Champa X Ts	Good for Raisins, Seedless variety
2.	Arka Krishna	BC X TS	Good for Red Wine
3.	Pusa Urvashi	Hur X Beauty Seedless	Tolerant toAntracnose
4.	Pusa Navrang	Madeline angavine X Ruby Red	Tenturier
5.	Arka Majestic	AS X BC	Table
6.	Arka Trishna	BB X Convert large black	Wine
7.	Arka Shyam	BB X BC	Double Cropping

BERRY SIZE:-

Normally the size of seeded berries are larger than the seedless one as seeds are the place to synthesis GA in berries. So, when seed settings are prevented by the external application of 'Pollenicides', the berry size becomes shorter/reduced.

❑ GA to Thompson Seedless @ 40-100 ppm (3-4 times in weekly interval from pre-bloom stage) is effective to increase the berry size.

❑ In Anab-e-shahi, GA @ 40 ppm at full – bloom stage it is effective.

❑ GA @ 75-100 ppm to cv. Perlette at full bloom stage can also increase the berry size.



CLIMATE :

- ✓ essential requirements are - hot, dry, rainless summer and a cool winter.
- ✓ rainfall does not exceed 900 mm annually is ideal.

soil :

☐ adapted to a wide range of soil types.

deep loamy soil with a high organic matter and PH ranges between 6.5 – 7.6.

PROPAGATION:-

- Common method – ‘Hard wood’ cutting.
- In north India – January to February.
- In peninsular India – September to November
- Under root – stock used, Wedge grafting in normal condition during July – August and in artificial humid condition Chip budding is practiced at the same time.

Size and shape Of the Cuttings :-

1. Thickness ----- 0.75 - 1.0 cm.
2. Length of cutting – 30 - 40 cm.
3. Internodal space ----- 8--10 cm.
4. No. of buds – 3-4 prominent & healthy.
5. Lower cut of the cutting – Nearly straight across 1 cm. below the basal node.
6. Top cut of the cutting - At an angle of 45° and 2 – 3 cm above the top bud.



Treatment of the cutting for : -

- In Thompson Seedless, prior to planting soaking of rooting cuttings for 12 hrs in 250 ppm IBA is advised.
- The concentration of PGR should be increased to 2000 ppm for quick dipping process of 10 seconds duration.

Planting of cutting for better establishment:

- Cutting may be planted in nursery under Flat / Raised bed , either in poly bags or these may be planted directly to the main field.
- Shade should be provided to the cuttings for better rooting.
- At least 2 nodes of the cutting should remain above the soil surface

Time of planting:-

- ❑ In tropical India --- October.
- ❑ In sub - tropical India --- February.

Spacing of cutting in nursery bed-

- ❑ Between the Cuttings : 30 cm.
- ❑ Between the Rows : 100 m.

Preparation of pits –

- ❑ 3 – 4 weeks before planting , these are dugged to a diameter of 90 cm³ each with a distance of 4.5 m x 4.5 m / 3 m x 3 m between the pits and then left open.

FILLING OF PITS AND TRANSPLANT THE CUTTINGS FROM NURSERY TO MAIN FIELD:-

After weathering each pits are filled with the following mixture of topsoil, FYM / Organic manures and inorganic fertilizers @----

- 1 basket leaf mould.
- 3 baskets of FYM.
- 1 kg bone meal / Fishmeal .
- 3 kg neem cake
- 1-3 kg SSP.
- 500 gm M.P.
- 250 gm Mg So₄
- 10 gms Zn So₄

After placement of rooted cutting at the centre of each pit, soils are to be allowed to settled properly by giving a light irrigation.

Age of the transplants : - · One year old rooted cuttings

ROOT STOCKS :

For saline, drought and nematode problem – Dog ridge

❖ Salt creek / Rainsey

1613

1616.

❖ For saline or wet soil-

1613

1616

❖ For Phylloxera problem –

St. George.

Reparia Glorie.

TRAINING OF GRAPE VINES :-

Following training systems are generally practiced in different areas of grape cultivation –

1. Bower / Arbour / Pargola.
2. Kiniffin.
3. Telephone / Over head trellis
4. Cordon.
5. Tatura trellis of 'V' / 'Y' system.

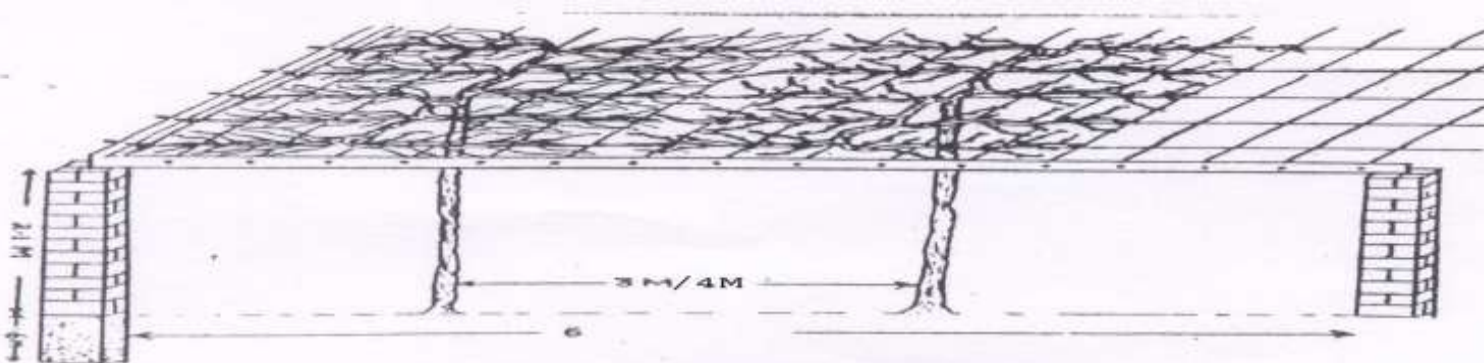
Objectives of training -

- 1.To get a desired shape to the growth of the grape Vines to facilitates the cultural operations, like cultivation, plant protection, pruning and harvesting.
- 2.To maintain the vineyard economically.
- 3.To get a desired yield with quality produce . 80 percent of the Indian farmers are followed 'Bower System' others.

DIFFERENT SYSTEM OF TRAININGS

BOWER SYSTEM :

- ❑ In this system criss-cross network of wires are made about 2.1 x 2.4 m on the pillars with holes at 60cm apart.
- ❑ The vines are allowed to grow up to the height of the wires either by stacking or tying, two primary branches with three secondaries on either side are allowed to grow so that each results into twelve secondaries are developed on reaching the height of wires.
- ❑ Vines are then pinched off to produce side shoots. These secondaries are then produce 8-10 tertiaries to fruit or to form the fruiting canes.



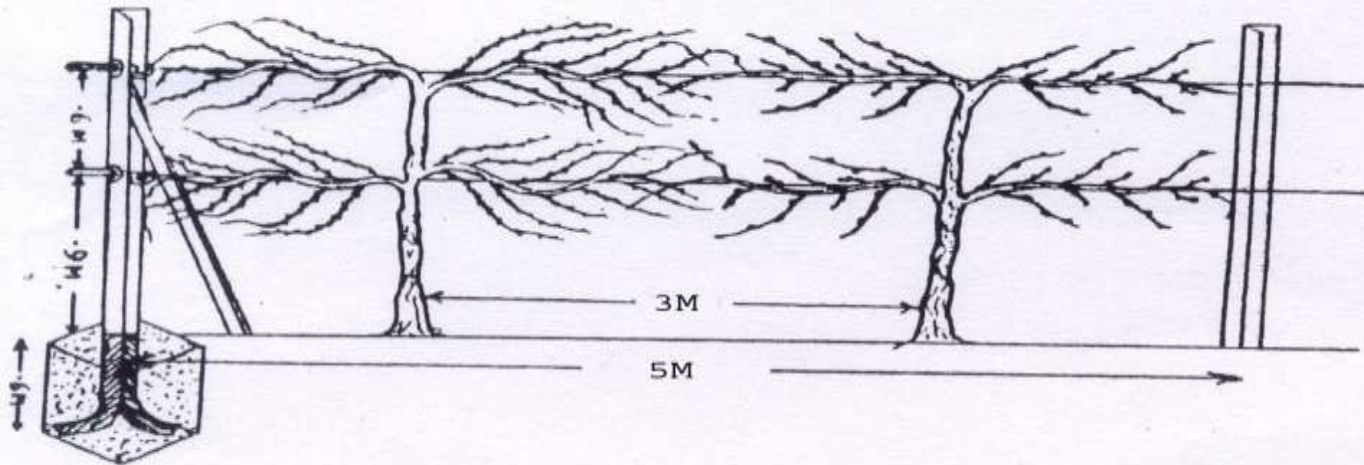
Training of vines on Bower system.

KNIFFIN SYSTEM:

❖ Here, 2 trellies of wires are strung supported by vertical poles. 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 height.

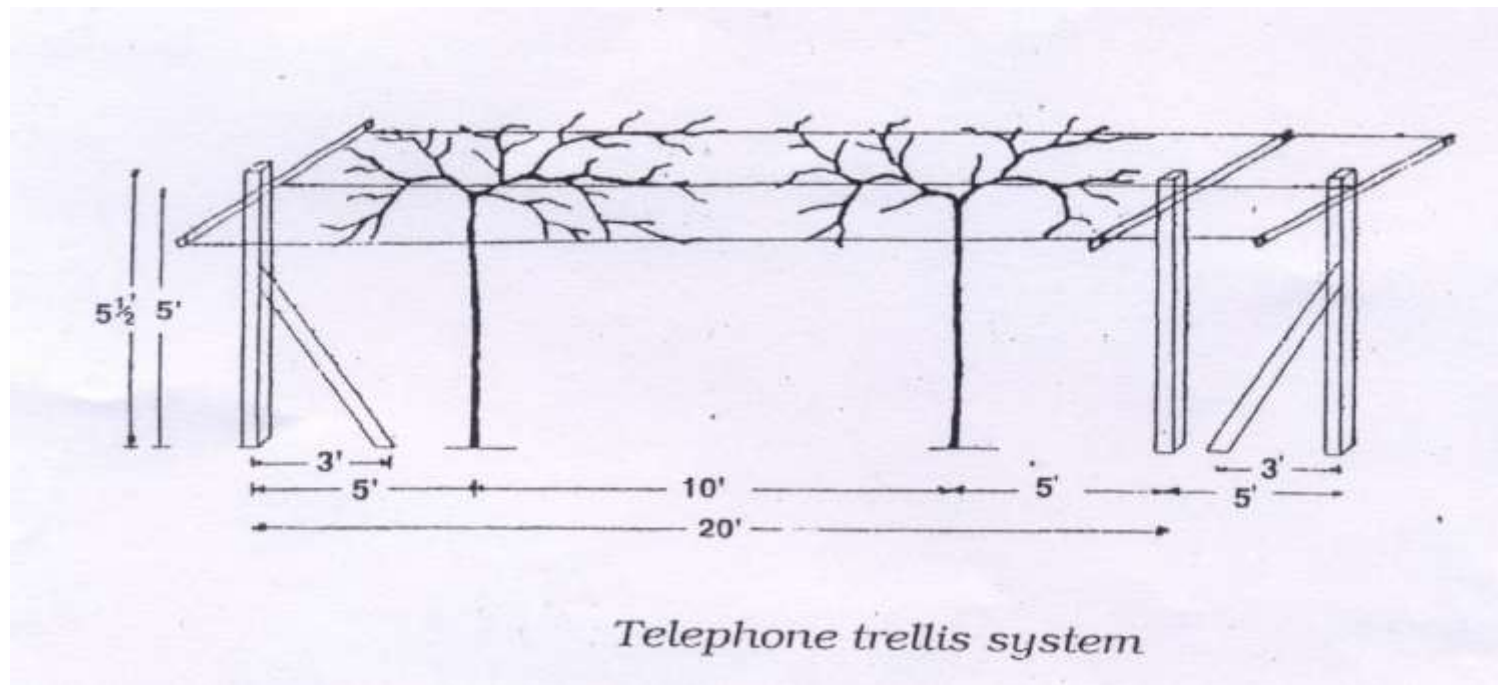
❖ Vines are planted at 2-4m distance between 2 poles supported by sticks to allow single stem to grow with one arm horizontally to either side so that each arm having with the results into 4 arms.



Vines trained on Kniffin system.

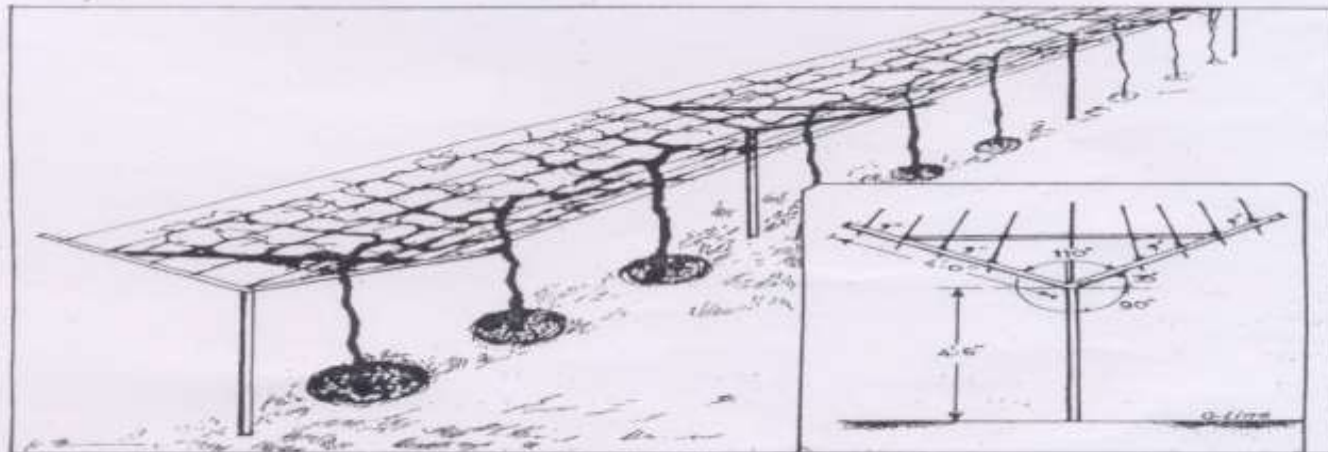
TELEPHONE SYSTEM:

- Under this system, 'T' trellis is used with 3 top wires on 'T' shaped supports which looks like a 'Telephone pole and wires'.
- Here, primaries are developed to grow from the main stem. From these primaries short secondaries of 30-45cm are developed on both the side at an irregular intervals forming an umbrella type of frame work.
- These secondaries are developed the fruiting canes.



TATURA TRELLIS OF V / Y- TRELLIS SYSTEM :-

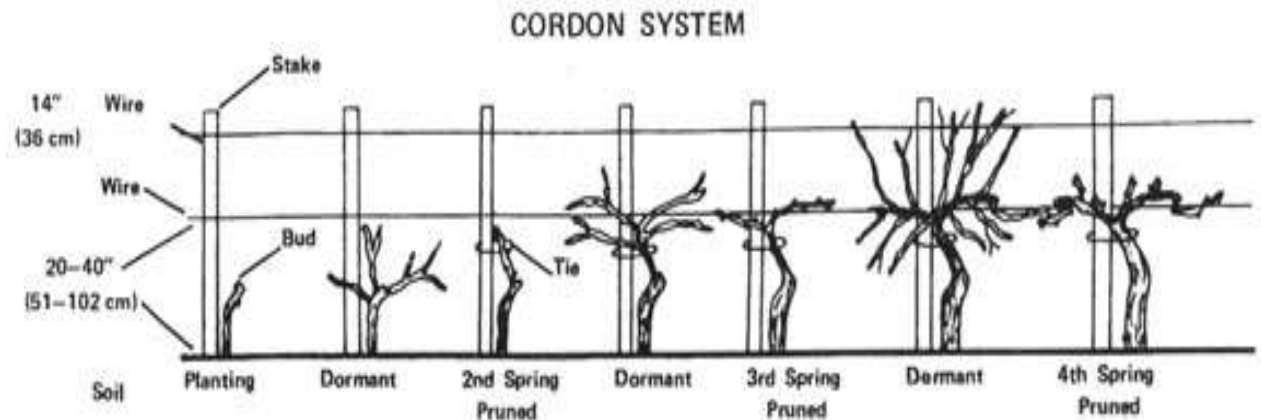
- ❖ This is suitable for vigorous vines. Here, trellis are fixed in rows at a distance of 25 cm. The length of 'Y' is 1.2 m. The angle between two arms of 'Y' is 100 - 110° and length of arm is 90 - 120 cm.
- ❖ Here, two rows of cordon wires are developed with a gap of 50 cm. The number of cordon can be one/two as per the choice of the grower and vigour of the vines. It is better to provide two rows of cordon in vigorous vines.
- ❖ Three foliage wires are run across the each sloping arm with a gap of 30 - 35 cm. Rows of sloping arms are inter connected by a thick wire, across which run two more wires to support the foliage. Hence, under this system between the two rows, a narrow bower is formed.



Y-trellis system

CORDON SYSTEM :-

- ❑ Under this system of training to get better exposure of sunlight, the vines are planted obliquely at an angle of 45°.
- ❑ The plants are supported by wires and stretched tightly along the direction of the rows.
- ❑ Here, wires are placed to a height of 0.8 – 1 m, 1.5 – 1.7 m. and 2.5 – 3m. above the ground level.
- ❑ In the cordon system of training , generally the main trunk of the vine is allowed to developed up to a height of 3 m (i.e. position of the last wire is stretched) which carries the fruiting spurs on attaining to the different height of the wires, either one shoot from the main trunk is trained to extend horizontally on one side of the wire trellis *i.e.* unilateral horizontal cordon or two shoots are trained to extend *i.e.* bilateral horizontal cordon is developed.



✓ WEED CONTROL :-

- ✓ In young vineyard it is important.
- ✓ Spraying with pre-emergence herbicide (diuron, paraquat, simazine, atrazine, caragard, dalapon, etc.) both after pruning and before the onset of monsoon is effective.
- ✓ Caragard@ 5kg/hectare
- ✓ Semazine in autumn - winter is most effective.

MANURES AND FERTILIZER :-

Nutrient can influence on the yield and quality of grapes.

Following are the recommended dose for 'Thompson seedless' grape/per hectare :

- 10 cart loads of Cowdung.
- 500-750 kg. N
- 500 – 800 kg P₂O₅ in 2 splits
- 500-750 kg K₂O

1. 60% after March or April Pruning .

2. Rest after September – November Pruning along with the foliar spray of –

- @0.2 per cent boric acid
- @0.2 per cent ZnSO₄
- @0.1 per cent Fe SO₄
- @0.3 per cent Mg SO₄ – To reduce the bud, flower and berry drops.

IRRIGATION :-

- ✓ Proper irrigation schedule is urgently needed for good yield and quality berry production.
- ✓ Generally 2 – 3 days immediate after pruning by furrows of 60 cm between the lines of cuttings.
- ✓ Intervals between two irrigations – 10 to 14 days during Nov. – Feb, 7 – 9 days during Feb. – Mar. (ripening period).
- ✓ Drip is effective for dessert grapes.



HARVESTING :-

- Non – climacteric.
- Harvested at full ripe stage on the vine. with an optimum stage of maturity.

Harvesting indices –

1. Physical appearance of the bunch at highest level of size, colour of the berry , etc.

2. Climatic factors-

❖ In temperate climate >100c from the day of anthesis to ripening . In tropical climate (Hyderabad) 15 – 300 c.

❖ In Thompson Seedless - 2,0000c (3,6000F) heat unit summation.

3. Biochemical composition of berries (> 200 brix & 0.75% acidity).

YIELD :-

➤ Anab –e – shahi in hyderabad condition may yield up to 100 tonnes / hectare. (‘ Biological Wonder’).

❖ In general

i. Anab –e – shahi – 60 tonnes / hac.(South India).

ii. Perlette – 25 to 30 t / hac.

iii. Thompson Seedless – 15 to 20 t/ hac. (North. Inda.)



DISORDERS:

1. Ecological –

- i. Dead – arm of trunk splitting.
- ii. Alkali Injury

2. Physiological –

- i. Leaf chlorosis.
- ii. Cane immaturity.
- iii. Barrenness of vine
- iv. Rudimentary panicles.
- v. Water berries.
- vi. Short berries.
- vii. Cluster tip wilting.
- viii. Uneven ripening.
- ix. Chicken and Hen / Millerandge.

3. ECO – PHYSIOLOGICAL –

- i. Flower Bud or Flower Drop/ Colure/ Shelling.
(French)
- ii. Blossom – end rot.
- iii. Pink Berry.
- iv. Berry Cracking and rotting

4. NON- SPECIFIC -

- i. Rachis Cracking
- ii. Stem Necrosis / Stiellahme.

Hens and chicks

"Hens and chicks" is when a **grape** bunch contains berries of different sizes and levels of maturity. The normal-sized, seeded berries are the "**hens**," and the small, seedless berries are the "**chicks**." It's believed to be caused by cool weather during flowering. (This is also known by a French term, millerandage.)

Management:

- ❖ Soil application of borax(Sodium tetraborate) 12-32 Kg/acre.
- ❖ Foliar application of solubor(20.5%B),0.25% 3 times every 15 days ,beginning from 5th -6th leaf development stage.





Cluster tip Wilted

Cane Immaturity

DISEASES :-

Fungal –

- i. Anthracnose.
- ii. Downy Mildew.
- iii. Powdery Mildew.
- iv. Rust
- v. Root rot . etc.

Bacterial –

- i. Blight.
- ii. Black knot.

Virul –

- i. Fan leaf.
- ii. Vein Banding
- iii. Leaf Roll.
- iv. Yellow Vein, etc.

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Downy mildew :

❑ Downy mildew is an extremely serious fungal disease of grapes that can result in severe crop loss. It is caused by the fungus (*Plasmopara viticola*).

❑ The pathogen attacks all green parts of the vine, especially the leaves. Lesions on leaves are angular, yellowish, sometimes oily, and located between the veins.

Management:

➤ Downy mildew is comparatively easy to control on most plants when the foliage and fruit are kept protected by a Mancozeb/Copper spray 0.3%.

➤ The systemic action of Organocide moves throughout the entire plant to treat common disease problems. Spray to run-off, as required for disease control.



Powdery mildew :

- Powdery mildew is the most persistent fungal problem of grapes in WA and one of the most widespread fungal diseases of grapevines in the world.
- It is caused by the fungal pathogen (*Erysiphe necator*) and seen as ash-grey to white powdery growth on green tissue of the vine. It affects both table grapes and wine grapes.

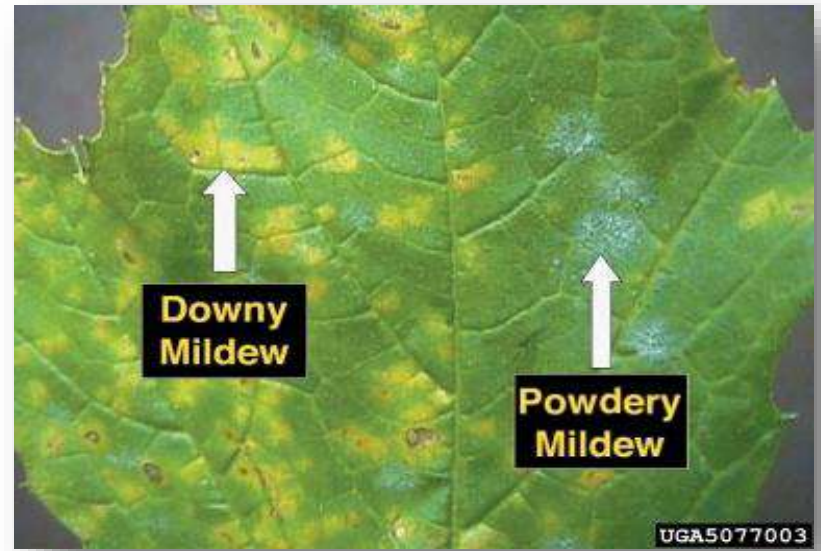
Management:

- Apply sulphur dust 2 kg/ha, karathane 0.2% fungicide to prevent infection of susceptible plants.
- For best results, apply early or at first sign of disease.
- Spray all plant parts thoroughly and repeat at 7-10 day intervals up to the day of harvest.





Antracnose



Black Knot



Fan Leaf



Leaf Roll

PESTS :-

- i. Stem Girdler.
- ii. Stem- Borer.
- iii. Mealy Bugs,
- iv. Thrips.
- v. Scale Insects, etc.

Mealybug Control:

- Prune out light infestations or dab insects with a Q-tip dipped in rubbing alcohol.
- Do not over water or over fertilize — mealy bugs are attracted to plants with high nitrogen levels and soft growth.



Stem Girdler

Sthenias grisator

- Female beetle - girdles the branches and inserts whitish spindle shaped eggs singly into the tissue in a slanting manner.
- branches above the girdle wither and dry.



- Swab Coal tar + Kerosene @ 1:2
- Injection of dichlorvas + monocrotophos solution into bore holes - Clay



Thrips



Scale Insect

Thank

you

