

## Viticulture in the tropical regions of India

by

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Most of the grape varieties of the world belong to the species *Vitis vinifera* L. This species has a wide adaptability and its culture has spread to countries with varying climatic conditions. Hitherto, based on limited experience, it has been generally believed that grapes do not perform well in the tropics, as "the vine stays evergreen and is capable of producing only small crops of very poor quality" (WINKLER 1962, pp. 54). However, in recent years, grape culture has been quite successful in the equatorial and tropical regions of Southern and Western India where the growth is continuous and the vine stays evergreen throughout the year. The purpose of this report is to describe the special attributes which have made grape growing not only possible but also a notable success in these tropical areas.

### Observations and Discussion

The present area under grapes in India is estimated to be close to twenty thousand acres. The country can be divided roughly into two distinct zones where commercial grape cultivation has been established in the last 10 years: (1) North India — where the vine is deciduous and in a definite rest period from the end of November to middle of February. Delhi (28'.35° N latitude) is typical of this region.

(2) Southern and Western India — where the vine has continuous growth without any definite rest period. Poona (Maharashtra) (18'.32° N latitude), Bangalore (Mysore) (12'.58° N latitude) and Hyderabad (Andhra) (17'.27° N latitude) are typical of this region (Fig. 1). Here most of the grapes are grown at elevations of less than 1500 feet above sea level.

The most important factor which has contributed to successful grape culture in our tropical regions is, in our opinion, the practice of pruning the vines twice a year. The first pruning is done in October which corresponds to regular dormant season pruning of Northern India and other temperate grape growing areas of the world of the Northern hemisphere. The fruiting canes are pruned to 4—10 buds, depending upon the variety, and the growth starts within a few days. The crop is harvested from late January to late March, depending upon the variety, location and the time of pruning. After harvest of the fruit, the vines are left intact for about a month to replenish the supply of carbohydrates (by photosynthesis) and then, the vines are pruned in April to a single bud. This is referred to as "foundation or back pruning". The growth starts after a few days. Any flower clusters which emerge are pinched off. The purpose is to let the wood mature for the October pruning. This practice of pruning twice in the year is remarkable in that the two basic functions of the vine, viz. (a) the maturity of the fruit and (b) the differentiation of fruit buds and maturity of the wood, are performed independently of each other at different times. Because of the good growth conditions, the whole process of differentiation is accelerated so that there is ample time (April to October) for the flower bud primordia to be formed and for the maturity of the canes for the next crop. This situation is in contrast to the growth conditions in the temperate

zones where the maturity of both fruit and wood for next year's crop must be achieved at the same time. Consequently, the yields obtained under such conditions are much less. The yields obtained by the grape growers of Poona, Bangalore and Hyderabad are truly spectacular. Yields of 30000—40000 lbs per acre are quite common.

The mean monthly temperature for the period, when the crop is on the vine, for Poona, Bangalore and Hyderabad (October to March); along with Delhi (March to June), and different locations in California (April to October) are given in

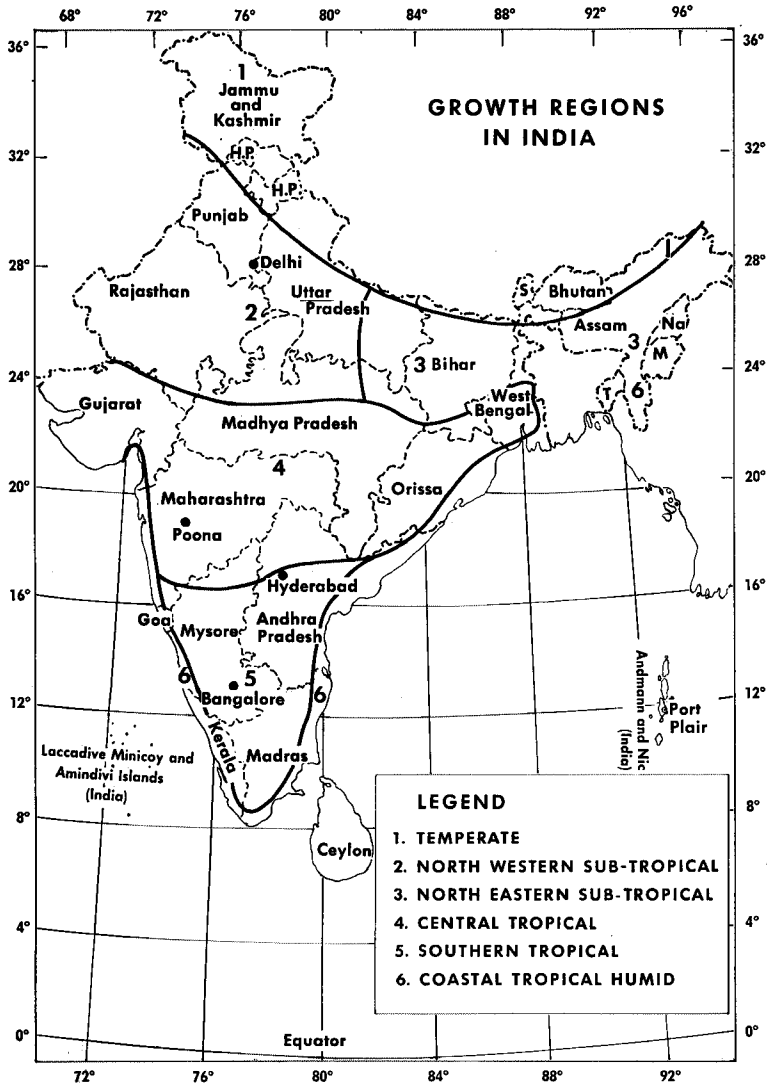


Fig. 1: Map of India showing the growth regions as marked by the Indian Council of Agricultural Research: Poona and Hyderabad are located in the central tropical region; Bangalore is located in the Southern tropical region and Delhi is in the North Western sub-tropical region of India.

Table 1

Mean monthly temperature as F degrees for the growing season in Delhi (North India); several locations in California, and the tropical regions of India

Growing season	Warm Sub-tropics	Warm temperate				Growing-season	Tropics		
	Delhi	Davis	Lodi-Stockton	Fresno	Bakers-field		Hyder-abad	Poona	Banga-lore
April	83.4	57.2	58.1	60.2	62.6	October	77.0	73.4	73.8
May	92.3	63.1	63.4	67.1	69.8	November	72.1	73.2	70.7
June	93.7	70.0	69.5	75.8	77.6	December	69.1	69.8	68.9
July	88.1	74.6	73.4	82.1	83.9	January	70.9	70.5	69.8
August	86.0	73.2	72.2	80.7	81.7	February	75.0	73.5	73.6
September	84.7	69.2	68.4	73.4	74.0	March	81.3	79.5	78.0

Table 1, for comparison. The mean temperatures in tropical regions during the period the crop is on the vine are moderate and compare quite favourably with mean monthly temperatures for the locations listed in California<sup>1</sup>).

In North India, because of the higher temperature, the period during which the fruit is on the vines is short (March-June) and the ripening proceeds much faster. Varieties like Thompson Seedless ripen before the first or second week of June. In contrast, in Southern and Western India, the ripening proceeds slowly and the fruit borne after the October pruning, develops during months of moderate temperature and dry weather followed by a hot dry season at the time of ripening during February-March (Fig. 2). Thus, the quality attained is also high.

It is quite possible to have a second crop (i. e. after April pruning) as well. However, this crop ripens during the rainy season and is hence insipid and of poor quality. Growers, therefore prefer not to take this crop. All the flower clusters which develop are removed.

Around Bangalore, 'Bangalore Blue' — a *V. labrusca*-type variety, is also being grown commercially. This variety is fairly resistant to diseases. Two crops are taken per year. The vines are pruned to spurs of normal length (3—6 buds) a few days after the harvest of a crop. No foundation or backspur pruning is usually practised in this variety. The vineyard is usually divided into blocks and the pruning time staggered in such a way that the fruit is available almost throughout the years. It is, therefore, not uncommon to see all stages of the vine growth — ranging from vines with young shoots to those with mature crops — in the same vineyard.

Other factors contributing to the successful grape culture in the areas under discussion are (1) heavy manuring (up to 500 to 1000 lbs. per year) (most of soils have good drainage) (2) regular plant protection measures, (3) proper weed control, (4) good drainage of soils and (5) proper irrigation facilities.

All the varieties are planted on their own roots. So far no authenticated cases of phylloxera or nematodes have been reported. The grapes for the most part are trained on 10'×10'×7½' pergolas or bowers. For some more vigorous varieties the

<sup>1</sup>) Although it is realized that comparison of mean temperatures can hardly be stressed too much since the diurnal fluctuation is much different between the temperate and tropical zones, even-though the mean may be same.

distance between plants is increased to 20 feet. The training on 'bower' allows the development of a large framework required for the heavy fruiting.

Other unique features of viticulture in the tropics are:

1. The short time for the rooted cutting to reach bearing age (18 months). The first pruning is done after 10–12 months.
2. The seeds do not require any stratification and germinate within 20–30 days, without any pretreatment (CHEEMA 1967, and GOPAL 1967).
3. The seedlings come into bearing in about two year's time, which permits early evaluation of hybrids in the breeding programme.

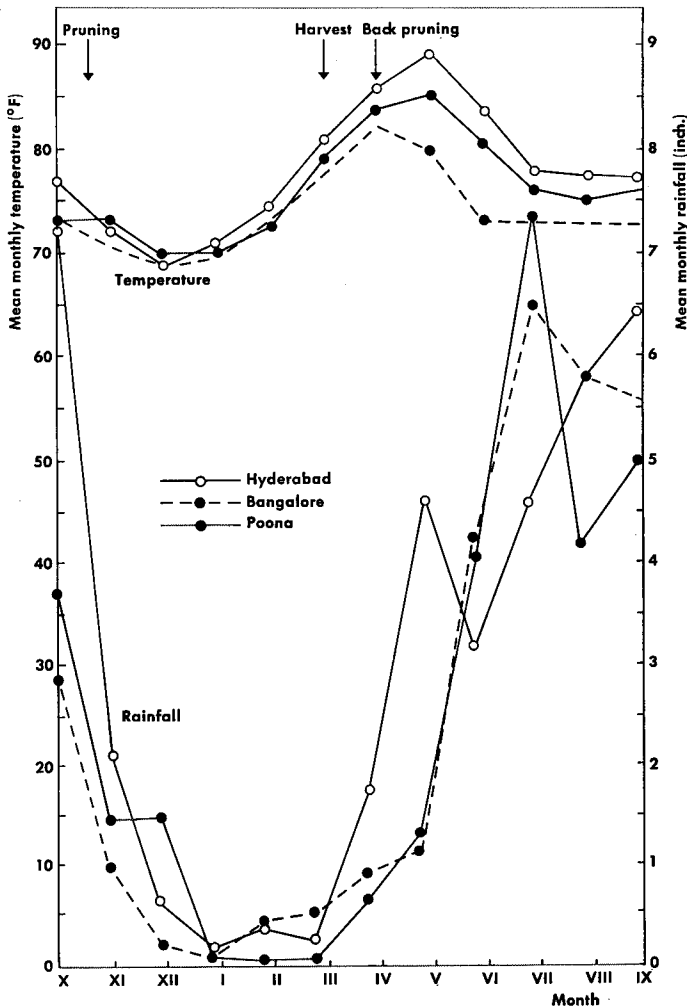


Fig. 2: Graph showing the mean monthly temperature; mean monthly rainfall and pruning and harvesting times in Poona, Bangalore and Hyderabad. Normal annual rainfall for Poona, Bangalore and Hyderabad are 28.5, 39.9 and 30.5 inches respectively.

4. The flowers can be made available almost throughout the year by adjusting the pruning time. Therefore, crosses can be made almost the year round.

At present, most of the grapes are being sold as fresh fruit, for which there is a great demand and the profits are still very high. The tropical grape growing regions are also potentially suitable for raisin making (Thompson Seedless attains upto 26—28° Balling) and for dessert wine varieties. Important commercial varieties grown in these regions are: Anab-e-shahi, Selection 7, Thompson Seedless, Bhokri, Gulabi, Kali Sahebi and Bangalore Blue. Brief descriptions of the local varieties are given in Appendix A for the benefit of viticulturists outside India. Varieties like Cardinal, Emperor and Castiza have been found to be superior in some ways to some of the existing commercial varieties and their cultivation is now being encouraged.

### Summary and Conclusions

By an intelligent appreciation of the vine's physiology grapes are being grown successfully in the tropical regions of India, where the vine stays evergreen throughout the year. The vines are pruned twice a year, once in April for vegetative growth and again in October for the fruiting cycle. The canes which bear the fruit are less than one year old. But, since the growth is continuous and rapid, the canes are equivalent in development differentiation to one-year-old canes of the warm temperate and sub-tropical grape growing regions.

The ever present over-abundant crop potential of the vine has been exploited by separating out the period of maturity of fruit and maturity of the wood for the next crop. The yields are very high as the depressive effects of high crops are eliminated by 'back or foundation' pruning in April and by heavy doses of fertilizers and manures at the time of pruning.

The growers have been able to harvest grapes almost the year round of the 'Bangalore Blue' (*V. labrusca* type) by staggering the pruning. In the *V. vinifera* types, the grape season is also extended, within limits, by adjusting the pruning time.

Because of shorter period in which the vines come into bearing, ready germination of seeds and the year round availability of flowers, this area is ideal for breeding and genetic studies.

As has been shown by the successful grape cultivation in the tropical regions of India, it seems probable that some grapes will do equally well in other tropical regions of the world where the climatological conditions are similar.

### Literature Cited

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2. CHEEMA, G. S.: Personal communications (1967).
3. GOPAL, B.: Personal communications (1967).

### Appendix A

#### 1. Anab-e-shahi: Synonym: Malta

Vigorous; seeded; very heavy yielding; bunch very large, slightly shouldered or conical, well filled; berries large to very large, oval, pale; excellent keeping quality; low Total Soluble Solids (T.S.S.) 16—17%; total titrable acidity 0.45—0.55%; late maturity.

2. **Bhokri:** Synonym: Pachadraksha

Vigorous; seeded; heavy yielding; bunch medium to large, usually shouldered, compact; berries green, medium, oval with soft pulp; medium in T.S.S. 18—19%; high acidity 0.75—0.85%; keeping quality poor; mid to late maturity.

3. **Selection 7:** Origin: Open pollinated seedling from the variety "Pandari Sahebi".

Vigorous; seeded; very heavy yielding; bunch large, multiple and pyramidal shape; berries large, oval; good quality, T.S.S. up to 22 per cent; shipping quality poor because of weak pedicel attachment; late maturity.

4. **Gulabi:**

Medium vigor; seeded; medium yielder; bunches small and loose; berries small, colored, spherical with thick skin; good keeping quality) T.S.S. up to 20.0%; muscat flavor; early maturity.

5. **Kali Sahebi:**

Medium vigor; seeded; medium yielder; bunch medium to large, well filled; berries black, large and elongated like the berries of 'Olivette Blanche', pulp firm; high quality; T.S.S. 22.0%; good shipper; late maturity.

6. **Bangalore Blue** (*V. labrusca* type):

Medium vigour; seeded; medium yield; bunches small and compact; berries small to medium, spherical, thick skin which separates, dark blackish purple, pulp pale green; T.S.S. 18—19%; titrable acidity 0.8—0.9%; good keeping quality; high resistance to anthracnose and downy mildew; This variety is being used on a limited scale for making sweet dessert wine.

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