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**Viticulture in the Brasil's ...  
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## Viticulture in the Brazil's Semi-arid Regions

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**Abstract.** Grapes are cultivated in different Brazilian states. The most important production regions are the South (43,961 ha), Southeast (11,968 ha) and Northeast (6,100 ha). The Northeast region stands out as the main region producing and exporting table grapes in Brazil. The species grown is *Vitis vinifera* L., and 80% of the production is concentrated in the cv. Italia and its mutations Benitaka and Brazil, as well as, Red Globe and Patricia (hybrids originated from Instituto Agronômico de Campinas Breeding Program). The seedless varieties Superior Seedless, also known as Festival, and Crimson Seedless have acquired great importance, increasing the cultivated areas. The main wine varieties for young and aromatic wines are Petit Syrah and Cabernet Sauvignon (black), Chenin Blanc and Moscato Canelli (white).

**Resumen.** La vid es cultivada en diferentes provincias brasileñas, todavía, las más importantes regiones de producción son Sur (43.961 ha), Sudoeste (11.968 ha) y Nordeste (6.100 ha). La región Nordeste se destaca como la más importante zona de producción e exportación de uvas de mesa del Brasil. Las variedades cultivadas pertenecen a la especie *Vitis vinifera* L., y un 80% de la producción está concentrada en las variedades Italia y sus mutaciones Benitaka y Brasil; bien como, Red Globe y Patricia. Las uvas sin semillas pertenecen a la variedad Superior Seedless, también conocida como Festival y Crimson Seedless. Las principales uvas para viño jóvenes y aromáticos son la Petit Syrah y Cabernet Sauvignon (viños tintos), Chenin Blanc y Moscato Canelli (viños blancos).

Grapes are cultivated in different Brazilian states, and the most important production regions are the South (43,961 ha), Southeast (11,968 ha) and Northeast (6,100 ha). Although the South of Brazil comes as the largest grape growing area of the country, it is worth to point out that the grape produced in that area is destined, mainly, to the wine grapes, while in the Southeast and Northeast regions are more important the table grapes. The grape growing in the Northeast of Brazil is concentrated mainly on the area of the São Francisco River Valley, in the countryside of Pernambuco and Bahia State, at 9°09 'S, 40°22 ' W, and average altitude of 365.5 m. The climate is classified as Bash type corresponding to a very hot semi-arid climate, the annual average temperature being 26.4°C, with minimum of 20.6°C, and maximum of 31.7°C; mean annual precipitation of 400 mm and relative humidity varying from 57 to 67%. Favored by good natural resources and by the public and private investments in irrigation projects, this area is in a great expansion in the cultivated area and crop load of grapes. Viticulture represents a great economic and social importance, in the measure that involves an annual volume of business involving the whole marketing chain, and it stands out among the crops as the one that presents the largest coefficient of generation of direct and indirect employments.

It is important to mention that viticulture in the tropical semi-arid of the Northeast presents many differences compared with the ones in temperate climate due to the adaptation and differentiated behavior of the vine in those climatic conditions. The physiologic processes are accelerated, the propagation is very fast and, in about one and a half years after vineyard establishment begins the first crop. Considering that the yield cycle oscillates around 120 days, it is possible to obtain two crops a year, through irrigation and pruning management. So there is harvesting all the year and high yields about 40 t/ha/year are obtained, that is above other Brazilian grape areas. On the other hand, it also allows the harvest of the fruits in periods of higher prices, makes viticulture a culture with smaller risks and high economic profitability.

**1. Varieties:** The *Vitis vinifera* table grapes include varieties of European origin that are sensitive to the fungal diseases and highly demanding in cultural practices. All the exported varieties are included in that group or they are hybrids between them and some other species of *Vitis*.

1.1. Rootstocks : The rootstocks are widely used in São Francisco Valley due to their nematode tolerance and their effects on the vine plant. The varieties that have been presenting satisfactory behavior for table grapes are hybrids obtained at the Instituto Agronômico de Campinas: IAC 313 or 'Tropical', IAC 572 or 'Jales' and IAC 766 or 'Campinas'. However other important rootstocks are also being researched, such as, Salt Creek, Dog Ridge, Courdec 1613, Harmony, 420-A, Paulsen 1103 and SO4, specially with seedless grapes.

1.2. Table grapes and wine grapes: The most important table grapes are Italia and its mutations Benitaka and Brazil, Red Globe and Patricia (hybrids originated from Instituto Agronômico de Campinas Breeding Program). The seedless varieties Superior Seedless, also known as Festival, and Crimson Seedless have acquired great importance, increasing the cultivated areas. The main wine varieties for young and aromatic wines are Petit Syrah and Cabernet Sauvignon (black), Chenin Blanc and Moscato Canelli (white).

**2. Trellising and Training:** The vines are usually spaced 3 to 4 m between rows and 1.5 to 3 between vines, which corresponds to a density between 952 up to 3,333 plants/ha. The horizontal overhead-wired trellis is extensively used as it promotes more marketable bunches because they are more attractive and show uniform maturity. This happens because the bunches hang isolated, free of being rubbed by leaves, shoots or trellis wire. The vines are trained to one side and then divided

along the training wire to form a bilateral cordon. Then the crossarms are alternate each side of the main arm, and the training system is called "fish spine".

Under tropical conditions first pruning is carried out about one year after the planting. This period can be shortened, if rootstocks are established and the vines are grafted on the field. The pruning can take place in any time of the year after the period of rest, that ranges from 30 to 60 days, when the vines complete their maturation of the branches and accumulate carbohydrates to be mobilized in the next cycle. A reduction of the amount of irrigation is necessary to stop the vegetative growth during this period.

The pruning system used is a head-training, cane pruning with one replacement spur for each cane and canes wrapped horizontally along a trellis wire. Cane length is about 8 to 15 nodes usually accompanied by 2-node replacement spurs which can provide the canes for the following cycle (Leão and Possidio, 2000). One problem typically observed is the 'apical dominance' that has been solved with the spraying of cyanamid hydrogen (Dormex) immediately after pruning.

### 3. Techniques to improve table grape quality

**3.1. Shoot thinning :** The main purpose is to open up the vine canopy and improve the ventilation and exposure of the remaining shoots. It is started early when the shoots have about six visible internodes.

**3.2. Shoot topping and tipping :** The removal of the shoot tips is done to force the development of secondary shoots that are originated from axillary buds. The shoots are fruitful in seedless grape variety 'Superior Seedless'.

**3.3. Leaf removal:** Two, three or sometimes whole laterals are removed nearby of the bunches, especially if they are shaded. The practice is important to allow sun and air penetrate the vine, which facilitates pest control and make it more efficient. It also facilitates harvesting by removing leaves that may interfere with bunches and by making fruits more visible.

**3.4. Inflorescence and bunch thinning :** These operations are carried out, respectively, before and after flowering aiming at the crop regulation for selectivity and quality improvement. It is especially useful during the first cycles when fruitfulness is high but reserves are low due to the limited development of the vine.

**3.5. Bunch tipping:** It is the removal of parts of bunches after set to regulate crop load and improve bunch shape and size to produce a smaller bunch that is more marketable.

**3.6. Berry thinning:** It is made in two different stages of berry development, as soon as after berry set and before the berries are large enough to touch each other. All undeveloped and short berries are removed. It results looser bunches, larger berries and uniform development of colour and maturation of the fruit.

### 4. Growth regulators

**4.1. Hydrogen cyanamide:** Hydrogen cyanamid is sprayed immediately after pruning with 2.5 a 3.0% cyanamide (e.g. Dormex). All arms and branches are completely wetted. The main purpose is to stimulate earlier and more uniform bud burst.

**4.2. Gibberellic acid (GA):** GA is widely used in Northeastern Brazil tablegrape growing to improve bunch and berry size. The rate and time of application depends on the variety, the weather and plant vigour. It has been used for most of the varieties, seeded and seedless grapes in this region. GA is sprayed directly on the bunches, but avoiding spraying all the foliage because bunch numbers may be reduced during the next cycle.

**Bunch elongation:** 1.0 to 10.0 ppm GA sprayed onto bunchstems when bunches are 2.0 to 3.0 cm of length causes them to grow longer and helps prevent excessive compactness.

**Thinning:** GA sprayed on flowers as they are beginning to open reduces the number of berries on the bunch, i.e. it has a thinning effect. It is not used for most of the varieties in the region, except Thompson Seedless.

**Berry size:** GA increases berry size when applied during fruit set (when the berries approach 3 mm diameter) and late, at 10-15 days after fruit set. It has been made one to three separate sprays during this period, and the concentrations can vary from 10 to 40 mg/L, depending on the variety.

**4.3. Ethephon:** Ethephon has been used in the São Francisco Valley to improve the berry colour in the red varieties. 'Red Globe' presented uniform and better colour when sprayed with 100 to 400 ppm ethephon at veraison (Leão and Assis, 1998).

**5. Fertilization:** Soil and tissues analysis have been used to predict when acidity, alkalinity, salinity or toxic agents are hazardous to grapevine, as well as to evaluate the potential availability of the nutrients to the vines. Soil analysis may be made once to every two years and tissue analyses each cycle to verify the fertilizer demand. There are two main methods of nutrient application: placement of the fertilizer in narrow bands or furrows adjacent to the vine or in the root zone to a depth of 15-30 cm below the surface of the soil, and through sprinklers or drippers, especially using urea and other soluble fertilizers. Foliar sprays are also used as supplement to the other methods.

**6. Irrigation:** Irrigation management of the vine consists of five different segments, selection of the irrigation system, planning of the irrigation, water management, root distribution and integration among water and nutrients management (Monteiro and Costa, 2000). Irrigation systems used in vineyards in São Francisco Valley can be classified as pressurized and non-pressurized types. The main non-pressurized method is furrow, although its use is declining. Pressurized systems comprise both over-canopy and under-canopy (sprinklers, micro-jets and drip).

The micro-jets and drip methods have advantages compared to other methods and they have been recommended in the region. They have higher efficiency and water and labor economy, allowing the automation of the system too.

**7. Pest and diseases:** The main fitossanitary problems are the fungal diseases (downy mildew, powdery mildew, black spot, descending death) and bacterial (bacterial cancer caused by *Xanthomonas campestris* pv. *viticola*). The pests can be a problem when they are not controlled, especially mites, thrips and scale. The control methods follow the principles of integrated management of pests and diseases based on economic damage levels in agreement with the rules established by Integrated Production of Grapes in this region.

**7. Harvesting and handling:** Ideally, harvesting is done during cool conditions, preferably in the early morning. The bunch is harvested with picking snips or secateurs, the cut being as close to the supporting stem as possible. Grapes should be held by bunchstem during picking and trimming to minimize loss of bloom. After picking the grapes are carefully placed in boxes and transferred to the packing house. For the export market, 4.5 kg fibreboards cartons are commonly used for European destinations but there are a wide variety of internal dimensions designed to meet the preference of each market. The boxes are palletized, then pre-cooled and putting storage. To preserve quality, grapes are cooled immediately after harvest to below 10°C. The temperature of storage recommended range is 0° to 2°C and relative humidity near 95%.

The production area in the São Francisco Valley is located hundreds of kilometers from domestic markets and export exit points. The domestic marketing extends through the whole year, while the export marketing period occurs from April to early June and from October to December. The domestic market is the most important; only 10% of the table grapes are exported, and the main destination is Europe. A reputation for good quality, got by self-imposed standards of growers and packers gives rewards in market volume and price. The increase in the volume of export earnings of Brazilian table grapes – increasing 281% from 1997 to 2000 – suggests that good methods have been adopted.

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