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Meteorological Behavior and its Influence on the 2005 Vintage in Serra Gaucha

Francisco Mandelli[1]

The meteorological elements have great influence on the development, production and quality of the grapes form Serra Gaucha. This influence happens throughout the phenological stages of the grapevine, that is, since its dormancy (winter), sprouting, flowering, fructification, growth of the berries (spring), ripening (summer) until the leaves fall down (fall). Each phenological stage needs a suitable quantity of light, water and heat so that the grapevine can develop and produce grapes with quality.

The study of the climate of the 2005 vintage was based on the meteorological data and climatological normals supplied by the station of Embrapa Uva e Vinho (Fig. 1). This station is located at an altitude of 640m and has been used to characterize the behavior of grapevines in Serra Gaucha, even though the grapevines, in this region, are grown in altitudes that range from 200 m to 900m.

The meteorological data of the 2005 vintage were compared to the climatological normal1961/1990, in the main phenological stages of the grapevine, as follows:

a) Vegetative dormancy – the grapevine**,** during fall and winter, begins its dormant period due to the decrease in the air temperature. The low temperatures that occur in June, July and August are fundamental for the grapevine, because the colder this subperiod is, the better the dormancy will be and the better the conditions for the sprouting of the grapevine will be. During the winter of 2004, there were six frosts and the number of hours when the temperature was below 10^0 C totaled 605 hours. This figure was 53 hours lower than the average of the years 1976/2003, but that was enough to provide good conditions for the grapevine sprouting.

b) Sprouting – the grapevines sprout at the end of winter and beginning of spring time, as the temperature rises. The grapevines with early sprouting began to sprout in the beginning of September while the ones with late sprouting started in the beginning of October. The temperatures in September were much above and in October they were a little below the climatological normal. The rainfall was very close to the normal both in September and October. These features provided good conditions for the ripening of the grapevine.

[1] Eng. Agrôn., Dr., Pesquisador, Embrapa Uva e Vinho, Caixa Postal 130, CEP 95700-000 Bento Gonçalves, RS. E-mail: mandelli@cnpuv.embrapa.br

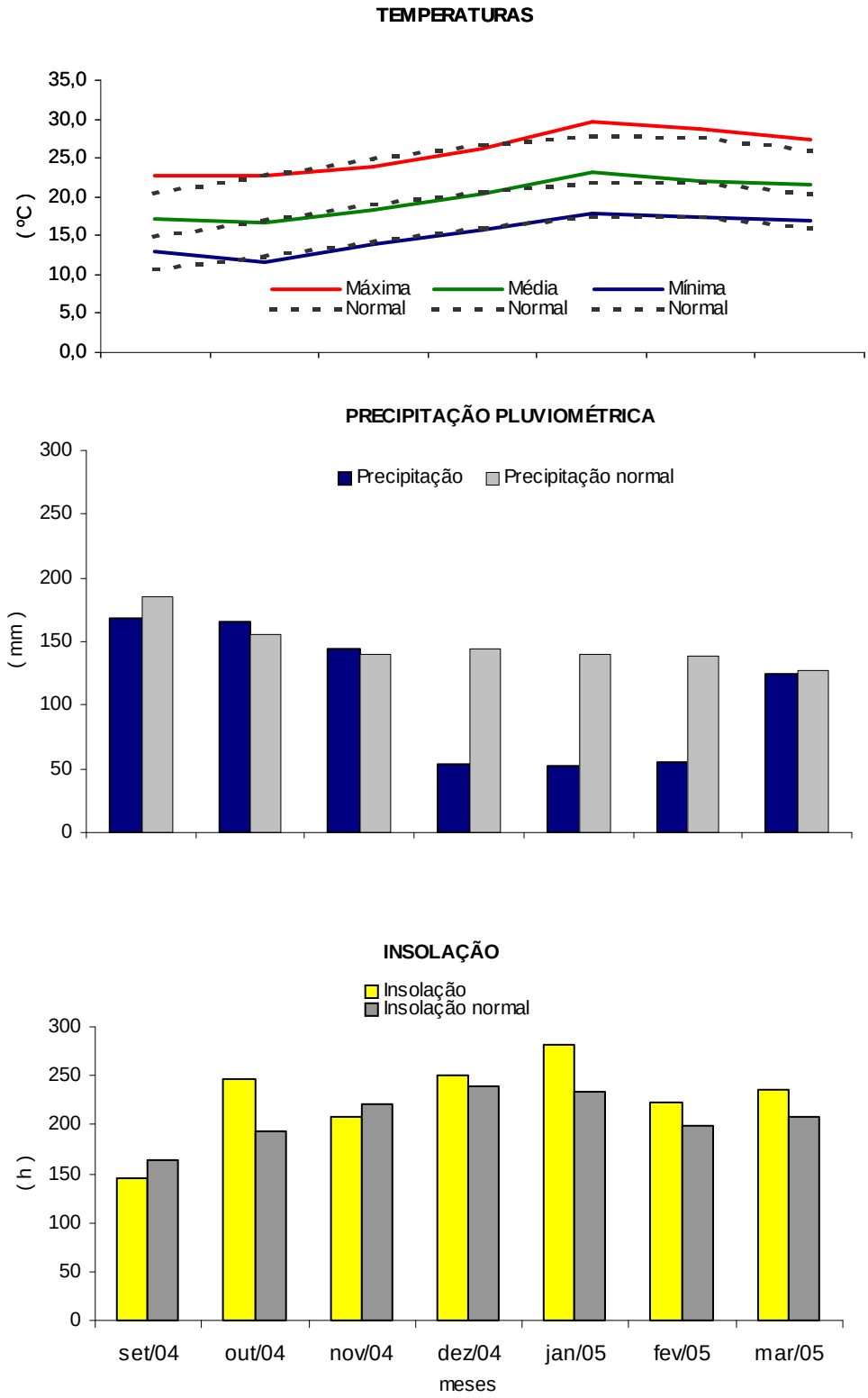

Fig.1. Meteorological behavior (maximum, medium and minimum air temperature, rainfall and insolation) in the 2005 vintage in relation to the climatological normal (1961/1990). Bento Gonçalves, RS.

Source:Embrapa Uva e Vinho

c) Flowering-Fructification – this subperiod is one of the most critical for the grapevine because it determines, in great part, the quantity of grapes to be harvested during the vintage. For the

adequate development of the flowering and fructification, it is necessary dry and sunny weather, with temperatures above 18^0C. This subperiod started in the middle of October for early cultivars and continued through mid-November, for later cultivars. In this subperiod temperatures in November were a little below in comparison with the climatological normal of the region. The precipitation and the insolation were similar to the normal. These features provided good conditions for flowering and fructification of the grapevine. On October 18 there was a hail storm that damaged the grapevines mainly in the city of Cotiporã.

d) Ripening-Harvest – this is the subperiod that most influences the quality of the vintage. During the ripening subperiod, sunny days with reduced precipitation are fundamental to obtain healthy grapes with balanced rate of sugar/acidity, among other components, essential characteristics to make wines with quality. Fig. 1 shows that the temperatures and insolation were higher from December through February, in comparison with the climatological normal. It is important to point out that not only the quantity of precipitation, but also its intensity, distribution and number of rainy days must be taken into consideration, since heavier rain, interspersed with periods of sunny days, is less harmful to the quality of the grapes than a period of cloudy days and/or with lower precipitation.

The number of rainy days (Fig. 2), during the ripening subperiod, was much lower in the 2005 vintage in comparison with the climatological normal of the region.

The 2005 vintage was characterized by severe drought that started in mid-November and continued through the entire period of ripening, causing harvest loss, especially for those grapevines planted in shallow soil. Due to the water stress, the grapevines in these places lost their leaves and the berries withered; this process was accelerated by the direct solar radiation, leading to the anticipation of the harvest.

Grapevines located in deeper soil, where the recommended plantation practices have been adopted, grew vines that resisted drought much better and benefit from it. The water restriction during the fruit growth period reduced the size of the berry and consequently the weight of the cluster. The reduction of the berry size resulted in clusters less compact and, thus, less vulnerable to rottenness. In this vintage there was an increase in the relation between skin/pulp which, associated with the health of the berries, allowed the berries to be harvested when their skin, pulp and seeds had reached an ideal ripening stage. The absorption of water by the grapevines with a higher restriction level than the normal yield fruit with more concentration of sugars and mineral and organic substances.

Since 1940, records have shown that droughts similar to the 2005 vintage, when the accumulated precipitation from December through February totaled 160 mm, happened in the vintages of 1943 (153 mm) and 1945 (108.9 mm), while the normal precipitation for this period is 423 mm.

Normally, the harvest starts on the first days of January and continues through the beginning of March. However, in this vintage, the harvest started in mid-January, for early cultivars, and continued through the end of March for late cultivars. Generally speaking, grapes from this vintage were not harvested because of their sanitary state, but because of their ripening level. Thus, the

climatic conditions combined with the adequate handling of the grapevines allowed the grapes to be harvested later and reaching the desired ripening level.

In this vintage, early ripening grapes, such as Chardonnay, Gewürztraminer and Pinot Noir, started to be harvested in mid-January and continued through mid-February. During this period, the insolation was higher and the precipitation was lower than the climatological normal, resulting in an evolution of the ripening well above the average conditions of the region.

Intermediate ripening grapes, such as Riesling Italico and Merlot, which were harvested from the end of January through the end of February, also had excellent meteorological conditions in comparison with the climatological normal.

Late ripening grapes, such as Cabernet Sauvignon, were harvested from the end of February through the end of March. These cultivars had a little lower ripening condition than the previous ones, although the insolation was much above and the precipitation was equal to the climatological normal of the region. It is important to say that this precipitation was concentrated on March 13, 14, 23 and 24, being originated from convectional rain, which is localized and irregularly distributed.

From December/2004 through March/2005, the accumulation insolation totaled 989 hours, while the normal for the region is 876 hours. For the same period the rainfall totaled 286 mm and 551 mm, respectively.

Summing up, the meteorological conditions of the ripening subperiod of the 2005 vintage were characterized by more sunshine hours (insolation), lower rainfall and fewer rainy days than the climatological normal for the region.

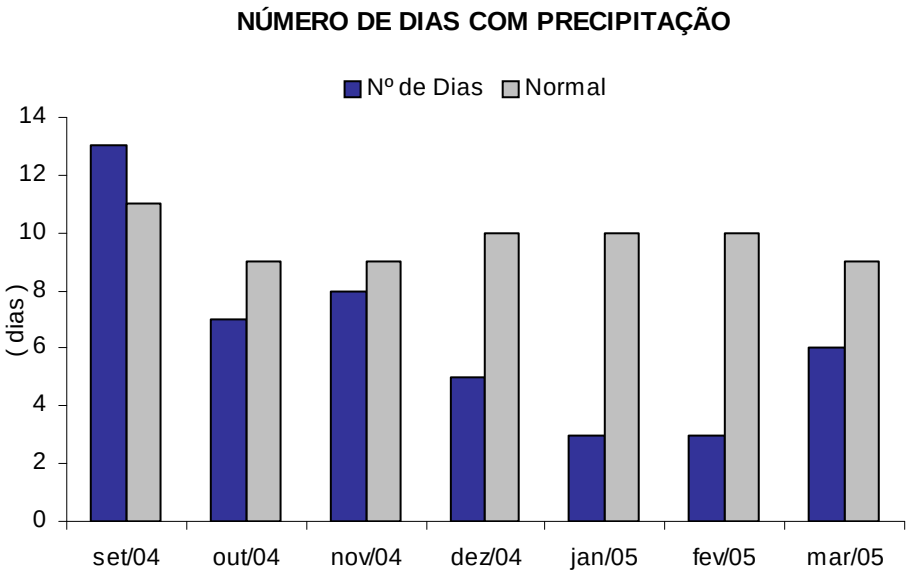

Fig. 2. Number of rainy days of the 2005 vintage in relation to the climatological normal (1961/1990). Bento Gonçalves, RS.

Source: Embrapa Uva e Vinho.

Comparative Analysis of the Vintages

The meteorological conditions to characterize the grape ripening in Rio Grande do Sul were established by Westphalen (1977), through the Ripening Heliopluviometric Index (QM). This index relates the effective accumulated insolation to the rainfall during the grape ripening subperiod (beginning with the change of the berry color through the grape harvest). An index value above 2 was considered ideal by the author, meaning that the higher the QM is, the better the conditions for the grape ripening will be. Table 1 shows the vintage QM of the vintages from 1996 to 2005, according to the period of the cultivar ripening.

Based on the QM, the meteorological conditions of the 2005 vintage were excellent for the early and intermediate grapes and very good (above average) for late grapes. Besides having more hours of sunshine, less rainfall and fewer rainy days the ripening subperiod of the 2005 vintage when compared to the climatological normal, was characterized by the health of the grapes and the drought (water restriction), consequently there was a reduction in the berry size (more relation skin/pulp) and in the average cluster weight. The climatic conditions allowed prolonging the grape ripening period enabling the berries to synthesize and accumulate more sugars, pigments, tannins, aromatic substances and their precursors (Zanus & Mandelli, 2004).

Table 1. Ripening Heliopluviometric Index (QM)[1] for different ripening periods. 1996/2005 vintages. Embrapa Uva e Vinho, Bento Gonçalves, RS.

Vintage	Ripening Heliopluviometric Index		
	Ripening period[2]		
	Early	Intermediate	Late
1996	1,37	0,36	1,72
1997	>2,0	0,95	1,54
1998	1,01	0,69	0,82
1999	>2,0	1,80	>2,0
2000	1,63	>2,0	1,56
2001	0,88	1,05	>2,0
2002	>2,0	1,44	1,62
2003	1,64	1,09	0,51
2004	1,69	1,25	>2,0
2005	>2,0	>2,0	2,0

[1] $QM = \frac{\text{Total insolation(h)}}{\text{Total precipitation (mm)}}$

QM > 2,0 considered ideal.

[2] Early: December 16 to January 15 (Chardonnay, Gewürztraminer); Intermediate: January 16 to February 15 (Riesling Italico, Merlot); Late: February 16 to March 15 (Cabernet Sauvignon, White Muscat).

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Embrapa Uva e Vinho
Rua Livramento, 515 – C. Postal 130
95700-000 Bento Gonçalves, RS
Phone: (0xx)54 455-8000
Fax: (0xx)54 451-2792
http:// www.cnpuv.embrapa.br

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