

Meteorological Behavior and its Influence on the 2004 Vintage in Serra Gaucha

Francisco Mandelli¹

The meteorological elements have great influence on the development, production and quality of the grapes from 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 2004 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 are grown in altitudes that range from 200 m to 900m.

The meteorological data of the 2004 vintage were compared to the climatological normals 1961/1990, 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 2003, there were eight frosts and the number of hours when the temperature was below 10^o C totaled 582 hours. This figure was 79 hours lower than the average of the years 1976/2002, 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 grapevines with late sprouting began to sprout in the beginning of October. The temperatures in September and October were above the climatological normal, except for the minimum and average temperature in September. The rainfall was lower in September,

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

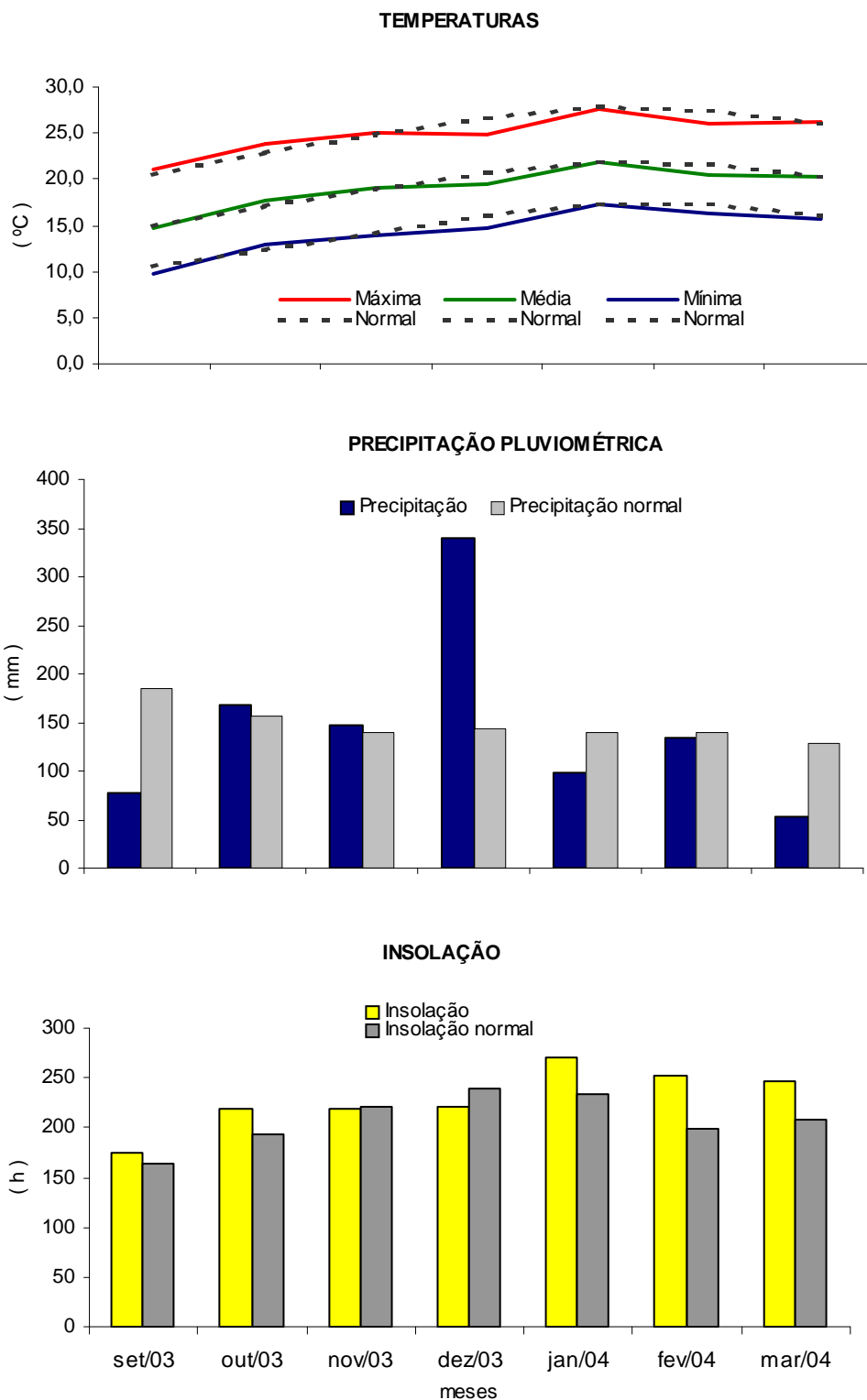


Fig.1. Meteorological behavior (maximum, medium and minimum air temperature, rainfall and insolation) in the 2004 vintage in relation to the climatological normal (1961/1990). Bento Gonçalves, RS.

Source: Embrapa Uva e Vinho

while in October the precipitation was similar to the normal. These features provided good conditions for the sprouting of the grapevine. The late frost on September 11 damaged the sprouting of the early cultivars, mainly in areas where there was an accumulation of cold air.

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 18⁰C. This subperiod started in the middle of October for early cultivars and continued through mid-November, for later cultivars. This subperiod had average and higher maximum temperatures and the minimum temperature, in November, a little lower than the climatological normal of the region. The precipitation and the insolation were similar to the normal. These features provided good conditions for the flowering and fructification of the grapevine.

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 insolation was a little lower in December and much higher in January, February and March, in comparison with the climatological normal. The precipitation was much higher in December, a lot lower in January and March and almost normal in February.

However, not only the quantity of precipitation, but also its intensity, distribution and number of rainy days must be taken into consideration. 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 period, was the same in December and much lower in January, February and March, in comparison with the climatological normal of the region. Normally, the harvest starts on the first days of January and continues until the beginning of March, however, in this vintage, the harvest started in the middle of January, for early cultivars and continued through the end of March for the late cultivars. The reason for this is the lower temperatures registered from December through March. Another factor that contributed greatly to the quality of the grapes in this vintage was the health of the grapes. 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 then reaching the desired ripening level. In this vintage, early ripening grapes, such as Gewürztraminer and Pinot Noir, started to be harvested in the middle of January and continued until the beginning of February.

During this period, the insolation was higher and the precipitation was lower than the climatological normal, resulting in an evolution of the ripening above the average conditions of the region.

Intermediate ripening grapes, such as Riesling Italico and Merlot were harvested from the end of January until the middle of February and had meteorological conditions a little lower than the previous ones since the precipitation was similar to the climatological normal.

Late ripening grapes, such as Cabernet Sauvignon and White Muscat, were harvested from the second half of February almost until the end of March. These cultivars had the best ripening conditions, as the insolation was much above and the precipitation much below the climatological normal of the region.

From January to March, the insolation totaled 767 hours, while the normal for this region is 638 hours. For the same period the rainfall was 284 mm and 407 mm, respectively. Summing up, the meteorological conditions in the ripening period of the 2004 vintage was characterized by more hours of sunshine (insolation), less rainfall and fewer rainy days than the climatological normal of the region.

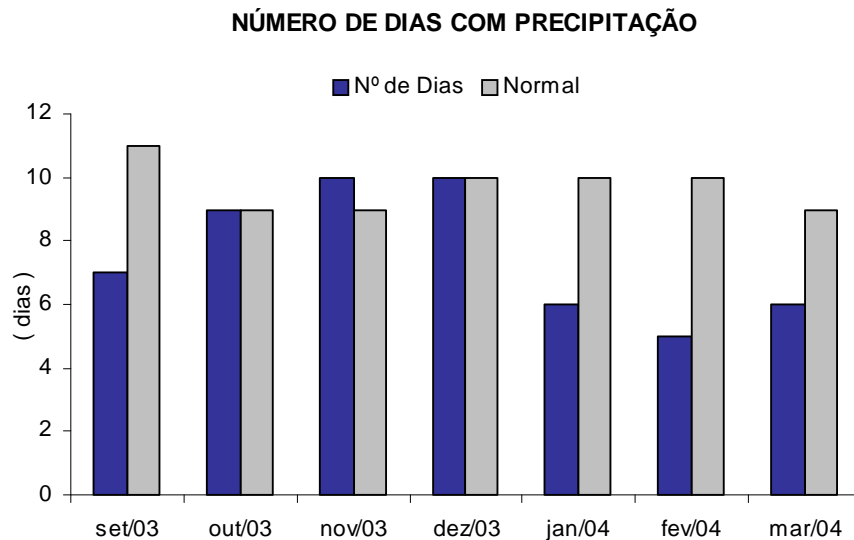


Fig. 2. Number of rainy days during the 2004 vintage in relation to the climatological normal (1961/1990). Bento Gonçalves, RS.
Source: Embrapa Uva e Vinho.

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 Heliopluiometric 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 1995 to 2004, according to the period of the cultivar ripening.

Table 1. Ripening Heliopluiometric Index (QM)¹ for different ripening periods. 1995/2004 vintages. Embrapa Uva e Vinho, Bento Gonçalves, RS.

Vintage	Ripening Heliopluiometric Index		
	Ripening period ²		
	Early	Intermediate	Late
1995	0,83	1,69	0,89
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

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

QM > 2,0 considered ideal.

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

Based on the QM, the meteorological conditions of the 2004 vintage were good for the early and intermediate grapes and excellent for the late grapes. Besides having more hours of sunshine, less rainfall and fewer rainy days, the ripening subperiod of the 2004 vintage, when compared to the climatological normal, was characterized by lower temperatures, mainly in February and March. These temperatures prolonged the grape ripening allowing the berries to synthesize and accumulate more sugars, pigments, tannins, aromatic substances and their precursors (Zanus & Mandelli, 2004).

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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](http://www.cnpuv.embrapa.br)

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