FAVOURABLE CLIMATIC CHARACTERISTICS FOR THE DEVELOPMENT OF GRAPEVINE IN COTNARI VINEYARD

CARACTERISTICI CLIMATICE FAVORIZANTE PENTRU DEZVOLTAREA VIȚEI DE VIE ÎN ZONA PODGORIEI COTNARI

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Abstract. *In this paper some of favourable climatic elements for the development of grapevine in Cotnari Vineyard will be characterized, such as soil temperature, atmospheric precipitations and foehn phenomenon. Monthly, seasonally and annual evolution of soil temperature and atmospheric precipitations will be analysed, taking into account the relation between these climatic elements and the grapevine requirements for Cotnari Vineyard.*
Key words: soil temperature, atmospheric precipitations, foehn phenomenon, grapevine, vegetation period

Rezumat. *În lucrarea de față se vor caracteriza câteva elemente climatice favorizante pentru dezvoltarea viței de vie în zona Podgoriei Cotnari, precum temperatura solului, precipitațiile atmosferice, foehnul. Evoluția lunară, anotimpuală şi anuală a temperaturii solului şi a precipitațiilor atmosferice va fi analizată, având în vedere relația dintre aceste elemente climatice şi cerințele viței de vie pentru zona Podgoriei Cotnari.*
Cuvinte cheie: temperatura solului, precipitațiile atmosferice, fenomenul de foehn, vița de vie, perioada de vegetație

INTRODUCTION

Optimum ecoclimate for grapevine in Cotnari Vineyard is determined, in a large measure, among other climatic elements, by soil temperature and atmospheric precipitations. These climatic elements are very important for realizing a qualitative viti-vinicole production. Growing and blossoming processes of grapevine are influenced by soil temperature and atmospheric precipitations, whose normal unfolding is given by certain termic and hydric limits.

MATERIAL AND METHOD

Soil temperature, atmospheric precipitations and foehn phenomenon will be characterized, based on data from Cotnari and Botoşani meteorological stations and a correlation between these climatic elements and grapevine requirements will be realized for Cotnari Vineyard.

RESULTS AND DISCUSSIONS

Soil temperature. Optimum temperature for the growing of roots grapevine is about 25 ºC, with the stopping of this process under 6-8 ºC,

respectively over 30 ºC (Oşlobeanu M., 1980). Nitrification process needs, for the beginning, a soil temperature of 5 ºC (Cotea Victoria, 1996).

The graphic of monthly average soil temperature between 1970-2006 shows an uniforme evolution of this climatic parameter. Thus, soil temperature increases easily in January, when termic minimum is registered (-3.3 ºC in Botoşani; -2.7 ºC in Cotnari), but it remains negative also in February. Temperatures become positive starting with March, going on to grow until July, when termic maximum is registered (24.6 ºC in Botoşani; 24.4 ºC in Cotnari). A gradual termic decreasing is produced from July and until December when temperatures become again negative (fig. 1). The annual average of soil temperature was low, both in Cotnari (10.6 ºC) and Botoşani (10.5 ºC). In Botoşani, the annual average amplitude was easily higher (27.9 ºC) than in Cotnari (27.1 ºC).

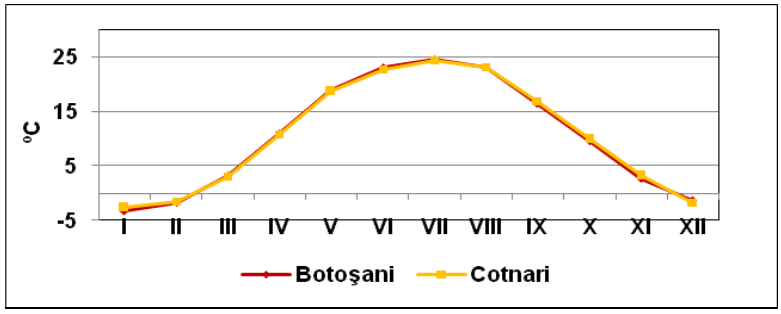

Fig. 1. The evolution of monthly average values of soil temperature in Botoşani and Cotnari (1970-2006)

In accordance with the depth, termic minimum is registered in 10 cm in January (under -2ºC) and in 20 cm in February (under -1ºC), while termic maximum is produced in July in 10 cm (over 24 ºC) and in August in 20 cm (over 23 ºC), the termic difference between the two levels of depth being caused by slower propagating in soil of warmth (Cotea D. V., 2006).

The average soil temperature of winter has been lower in Botoşani (-2.1ºC) than in Cotnari (-1.9 ºC). In spring, the average soil temperature has been 10.9ºC in Cotnari and 11.1 ºC in Botoşani. Dudnic M. A. and Hmelevskii K.K. (1971) have ascertained that during spring, the growing of grapevine roots is more intensive in superficial horizon of soil (0-20 cm) while in autumn this is more intensive in deeper horizons (40-60 cm), because of the cooling of soil in surface (Oşlobeanu M., 1980). In summer, the average soil temperature was 23.4 ºC in Cotnari and 23.6 ºC in Botoşani. The average soil temperature in autumn was 10.0ºC in Cotnari and 9.5 ºC in Botoşani.

In the long-term annual profile, the highest value of soil temperature (12.5ºC) has been registered both stations: Cotnari (1990) and Botoşani (2000) (fig. 2).

The minimum monthly values of soil temperature for studied period have been registered in January 1985, both in Cotnari (-9.1 ºC) and Botoşani (-10.3 ºC).

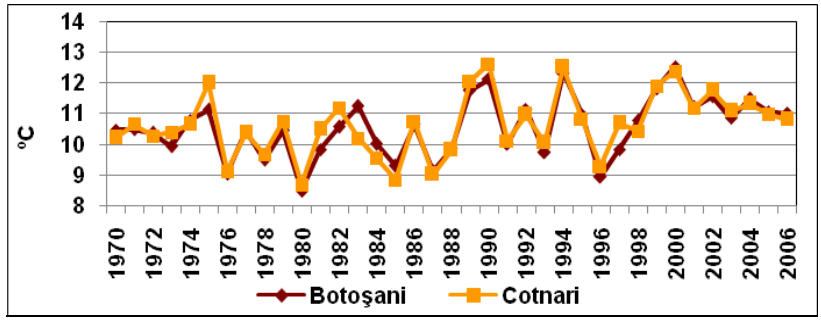

Fig. 2. The long-term evolution of annual average values of soil temperature in Botoşani and Cotnari (1970-2006)

Atmospheric Precipitations

Analysing the annual average of atmospheric precipitations between 1956-2006 we can observe a maximum value in July (76.3 mm in Cotnari and 87.8 mm in Botoşani) and a minimum value in January-February (21.6 mm in Cotnari in February; 23.2 mm in Botoşani in January) (fig. 3). The annual averages of atmospheric precipitations have been 569.9 mm in Botoşani and 515.2 mm in Cotnari. Lower annual average quantity of precipitations in Cotnari in comparison with that in Botoşani could be explained by foehn influence in this area.

Atmospheric precipitations during vegetation period had an ascending evolutive course from April (48.8 mm in Cotnari; 50.1 mm in Botoşani) until July (76.3 mm in Cotnari; 87.8 mm in Botoşani), when pluviometric maximum is registered. Starting with August, the quantity of atmospheric precipitations is diminished easily (61.4 mm in Cotnari; 64.2 mm in Botoşani), getting in September under 50 mm (43.0 mm in Cotnari; 44.6 mm in Botoşani). The sum of atmospheric precipitations from vegetation period (April-September) has been higher in Botoşani (401.7 mm) than in Cotnari (361.7 mm).

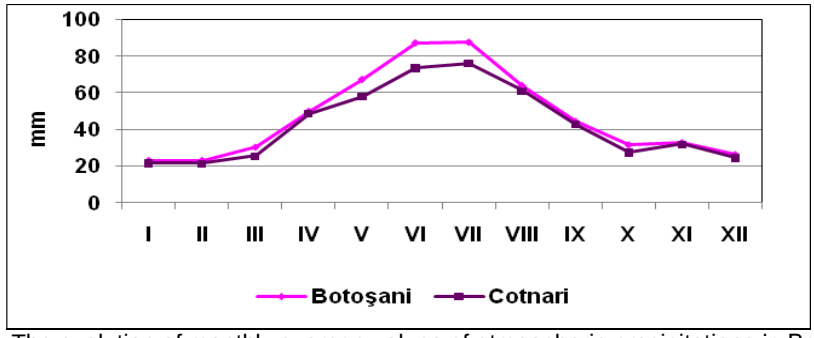

Fig. 3. The evolution of monthly average values of atmospheric precipitations in Botoşani and Cotnari (1956-2006)

The annual pluviometric minimum has been registered in Botoşani in 19.6% of the cases in February and in Cotnari in 23.5 % of the cases in October. The pluviometric minimum from February and October is determined, during

winter, by Siberian Anticyclon, which acts on Romania through Voeikov dorsal, and in autumn, this is produced by Azoric Anticyclon.

The annual pluviometric maximum has been produced in July in Botoşani in 33.3 % of the cases and in Cotnari in 27.4 % of the cases. The pluviometric maximum in July is due to richness in humidity of atlantic cyclons on the one hand and to Azoric Anticyclon, which is extending one of his flanks to the inside of our continent on the other hand.

On seasons, the smallest quantity of atmospheric precipitations during a year is registered in winter (73 mm in Botoşani; 68.1 mm in Cotnari) and the highest in summer (239.4 mm in Botoşani; 211.5 mm in Cotnari). In the seasons of transition we can remark higher quantities of atmospheric precipitations in spring (148.1 mm in Botoşani; 132.7 mm in Cotnari) than in autumn (109.4 mm in Botoşani; 102.9 mm in Cotnari).

The repartition of atmospheric precipitations on semesters marks out that in warm semester (April-September) falls the highest quantity of atmospheric precipitations (70.5 % of annual average in Botoşani; 70.2 % of annual average in Cotnari), because of an intensive anticyclonic activity. In cold semester (October-March), atmospheric precipitations represents almost a third of annual average (29.5 % of annual average in Botoşani; 29.8 % of annual average in Cotnari), because of high atmospheric pressure areas.

The grapevine requirements for humidity are high in the beginning of the vegetation period and in the stage of the growing of vegetative organs, then in the ripening and in the stage of „filling with water" of grapes. During the blossoming and in the ripening of grapes and of wood period, grapevine requirements are minimum. High humidity during the ripening of grapes affects negatively the quality of vintages, that is the sugar content becomes diluted, the peel splits and the grapes are rotting. If a rainy period follows after a drought one, grapes split more easily and inferior quality vintages will result (Martin T., 1968).

Analysing the distribution of atmospheric precipitations in the long-term annual profile we can distinguish the existence of some rainy periods and others drought periods. High quantities of atmospheric precipitations which fall in certain periods are due to persistence of low atmospheric pressure of baric system, as Mediterranean, whose influence feels, especially, in the second part of summer or in the beginning of autumn and in winter. Among rainy years we can remark: 1969 (787.3 mm), 1988 (701.7 mm), 1998 (823.7 mm), 2001 (729.3 mm), 2005 (719.5 mm) in Botoşani; 1991 (825.1 mm) and 1998 (715.2 mm) in Cotnari (fig. 4). Besides, the excess of the humidity determines the falling of grapevine flowers, the softening and the beading of grapes, the splitting and the rotting of these (Martin T., 1968). The poorest periods of atmospheric precipitations have, in origin, the persistence of anticyclonic areas, as Azore Islands, which acts, especially, in summer through its flanks whom push it on Mediterranean Sea and on Central Europe. The retreating of this baric system to North allow penetrating of tropical air masses from Small Asia, air masses responsible for installing of drought weather in Romania. Among drought years we can mention: 1963 (374.4

mm), 1967 (387.8 mm), 1986 (323.8 mm) in Botoşani; 1963 (389.8 mm), 1965 (349 mm), 1967 (355.2 mm), 1982 (361.1 mm), 1986 (313.7 mm), 1994 (393.4 mm), 2000 (361.9 mm), 2003 (377.4 mm) in Cotnari (fig. 4).

In the analysed period, the highest quantity of atmospheric precipitations has been registered in July 2002 (225.8 mm) in Botoşani and in July 1991 (225.0 mm) in Cotnari; the smallest quantity of atmospheric precipitations has been registered in September 1982 (0.0 mm) in Botoşani and in January 1978 (0.9 mm) in Cotnari.

The long-term annual regime of atmospheric precipitations for a long time period (51 years) could contribute to the contouring of an ensemble vision regarding the evolutive tendency of this climatic parameter, as and in realizing a short term prediction. Thus, atmospheric precipitations graphic indicates a succession of large fluctuations of ascending type (2003-2006 in Cotnari; 1963-1966 in Botoşani), marking out an evolutive trend in easy preponderant growing (fig. 4). As regards short term prediction, we can await, with some approximation, in keeping above mentioned tendency in the near future.

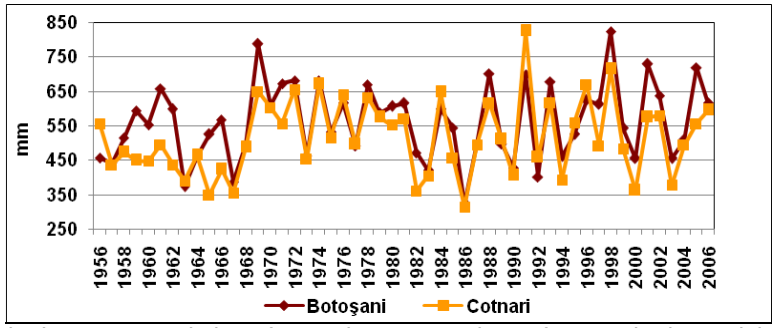

Fig. 4. The long-term evolution of annual average values of atmospheric precipitations in Botoşani and Cotnari (1956-2006)

Foehn phenomenon

In Cotnari Vineyard region, foehn appears when warm air masses from west slopes of Great Hill, in ascending movement, are cooling and descends warm on east slopes of Cotnari Coast. During ascension, the air is cooling, both after dry adiabatic gradient (until condensation level) and after humide adiabatic gradient (above condensation level); during descending, the air is warming only after dry adiabatic gradient (Posea Gr., 1986). Thus, on sheltered slopes of Cotnari Coast, temperatures are higher and nebulousness, relative humidity and atmospheric precipitations are lower than on those exposed to wind from Great Hill. In Cotnari Vineyard region, winds, which come from NV, contribute, in great measure, to the forming of foehn phenomenon, adding winds from V and SV. Maximum manifestation of this phenomenon can be remarked in July when the length of sun shining is high (291.4 hours) and the frequence of NV winds is large (40.9 %). This phenomenon favours the grapevine culture in Cotnari Vineyard region because warm air is canalized to the base of Cotnari Coast, in

long of the depression corridor, keeping a favourable microclimate for the ripening and even for the superripening of grapes.

CONCLUSIONS

Soil temperature and atmospheric precipitations influence the developing processes of grapevine whose normal unfolding is given by certain termic and hydric limits. Generally, these limits are satisfied in Cotnari Vineyard. Thus, the annual average of soil temperature between 1970-2006 was 10,6 ºC in Cotnari and 10,5 ºC in Botoşani. The quantity of atmospheric precipitations during vegetation period (April-September) has been higher in Botoșani (401.7 mm) than in Cotnari (361.7mm) between 1956-2006. The repartition of atmospheric precipitations on semesters marks out that in warm semester (April-September) falls the highest quantity of atmospheric precipitations (70.5 % of annual average in Botoşani; 70.2 % of annual average in Cotnari), while in cold semester (October-March), atmospheric precipitations represent almost a third of annual average (29.5 % of annual average in Botoşani; 29.8 % of annual average in Cotnari).

Foehn phenomenon favours the grapevine culture in Cotnari Vineyard region because warm air is canalized to the base of Cotnari Coast, in long of the depression corridor, keeping a favourable microclimate for the ripening and even for the superripening of grapes.

Finally, we can affirm that in Cotnari Vineyard region, ecoclimatic conditions are favourable for getting on normal of grapevine phenological phases, qualitative viti-vinicole production being an argument to which, among others, pedological conditions contribute. The two ecoviticole components of the concept „terroir" – climate and soils – contribute (in case of Cotnari Vineyard), in a large measure, in establishing of an intimate relation among the unrolling in optimum conditions of the grapevine phenological phases, the grapes composition, the wine characteristics and the viti-vinicole production.

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