THE EVOLUTION OF THE MAIN METEOROLOGICAL PARAMETERS (YEAR 2011) IN THE EASTERN PART OF WINE REGION MOLDOVA HILLS

EVOLUȚIA PRINCIPALILOR PARAMETRII METEOROLOGICI (ANUL 2011) ÎN PARTEA DE EST A REGIUNII VITICOLE A DEALURILOR MOLDOVEI

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Abstract. *Vine is a plant with a large plasticity and it adapts easily to different areas of culture, while the influence of climate and weather trends in a given time have a decisive role on the quality of the obtained products. The article aimed at studying the spatial distribution of meteorological parameters in the area of the eastern part of the Moldova Hills wine region during 2011. The results obtained show that, except in periods of heat, in the summer, when thermal stress exceeded the critical threshold of air and soil and an increase in droughts soil appeared, particularly in the southern part of Moldova, the year 2011 was favourable to vine culture.*
Key words: vine, agro-meteorology, clime, wine region

Rezumat. *Viţa de vie este o plantă cu o largă plastictate ecologică, adaptându-se cu usurinţă în diverse areale de cultură, iar influenţa factorilor climatici cât şi evoluţia lor meteorologică într-un anumit interval de timp au un rol hotărâtor asupra calităţii produselor obţinute. În lucrare a fost urmărită distribuţia spaţială a parametrilor meteorologici în arelul părţii de est a regiunii viticole a Dealurilor Moldovei pe parcursul anului 2011. Rezultatele obţinute au evidenţiat faptul că, cu excepţia unor perioade de caniculă din sezonul cald al anului când s-a depăşit pragul critic al stresului termic din aer şi sol şi a avut loc o accentuare a fenomenului de secetă pedologică, în mod deosebit în sudul Moldovei, anul 2011 a fost favorabil culturii viţei de vie.*
Cuvinte cheie: viţă de vie, agrometeorologie, climă, regiune viticolă

INTRODUCTION

The Romanian climate characteristics are given by the country's geographical position and air circulation in the earthly atmosphere. Because of its geographical position, mainly because of the tropical air masses blending with polar air masses, the Romanian climate is directly influenced by the great baric systems from Europe.

The viticultural plantations are situated, almost entirely, on the eastern sub-Carpathian hills, as well as on other hilltops and slopes, mostly along the rivers

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that cross the Moldavian Plateau.

The relief insures very favourable conditions to vine culture, as it has many microareas with specific ecoclimates. In its whole, the ecoclimate, with strong east-European influences, is characterised through heliotermic resources with high values, the hydric resources being of course lower. The predominant climate is that of silvo-steppe, with continental accents especially in the north-eastern part, with very warm and dry summers, harsh winters that usually endanger the unprotected vines in culture. The eco-climatic variations are very wide. The soils that are used for vine culture are found in a large segment: grey forest soils, cernoschernozem soils in different evolution stages, podsoils, chalky rendsiness, sands and sandy soils (Mustea, 2003).

The viticultural area has as main aim the obtaining of wines from a very large palette, while in the southern part, the culture conditions allow the obtaining of table grapes with economical value (Rotaru and Colibaba, 2011).

MATERIAL AND METHODS

The agro-meteorological peculiarities of 2011 and their influence on the grape vine were analysed over critic characteristic time intervals on the vegetation state and productive potential. Meteorological parameters from the main meteorological station from the east side of the region (Cotnari, Iaşi and Dealurile Bujorului vineyards) were registered. The indices that were analysed are: the annual and monthly average temperature, the absolute monthly minimum and maximum temperature, annual and monthly average precipitations, number of frosty nights and days in winter, depth of the snow layer, humidity reserve accessible to the plants during April - July and August-September (grape maturation period).

RESULTS AND DISCUSSIONS

From a thermal point of view, the year 2011 was warmer then normal, the average temperature varying from $8,6^0$C at Darabani to $10,5^0$C at Galaţi (fig. 1). Minimal temperatures were registered between–$12,8^0$C at Cotnari and –$20,4^0$C at Negreşti in February and March. The maximal temperature was registered in August, between $32,2^0$C at Darabani and $36,0^0$C at Galaţi (tab.1).

Analysing the precipitations quantity (fig. 2) it was registered that, as a whole, Moldova region, in 2011, had a 168,8 l/m^2 deficit compared to the multiannual average. The highest values were registered in the north of the region, the maximum being attained at Darabani where the deficit was of 238,4 l/m^2. At the opposed pole is the southern part of the analysed region, the minimum being registered at Bârlad with a deficit of 70,0 l/m^2.

Regarding the monthly evolution of precipitations during 2011, it can be registered that , except the months of April and June, all these areas were having a deficit in water in all of the other months (fig. 3). Especially interesting is the case of the month of November, when the whole region registered a deficit of 98% compared to the normal situation. A characteristic of the precipitations of 2011 was their relative homogeneity in space and time during April and July, fact that lead to the formation of a good water reserve accessible to the vines.

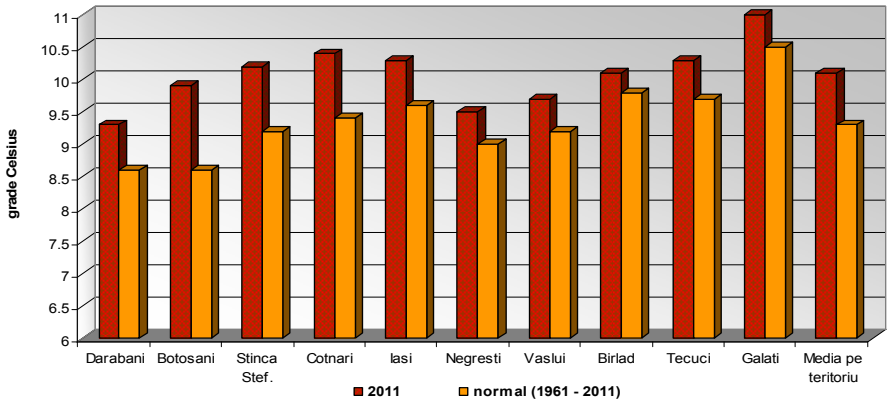


Fig. 1 – Average temperature in 2011 at meteorological stations from Moldova area (east of Siret river)

Table 1

Air temperature - ºC (average, absolute minimum and maximum)

Station	Yearly average	Multiannual average (1961-2011)	Absolute minimum temperature (2011)	Absolute maximum temperature (2011)
Darabani	9,3	8,6	-17.8/5.01	32,2/19.07
Botoşani	9,9	8,6	-20.0/5.01	33,8/20.07
Stânca Şt.	10,2	9,2	-17.0/5.01	34,0/19.07
Cotnari	10,4	9,4	-12.8/16.02	33,6/20.07
Iaşi	10,3	9,6	-16.6/5.01	35.5/20.07
Negreşti	9,5	9,0	-20.4/3.03	34,7/20.07
Vaslui	9,7	9,2	-18.5/5.01	34,5/19.07
Bârlad	10,1	9,8	-18.2/26.01	34.3/20.07
Tecuci	10,3	9,7	-19.1/31.01	34,3/9.07
Galaţi	11,0	10,5	-16.2/31.01	36.0/9.07
Average	10,1	9,3	-20.4/3.03	36.0/9.07

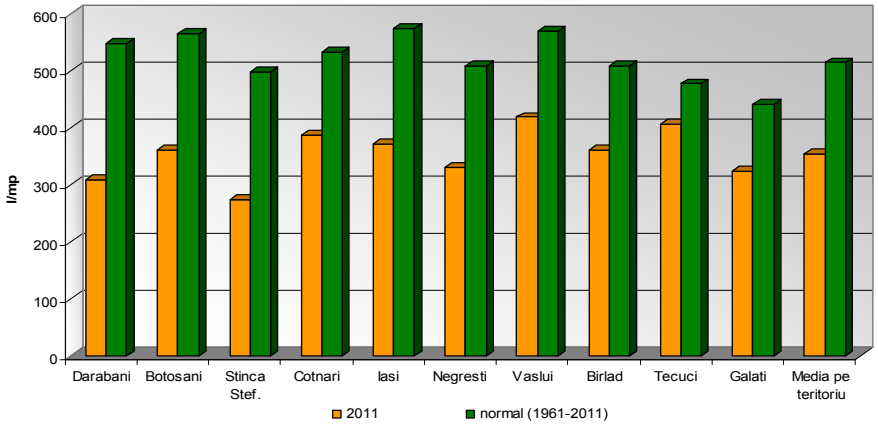


Fig. 2 – Average precipitations of 2011 in meteorological stations of Moldova (east of Siret river)

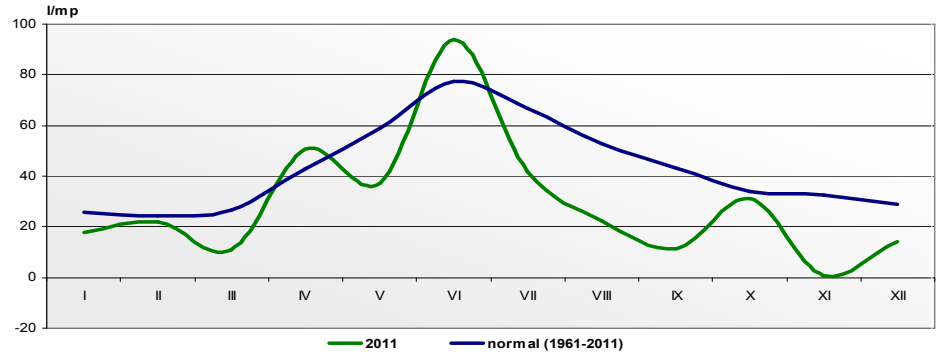


Fig. 3 – Monthly regimen of 2011 compared to normal values of atmospheric precipitations in Moldova (east of Siret river)

2011 started with a gentle winter, characterised by a higher than usual thermal regime. In the last decade of January, the weather becomes cold, even frosty at nights and mornings, all over the agricultural soils of Moldova a layer of snow with a depth of 3 - 10 cm (northern half) being registered. In the 15 frosty nights and 38 winter days that were registered in average for the whole of Moldova (tab. 2), on viticultural areas without protective snow layer or a superficial one (under 10 cm), with extremely low minimal air temperatures, situated below the critical threshold for plants, partial damages were registered. The number of days with temperatures ≤ -10ºC was higher in January (between 3 days at Cotnari and 11 days at Bârlad). Starting with the last decade of January, during the whole month of February and the first half of March, the soil was frozen at depths of 5-15 cm in the majority of the territory. Locally, the frost reached a depth of 20 cm in February. In the beginning of April, a level of average and good vegetation state of the vineyard was registered.

Table 2

Number of frosty nights, winter days and snow layer in 2011

Station	Frosty nights (min, ≤10 ºC) (monthly sum)				Winter days (max, ≤0ºC) (monthly sum)				Snow layer (cm) - monthly average-				
Month	I	II	III	Suma	I	II	III	Sum	I	II	III	XII	Average
Darabani	6	4	2	12	16	17	5	38	6	5	3	1	3.8
Botoşani	8	5	4	17	11	15	3	29	6	5	3	0	3.5
Stânca Şt.	9	3	5	17	16	17	5	38	2	3	2	0	1.8
Cotnari	3	3	0	6	15	16	5	36	2	7	6	0	3.8
Iaşi	8	3	2	13	14	16	1	31	6	4	1	0	2.8
Negreşti	10	5	4	19	15	14	4	33	3	5	4	0	3.0
Vaslui	10	5	3	18	16	15	2	33	5	6	3	0	3.5
Bârlad	11	5	4	20	17	16	3	36	6	15	2	0	5.8
Tecuci	9	7	2	18	15	15	2	32	5	6	2	0	3.3
Galaţi	8	2	0	10	16	15	1	32	11	7	0	0	4.5

Regarding the accessible humidity reserve in the soil at 0-100 cm, at the beginning of spring, it was satisfactory (AS), close to the optimal (ApO) and optimal (AO) all over Moldova (900-1600 m³/ha). During May-July, when the vine passes through its most important vegetation stages, and the water request is the highest, the accessible humidity reserve for plants presented the same characteristics (fig. 4), fact that was due to a relatively uniform time repartition of precipitation quantities. The exception was the month of June, when, because of reduced rains and high evaporation, in the northern part of Moldova, a moderate pedological drought (SM) and even strong pedological drought (SP) appeared.

The favourable air and soil hydrothermal regime from the months of August and September 2011 registered normal vegetation rhythms of corn plants on the lands of the north and north-west of the studied territory where the soil water reserve was satisfactory and close to the optimum. The uniformity and vigour of the plants was good and average, respectively average and weak at phenologically late cultures and on agricultural surfaces affected by pedological draught phenomena (fig. 5a.).

Autumn started with warm weather, but the precipitations were reduced. During this season, because of low quantity of precipitations, the deficit of humidity content led to the establishment of a pedological drought, with different degrees of intensity, respectively average, strong and excessive (fig. 5b.), affecting somewhat the grape maturation. Due to the lack of water in the soil, the grapes had the possibility to accumulate important quantities of sugars, so that the wines were of quality, although the harvest loss was quite big.

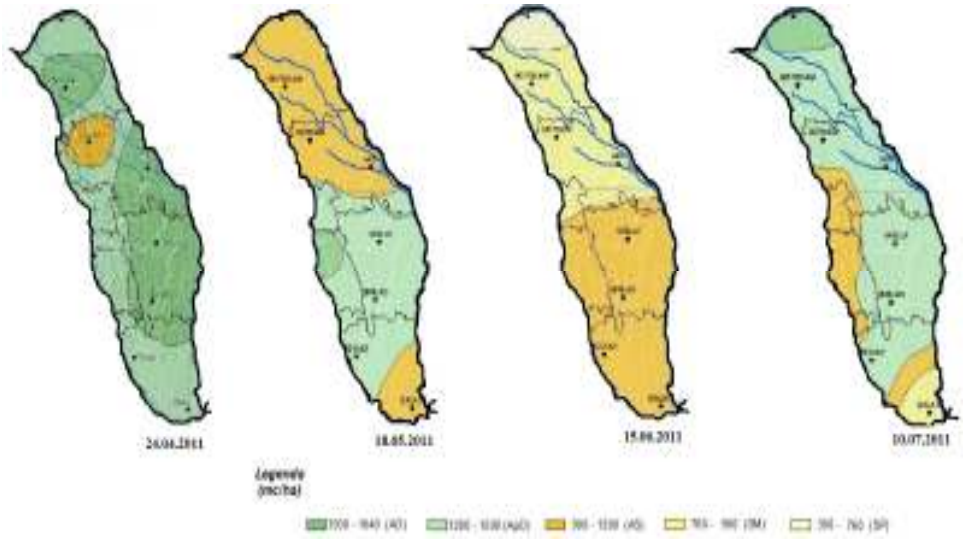
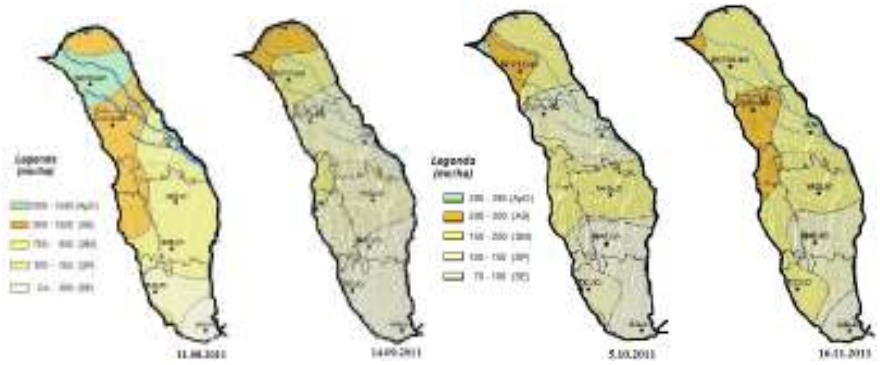


Fig. 4 – Accessible humidity reserve of plants in 0-100 cm level on Moldova territory (eastern of Siret river) during April – July 2011



a) soil profile 0 – 100 cm b) soil profile 0 – 20 cm

Fig. 5 – Humidity reserve of Moldova (east of Siret river) during August-November 2011

The end of autumn (November) and beginning of winter were characterised by the maintaining of a high thermal degree and the registering of very low quantities of precipitations. An important fact is that the snow layer was absent in all of the area, except its extreme northern part where it was insignificant (tab. 1).

CONCLUSIONS

1. Except some drought periods of the warm season when the critical threshold of the thermal stress from air and soil, and the pedological drought phenomena was accentuated in the south of Moldova or the precipitations interval, that had a temporary torrential character that were sometimes teamed up with hail and short time wind enhancements, in general, 2011 was a year when the vine had a good and average vegetation state.

2. Exception is made by the period at the end of the year, characterised by deficit precipitations almost all over the territory, the vine being affected especially in the south of Moldova, the values of the precipitation quantities indicating pedological drought, under the resistance limit of the vine (250 mm). Therefore, in these areas, in some years, vine irrigation is necessary even if the vine is know for its drought resistance

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