

# THE DELIMITATION OF MULTI-CRITERIA CLIMATIC GROUPS ON THE LEVEL OF THE WIN-GROWING REGIONS AND DANUBE'S TERRACES

## DELIMITAREA GRUPELOR CLIMATICE MULTICRITERIALE DE LA NIVELUL REGIUNII VITICOLE A TERASELOR DUNĂRII

**SAVU (BUCUR) GEORGETA MIHAELA, STROE MARINELA VICUȚA**

University of Agricultural Sciences and Veterinary Medicine Bucharest

**Abstract:** *The proposals existing on the world level regarding the promotion on large scale of viticulture products of high quality especially emphasize the area of grape vine culture. The quality and typicality of the wine is depending on the natural and human factors. It is known that on the world level as well as in our country, the climate of different viticulture regions determine, to great extend, a diversity of the sorts of cultivated types, of obtained viticulture products, but especially of the wine's quality and typicality. On international level, J. Tonietto and A. Carbonneau, (2000) proposed the adoption of a multi-criteria climate classification (C.C.M.) by using three criteria (multi-criteria) which under the eco-climatic report are represented by three synthetic indicators (the drought index – IS, the helium-thermal index – IH and the night cooling index – IF). This problem became of great actuality for the Romanian viticulture, on the verge of the integration in the European Union. From here it results the necessity of calculating and analyzing the values taken by the multi-criteria indexes (IS, IH and IF), on the Romanian territory, data contoured in the viticulture climates and implicitly in the climatic groups which they form. As a result, these indicators have been calculated also for the viticulture region of Danube's Terraces, using climatic data on a period of up to 100 years.*

**Rezumat:** *Stabilirea aptitudinii oenoclimatice a unei zone climatice, pe baza folosirii unui singur indicator sintetic, nu este în măsură să aprecieze în mod corespunzător gradul de favorabilitate al unor centre viticole din diferite zone sau subzone climatice și cu atât mai puțin spectrul larg de cuprindere privind variabilitatea condițiilor ecoclimatice de la nivelul viticulturii naționale și mondiale. Pe plan mondial, s-a trecut în ultima vreme la utilizarea mai multor criterii (multicriterii), respectiv mai mulți indicatori sintetici, care să integreze principalele componente ale ecoclimatului viticol din timpul perioadei de vegetație convențională, și anume: indicele de secetă – IS, indicele heliometric – IH și indicele de răcire al nopților – IF. Acești indicatori, folosiți într-un sistem multicriterial, au fost calculați și pentru regiunea viticolă a Teraselor Dunării, utilizând date climatice pe o perioadă de până la 100 de ani, permițând astfel evidențierea diferențelor de climat din cadrul acestei regiuni, dar și comparativ cu alte regiuni viticole, oferind posibilitatea de stabilire a climatului viticol pentru fiecare centru viticol în parte, dar și conturarea grupelor climatice multicriteriale.*

### MATERIAL AND METHOD

In order to make this study, there have been utilized eco-climatic dates which concern the heliothermal resources and the hydric resources from the conventional vegetation period, from a number of 8 winegrowing centers from the Danube's Terraces. The obtained data base, was used in calculating the three synthetic indicators which have a eco-climatic

character and are used by the multicriterial method: drought index (IS), heliothermal index (IH) and night cooling index (IF).

This indicators, used in a multicriterial system, had been calculated also for the wine growing center of the Danube's Terraces, using climatic data stretched over a period of 100 years permitting in this way to see the different climate in this region, treat also to compare it with other wine-growing centers, offering the possibility to establish the wine-growing climate for each center, and also to outline the multicriteria climatic groups.

## RESULTS AND DISCUSSIONS

### *The specific climate of viticulture centers on the region of the Danube's Terraces*

The viticulture region of the Danube's Terraces composed of eight viticulture centers placed in two vineyards represent a climate that varies in reduced limits thus for the drought index (IS) the values situate within the classes IS<sub>1</sub> (moderate drought climate) and IS<sub>2</sub> (pronounced drought climate); for the night cooling index we find the classes IF<sub>3</sub> (climate with cool nights) and IF<sub>4</sub> (climate with very cool nights); and the helium-thermal index remains constant, being placed only in the variation class IH<sub>4</sub>, specific to the warm temperate climate. As a result of the performed calculus we notice differences on the level of the multi-criteria indicators (table 1), thus:

- for the drought index, the majority holds the class of the climate with pronounced drought (IS<sub>2</sub>), credited with five viticulture centers and a percentage of 62% of the total;
- for the night cooling index, class IF<sub>4</sub> (climate with very cool nights) holds the largest percentage, respectively six viticulture centers, that is 75%;
- the helium-thermal index is situated, in this region, only in the class of the warm temperate climate (IH<sub>4</sub> – 100%).

Table 1

**The statistical of some viticulture climates in region Danube's Terraces**

► Indicators	Specification	IS		IH	IF	
		IS <sub>1</sub>	IS <sub>2</sub>	IH <sub>4</sub>	IF <sub>3</sub>	IF <sub>4</sub>
Viticulture centers	Nr.	3	5	8	2	6
	%	38	<b>62</b>	<b>100</b>	25	<b>75</b>

This fact emphasizes a pass to the very cool nights climate (IF<sub>4</sub> = 75%) and pronounced drought (IS<sub>2</sub> = 62%), based on high helium-thermal resources without being excessive (for their realization contributing the vicinity of the Danube and the lacks in the area).

### *The climate groups representative for the viticulture region of Danube's Terraces*

For this viticulture region we have four climatic groups, unequally constituted with variations from one single center (Zimnicea – IS<sub>1</sub>, IH<sub>4</sub> IF<sub>3</sub>, Aliman – IS<sub>2</sub> IH<sub>4</sub> IF<sub>3</sub>), until maximum four centers for the climatic group IS<sub>2</sub> IH<sub>4</sub> IF<sub>4</sub> (Ostrov, Baneasa, Oltina and Fetesti). It is ascertained that the groups specific to this region are somehow agglomerated, existing a small discontinuity related to the existence of two intermediary climate groups (IS<sub>1</sub> IH<sub>5</sub> IF<sub>3</sub> and IS<sub>2</sub> IH<sub>3</sub> IF<sub>3</sub>), which do not present any viticulture centers (figure 1), although the next two climatic groups are populated, even hold the

majority with a percentage of 62%. This underlines the fact that in the two intermediary groups not occupied by viticulture centers, there are favorable conditions for viticulture.

Under climatic report, the four groups do not cover a very large specter of situations, but report only to the two types of predominant climate which are: two climatic groups contain the drought index situated in the class IS<sub>1</sub>, resulting in a moderate drought climate, warm temperate, based on cool or very cool nights (IS<sub>1</sub> IH<sub>4</sub> IF<sub>4</sub>, IS<sub>1</sub> IH<sub>4</sub> IF<sub>3</sub> – 38%) and the next two groups (IS<sub>2</sub> IH<sub>4</sub> IF<sub>4</sub> and IS<sub>2</sub> IH<sub>4</sub> IF<sub>3</sub> – 62%), present a pronounced drought climate, warm temperate, based on cool or very cool nights.

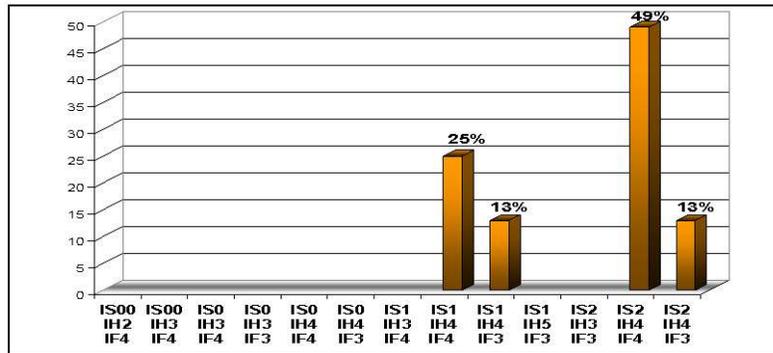


Fig. 1. The disposal of climatic groups in the viticulture region of the Danube's Terraces

The last two groups contoured in the viticulture region of Danube's Terraces that include the drought index situated in the class of IS<sub>2</sub> (pronounced drought climate), hold the majority of the viticulture centers of this region (62% of the total), centers that benefit, under the meteorological aspect, from a precipitations regime of the poorest, a high quantity of solar radiations and rich helium-thermal resources. The orientation of the climatic groups to the right, the credited area with the highest helium-thermal resources, based on a drought climate (moderated to pronounced), makes the cultivation of types for red superior quality wines as well as the table grapes possible. We may conclude that the four climate groups presented here represent 3% of the 120 theoretically possible groups (table 2).

Table 2

**THE POSITIONING OF THE MULTI-CRITERIA CLIMATIC GROUPS**  
for 8 viticulture centers of the region of the Danube's Terraces

The night cooling index	IS <sub>1</sub>	IS <sub>2</sub>	Observations
	IH <sub>4</sub>	IH <sub>4</sub>	
IF <sub>4</sub>	2	4	IF <sub>4</sub> is stable, contains six viticulture centers composing two climatic groups.
IF <sub>3</sub>	1	1	IF <sub>3</sub> is in two climatic groups, with a small number of centers (two).
IF <sub>2</sub>			-
IF <sub>1</sub>			-

4 = the number of viticulture centers

## CONCLUSIONS

1. In the viticulture region of the Danube's Terraces we find, in great measure, a pronounced drought climate (IS<sub>2</sub> – 62%), but we find, in a smaller percentage, the moderate drought climate (IS<sub>1</sub> – 38%). The character of pronounced drought climate from the IS<sub>2</sub> point of view, suggests the existence of an estival drought, with positive influences over the maturation of grapes and the concentration of sugars in must, under these conditions of hydric stress the irrigation must be a current practice.

The helium-thermal resources situate the present region in the area of the warm temperate climate (IH<sub>4</sub>), credited with 100%, so the viticulture center benefit, under meteorological aspect, from a large quantity of solar radiation and rich helium-thermal resources, under the conditions of a regime poor in precipitations.

What concern the night cooling index, this is situated, in great measure, in the IF<sub>4</sub> class (very cold nights), reaching a percentage of 74%, class that exerts a benefic influence over the qualitative features regarding the specific flavor of type, the accumulation of anti-oceanic substances and tannin, typicality, etc. The presence of cold nights in September is marked by the variant class IF<sub>3</sub>, class that through the taken values allows a good maturation of the grape.

2. According to the multi-criteria evaluation, the group IS<sub>2</sub> IH<sub>4</sub> IF<sub>4</sub> (dominant in this region), is defined as presenting a pronounced drought climate, warm temperate, with very cold nights in September, and it is credited with four viticulture centers and a percentage of 49% of the total. This group, through its particular climate, does not have a correspondent on European level, but on world level: Australia – Nuriootpa, Chile – Santiago, SUA – Medford.

3. The climatic group on the third place as percentage in this region (IS<sub>1</sub> IH<sub>4</sub> IF<sub>3</sub> – 13%) is found at an European level and includes famous vineyards such as: Montelimar in France, Anadia in Portugal and Rioja in Spain.

4. Although the viticulture region of the Danube's Terraces is composed of only two vineyard (with a total of with viticulture centers), here we can find four types of viticulture climate, which reach a percentage of 11% of the 38 types real possible that are found in the level of Geo-viticulture.

## REFERENCES

1. **Carboneau A., Tonietto J., 1998** - *La géoviticulture – De la géographie viticole aux évolutions climatiques et technologiques à l'échelle mondiale*. Revue des Oenologues et des Techniques Vitivinicoles et Oenologiques, n.87, 16-18.
2. **Tonietto J., Carboneau A., 2000** - *Le climat mondial de la viticulture et la liste des cépages associés. Système de Classification Climatic Multicritères (C.C.M.) des Région à l'Echelle Géoviticol*. Groupe d'experts „Zonage vitivinicole” 6 mars.
3. **Huglin P., 1978** - *Nouveau mode d'évaluation des possibilités héliothermiques d'un milieu viticole*. In: SYMPOSIUM INTERNATIONAL SUR L'ECOLOGIE DE LA VIGNE, Constança, Ministère de l'Agriculture et de l'Industrie Alimentaire, p. 89-98.