

Oenoclimate Assets of Viticultural Regions and Centers in Romania

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Abstract

The concept of oenoclimatic signifies the asset of a region able to allow the organized growth vine. One or many kinds of wine or wine distillations might be thus obtained. Their composition fulfils all the lawful conditions bearing them an origin denomination. Organoleptic features stand for it. This paper relies upon the study of: chemical composition and microbiological parameters, the Romanian traditions, the beverages' behaviour and awarded prizes. A specific taxonomy of the Romanian viticultural regions, with their distinctive assets, is therefore drawn.

Keywords: viticultural region, oenoclimatic characterization

Introduction

The taxonomy of climate suitability of different viticultural regions is determining a range of oenoclimate types, which have been outlined by the authors as oenoclimatic zones, including regions or centers with the same oenoclimate type (Branas, 1978; Dizy, 2003; Dizy *et al.*, 2008). The oenoclimatic zone is expressing, in deep detail, an ensemble of climatic conditions, proper to many regions or centers, which are creating the same collection of viticultural production-classes, categories, and wine types (Sequin, 1983; Sylvander, 1995; Serdinescu and Tudorache, 2002).

Obviously, the wines of the same type (dry red wines, for example) obtained in different regions or centers from the same areas are maintaining their peculiarities and personality, determined by the ecoclimate ensemble of features (site, kind, cultivation methods and wine making techniques) which are dominant for each region.

The knowledge of the intervals into which are developed the weather-climate features of viticultural centers, inside each climate zone, is enabling us to outline some parameters owned by the zones, which are conditioning, defining and creating their oenological abilities (Condei, 2004; Dunoiiu *et al.*, 2008; Fregoni, 1990; Fregoni, 1998; Iravedra, 1980; Morlat, 1998; Olteanu, 1999). In this respect, from the variation field of ascertained elements at the centers from each zone, we established the optimal and limit values by their highest level and frequency.

For the climate characterization of viticultural centers from each zones, we appreciated specific features and synthesis indexes. As a result, five oenoclimatic zones for

Romania were outlined taking into account the climate types, denoted for Romania and actual Romanian viticultural areas (Anca Bandoi *et al.*, 2006; Cotea *et al.*, 2000; Cotea *et al.*, 2006; Popa and Gheorghita, 2000; Popa *et al.*, 2005; Popa (2006); Popa *et al.* (2006); Popa and Condei, 2006; Popa *et al.*, 2007, 2008; Teodorescu *et al.*, 1987).

Materials and methods

For the oenoclimate characterization of viticultural regions following parameters were determined: air average temperature in July, air maximum temperature average in August, absolute maximum air temperature in August, average air relative humidity in August, average air relative humidity in August at 1 o'clock p.m, saturation air deficit with water evaporation in August, at 1 o'clock p.m, hydro-thermal index Seleaninov during 1.04-30.09 period, hygro-hydro-thermic index during 1.04-30.09 period, theoretical hydro survey in soil for vine during 1.04-30.09, oenoclimatic assets' index of the zones.

Results and discussion

Oenoclimate characterization of the A0 zone

It is the coldest and the wet Romanian zone (Tab. 1 and Fig. 1). For this zone are appreciated as adequate the following main directions of oenological production: sparkling wines with origin nomination (predominantly 'Pinot Noir'); dry table wines of superior quality or (for the regions with high frequency of *Botrytis* mildew) half-dry or half-sweet wines, with origin nominations (predominantly 'Feteasca alba').

Tab. 1. Weather parameters and possible products for the A0 oenoclimate zone

Parameters	Optimum	Limits	Products
Air average temperature in July	18.5-19.0°C	18.2 -9.5°C	-Sparkling wines with origin nominations (predominantly 'Pinot Noir').
Air maximum temperature average in August	25.2-25.5°C	25-26°	
Absolute maximum air temperature in August	34.5-35.0°C	34-35.5°C	
Average air relative humidity in August	76-78%	70-80%	-Dry white table wines of high quality.
Average air relative humidity in August at 1 o'clock p.m	52-55%	50-60%	
Saturation air deficit with water evaporated in August, at 1 o'clock p.m	13.5-15 mb/cm ²	13-16 mb/cm ²	-Half-dry or sweet wines with origin nominations (predominantly 'Feteasca alba').
Hydro-thermal index Selestinov during 1.04-30.09 period	1.4-1.5	1.3-1.6	
Hygro-hydro-thermic index during 1.04-30.09 period	8.5-9	8-9.5	
Theoretical hydro survey in soil for vine during 1.04-30.09	+ 50 - + 90 mm	+ 50 - + 130 mm	
Oenoclimate assets' index of A0 zone	3900-4000	3800-4100	



Fig.1. Viticultural centers from the A0 area

Oenoclimate characterization of the A1 zone

It is a cold zone (Tab. 2 and Fig. 2). The oenoclimate adequacy of the centers from the A0 and A1 zones is surely confirmed by the exquisite delicacy of dry white wines, of the various types of sparkling wines with origin nominations (Blaj, Jidvei, Alba-Iulia, Dacia-Apold, Sylvania-Simleu centers) and also by the important number of centers

with favourable conditions for noble mildew of grapes and realizing half-dry or sweet wines, naturally liquerous, with and exceptionally agreeable aroma (Alba Iulia, Ighiu, Telna, Blaj, Craciunelu, Jidvei, Medias centers) especially with 'Feteasca alba', 'Traminer', 'Muscat Ottonel', 'Sauvignon', 'Riesling' of Rhin kinds.

Tab. 2. Weather parameters and possible products for the A1 oenoclimatic zone

Parameters	Optimum	Limits	Products
Air average temperature in July	19-19.8°C	18.8 -20.5°C	-Sparkling wines with origin nominations.
Air maximum temperature average in August	25.5-26°C	25.2-26.5°	
Absolute maximum air temperature in August	35-36°C	34.2-36.8°C	
Average air relative humidity in August	72-74%	70-78%	-Dry white table wines demy-sweet, sweet or natural
Average air relative humidity in August at 1 o'clock p.m	52-55%	50-55%	
Saturation air deficit with water evaporated in August, at 1 o'clock p.m	15-15.5 mb/cm ²	14.5-16.5 mb/cm ²	liquerous with flavour ('Muscat', 'Traminer', 'Sauvignon') with origin nominations.
Hydro-thermal index Selestinov during 1.04-30.09 period	1.25-1.35	1.15-1.50	
Hygro-hydro-thermic index during 1.04-30.09 period	7.5-8.0	7.0-8.5	
Theoretical hydro survey in soil for vine during 1.04-30.09	+ 20 - + 40 mm	+ 10 - + 100 mm	
Oenoclimate assets index of A1 zone	4000-4200	4100-4300	



Fig. 2. Viticultural centers from the A1 area

Oenoclimate characterization of the A2 zone

Generally, the presented data (Tab. 3 and Fig. 3) demonstrate the existence of a moderate level (and in the same time equilibrium) of the studied weather factors, a good monthly dissemination for them, and the absence of any deficiency or excessiveness. Oenologically speaking, these features are confirmed by a lot of assets owned by the various viticultural centers of this oenoclimate zone, materialized in a large range of categories and types of table wines, of high quality. Except dry white wines which are dominant in all centers of this zone, headed by Odobesti, Panciu Iasi, in some places were recorded also dry red wines from some restricted grape kinds (Urinari-Iasi: 'Feteasca neagra'; Razoare-Panciu: 'Pinot Noir', Iania Puiesti Smulti-'Merlot'). A good appreciation is granted to the sparkling wine from Mivilita and Chicera Panciului. The site of the great and

famous family of the flavour wines. Starting with too the amazing 'Busuioaca roz de Bohotin' and the exceptional sweet flavored sparkling wine of Bucium, the exceptional semidry and sweet wines from Stefanesti Arges and often the ones from Balanesti Targu-Jiu earned extremely good appreciations. The favourable conditions for developing the grapes noble mildew in a lot of centers from the A2 oenoclimatic zone assured an anciently prestige. A special place is assigned here to the natural liquerous wine of Cotnari, considered as the best wine of our country. Going to the Northern Romania, towards the most distant Dacian viticultural spaces, the similar wine of Halmeu is stating its right to fame. The reputation of aged distillates should be denoted well produced wines of Odobesti and Panciu and especially of Stefanesti Arges.

Tab. 3. Weather parameters and possible products for A2 oenoclimate zone

Parameters	Optimum	Limits	Products
Air average temperature in July	20.2-21.2°C	20 -21.5°C	-Dry or half-dry white table wines, with origin nominations. -Pink or red dry table wines, with origin nomination (predominantly 'Feteasca neagra', 'Pinot Noir', 'Merlot'; -Half-dry, half sweet and sweet wines, or natural liquerous, with origin nominations. -Aged wine distillations with origin nominations. -Demy-dry or sweet flavored wines or sparkling ones, with origin nomination.
Air maximum temperature average in August	26.2-27°C	25.8-27.2°C	
Absolute maximum air temperature in August	35.8-37°C	35.5-38°C	
Average air relative humidity in August	68-72%	65-75%	
Average air relative humidity in August at 1 o'clock p.m	49-53%	47-55%	
Saturation air deficit with water evaporated in August, at 1 o'clock p.m	16.5-17.5 mb/cm ²	16-18.5 mb/cm ²	
Hydro-thermal index Seleaninov during 1.04-30.09 period	1.13-1.25	1.1-1.30	
Hygro-hydro-thermic index during 1.04-30.09 period	6.5-7.5	6-8	
Theoretical hydro survey in soil for vine during 1.04 - 30.09	+3 - + 50 mm	+ 30 - + 100 mm	
Oenoclimate assets index of the A2 zone	4400-4500	4300-4600	



Fig. 3. Viticultural centers from the A2 area

Oenoclimate characterization of the A3 zone

This area are included the viticultural centers with a warmer climate shade (Tab. 4 and Fig. 4). The geographical situation is providing some weather peculiarities for these centers, imposing their classification in A_3 -hillock centers, A_3 -hillock meridional centers and A_3 -meridional centers, near to the Black Sea. It must be remarked, as a general status issued from the data ensemble, that in all

three groups of viticultural centers could be noticed a considerable ratio of sunstroke hours and of temperature degrees recorded during the vegetation period, parameters which can uphold a high level for synthesis and for other physiological processes. Therefore the situation of these centers on hillock regions or in the neighbourhood of the sea is not determining an excessiveness of this helio-thermic plenitude. Thus, during July, the warmest one, aver-

Tab. 4. Weather parameters and possible products of the A3 oenoclimate zone

Parameters	Hillock centers group		Hillock meridional centers group		Meridional centers group near to the Black Sea		Products
	Optimum	Limits	Optimum	Limits	Optimum	Limits	
Average air temperature in July	21.2-21.8°C	21-22°C	21.8-22.4°C	21.5-22.5°C	22.1-21.8°C	22.8-22.5°C	-Red table wines with origin nominations.
Air maximum temperature average in August	27.4-27.8°C	27.2-28.2°C	28.2-28.5°C	27.5-29°C	27.2-28°C	27-28.8°C	
Absolute maximum air temperature in August	36.6-37.8°C	36-38°C	37.2-38.2°C	37.0-38.5°C	35-38°C	35.0-38.5°C	
Average air relative humidity in August	66-70 %	65-70 %	66-68 %	65-68 %	70-72 %	68-72 %	-Half-dry white table wines, sweet and natural liquerous with origin nominations.
Average air relative humidity in August at 1 o'clock p.m	50-52 %	48-55 %	47-50 %	46-50 %	50-52 %	48-52 %	
Saturation air deficit with water evaporated in August, at 1 o'clock p.m	17.5-18.5 mb/cm ²	17.5-19 mb/cm ²	18.5-20.0 mb/cm ²	18-20.5 mb/cm ²	17.0-18.0 mb/cm ²	17-18.5 mb/cm ²	
Hydro-thermic index Szelestinov during 1.04-30.09 period	1.0- 1.2	0.98-1.25	0.9-1.0	0.85- 1.05	0.7-0.8	0.65- 0.80	-Sweet natural flavored table wines with origin nominations.
Hygro-hydro-thermic index during 1.04-30.09 period	4.8-5.2	4.5-5.5	3.9-4.2	3.8-4.5	3.3-4.0	3.0-5.0	
Theoretical hydro survey in soil for vine during 1.04 – 30.09	+20 – 20 mm	(+20) – (+50) mm	0 – 60 mm	0 – (-100) mm	0 – (-100) mm	0 – (-175) mm	
Oenoclimate assets index of A_3 zone	4650-4700	4600-4800	4750-4800	4700-4900	4850-4900	4800-5000	



Fig.4. Viticultural centers from the A3 area

age temperature is below 22.5°C, for all the 29 studied centers from A₃ zone (excepting Turnu Severin, 22.7°C). During August, the warmest tolerated by grapes after beginning of the maturation process, the temperature is below 22°C (excepting Turnu Severin, 22.5°C and Segarcea 22.2°C). But also in these two centers, thermal challenge is mitigated by the 565 mm yearly rainfalls at Segarcea (288 mm are recorded during the vegetation period and 33 mm in August) and by the 762 mm at Turnu Severin (354 mm during the vegetation period and 36 mm in August). The fact that solar light and warmth resources from all over the viticultural centers of the three groups of the A₃ oenoclimatic zone have no excessive features, is confirmed by the great red wines' generosity (Minis, Recas, Oravita-Vanu Mare, Corcova, Segarcea, Samburesti, Valea Calugareasca, Dealu-Mare, Nicoaresti, Sarica-Niculitel) and by the excep-

tional 'Muscat' and natural liquerous wines (Dragasani, Pietroasa, Murfatlar), produced in these centers with a worldwide fame.

Oenoclimatic characterization of the A4 zone

The warmest in Romania, this zone is characterized by weather parameters presented in Tab. 5 and Fig. 5. The centers from this zone are, in terms of helio-plenitude heliothermal hillock-meridional and meridional ones nearly to the sea (from the A₃ zone), but are different by two specific features: higher air temperature in August and lower air humidity. That is why the component viticultural centers have no fame in producing superior table wines. Even go they are still endowed with climate disponibilities assuring the quality of the obtained products.

Tab. 5. Weather parameters and possible products for the A4 oenoclimatic zone

Parameters	Optimum	Limits	Products
Air average temperature in July	22.3-22.7°C	20 -21.5°C	-Table grapes.
Air maximum temperature average in August	29.2-29.5°C	28-30°C	
Absolute maximum air temperature in August	39.4-39.6°C	39.2-41°C	
Average air relative humidity in August	66-67%	64-69%	
Average air relative humidity in August at 1 o'clock p.m	44-46%	42-47%	
Saturation air deficit with water evaporated in August, at 1 o'clock p.m	20.5-21 mb/cm ²	17.5-23 mb/cm ²	-Special wines without or with origin nominations
Hydro-thermic index Seleaninov during 1.04-30.09 period	0.85-0.90	0.7-1.07	
Hygro-hydro-thermic index during 1.04-30.09 period	3.4-3.6	2.7-3.9	
Theoretical hydro survey in soil for vine during 1.04 – 30.09	(-45) – (-75) mm	(-40) – (-150) mm	
Oenoclimatic ability index of A ₄ zone	4880-4950	4800-5020	



Fig. 5. Viticultural centers from the A4 area

Conclusions

The temperature and variable humidity assets of the Romanian climate are determined by a series of factors among which. It has been remarked that the geographical position of the country on the 45° Northern parallel on the European continent, into a zone dominated by dynamical stability, resulted facing the Atlantic air masses, the Mediterranean, the East-European and Polar ones-above a territory disposed in concentric levels-mountains, hills, plains-imposing a circuit of our masses particular for the Romanian territory.

The suitability of the Romanian climate is doubtless confirmed by the assets of viticultural regions in producing the whole possible range of wines, by requiring weather conditions clearly differentiated.

On the oenoclimatic zones from Romania, there are a lot of viticultural centers where, in autumn, after maturation, often is present the noble grapes mildew, creating high quality half-dry or sweet-liquorous wines, exceptionally appreciated.

Grouped according to the produced wine categories, the main regions and viticultural centers from Romania were analyzed by taking into account the climate suitability classified in five oenoclimatic zones (A_0 , A_1 , A_2 , A_3 , A_4).

The assets of the Romanian climate, not so common, are offering some of the most important possibilities in obtaining some categories of table wines, of high quality, with origin nominations as dry, halfdry or sweet ones from flavoured kinds ('Traminer', 'Sauvignon', and 'Muscat'), sparkling wines, raw type and sweet flavoured sparkling wines, great red wines or natural sweet 'Muscat'. The

Northeast colder regions and viticultural centers can offer juices and cooling drinks free of alcohol, and grape yields adequate for winter storage too.

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