THE IMPACT OF ECO-AGROTEHNIC FACTORS ON GRAPE QUALITY FOR ROSÉ WINE PRODUCTION

IMPACTUL FACTORILOR ECO-AGROTEHNICI LA FORMAREA CALITĂȚII STRUGURILOR PENTRU PRODUCȚIA DE VINURI ROZE

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Abstract. *This article contains state-of-the-art data in technology of rosè wines production and their colour indices. In addition, a complex of factors is presented, all required for tipical colour formation during the primary stages of winemaking and extraction of antocyans obtained from red grapes is presented. New technologies were proposed for obtaining rosè wines with a low and high content of phenolic components. Some hypotheses are formulated regarding the technological requirements for rosè wines and a number of important challenges in modern winemaking are registered.*
Keywords: indigenous varieties, red grapes, ecological factors, rosè wines

Rezumat. *Acest articol conține dele mai noi informații referitoare la tehnologia producției vinurilor roze şi indici de culoare. În plus, este prezentat un complex de factori, necesari pentru formarea culorii tipice în etapele primare de vinificație şi extracție a antocianilor din struguri negri. Au fost propuse noi tehnologii pentru obținerea vinurilor rosé cu un conținut scăzut şi ridicat de compuşi fenolici. Unele ipoteze sunt formulate cu privire la cerințele tehnologice pentru vinurile rosé şi sunt înregistrate o serie de provocări importante în vinificația modernă.*
Cuvinte cheie: soiuri autohtone de struguri, struguri negri, factori ecologici, vinuri roze

INTRODUCTION

The recent growth in rosè wines is easily explained: easy to understand, optimal content of aromatic and flavonic compounds, active biologic compounds and compared to red wines, the grapes do not require a perfect phenolic maturation degree. In the Republic of Moldova, there are some wineries that produce good rosè wines (Purcari, Fautor, Cricova, Migdal-P, Chateau Vartely, Mimi and some small producers). Of course, the wines' quality will depend on the state of the raw matter, eco-pedological factors, so not all will have the typicity of the terroir. During development and maturation, the grapes depend on abiotical (light, water, heat, mineral substances) and biotical (the soil microbiota) factors, with a more important role on wine quality (Georgescu *et al,* 1991).

The complex factors (vineyard, grape variety and technology) insure a good typicity year after year, maintaining the authenticity, tradition and culture of the

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geographical area, especially in the case of IGP wines. Some traditional areas are: Ciumai, Romaneşti, Purcari, Raşcov, Cricova, Şişcani, Răzeni, Tigheci, Tomai, Speia, Talmaza, Răscaieți, Lăpuşna, Sălcuța, Cărpineni. The evolution of viticulture, the impact of humans in the environment, technical development, the green house effect, all underline the fact that we need to revise technologies and carefully evaluate the factors (Pițuc *et al*, 2001).

As phylloxera has reduced the surfaces planted with autochtonous grape varieties, loosing the fame of the area. Now, there are different resistant interspecific varieties that need promoting (Vacarciuc, 2016).

Fortunatelly, in some areas, the autochtonous varieties have been maintained and the producers need to promote them for export (Teodorescu *et al,* 1987).

MATERIAL AND METHODS

Qualitative vine cultivation is possible through a complex cooperation of ecological, agrotechnical, viticultural and pedological research. Agroecology studies the environmental factors in collaboration with the dinamics of the area- a complex factor named terroir. The formation and maintainence of colour compounds are very important (Vacarciuc, 2004), in direct relation to the factorial relation: variety* - climatic factors* - agriculture* - soil* - technology* - human resources*.

In the last five years, different varieties for red wines from the „Codru" region, were harvested at 180-200 g/L and total acidity of 4-5 g/L tartaric acid, allowing to test some these factors on slopes with 4-10 % in Răzeni-Zâmbreni, Stăuceni-Codru (IŞPHTA) and Romaneşti-Bucoveț. Field and lab analysis, as well as phenological, agro-biological and physical-chemical analyses were done according to standards in specific literature (Țârdea, 2007).

The study used local grape varieties. The authors want to underline that the varieties used traditionaly in other countries such as Grenache, Cinsaut, Merlot, Syrah, Gamay freux, Aleatico, Alicante Bouchet, Odeskiiciornii, Saperavi can be partially used for rosè wines (Somers and Evans, 1979). Some grape varieties were not taken into study as they present malvidin 3,5- diglucoside (Bejan, 2007).

RESULTS AND DISCUSSIONS

The grape varieties that were taken into study were Cabernet Sauvignon, Pinot Noir as well as Feteasca regală, Feteasca neagră, Rara neagră, Codrinschii, Riton, Viorica, Floricica, Legenda, Flacăra, the last six being new interspecific varieties. Even if the global tendency registers a 100 % increase in Sauvignon, Chardonnay, Pinot noir, Cabernet Sauvignon and Syrah, the market is over saturated and needs some new wines (Vacarciuc, 2015). The local grape varieties expresses the local specific and added value to oenoturism.

For producing dry, demi-dry and demi-sweet rosè wines, as seen in previous studies (Cazac *et al.,* 2013), aromatic grape varieties were tested. The OIV rules that white musts can also be used in the blend (up to 20 %). The use of new clones is welcomed in rosè wines production (tab. 1). A study drawn over 7 years udnerlines the frost resistance of clones Pinot noir SMA201, Cabernet-Sauvignon

FV5. Eight varieties were chosen for the production of rosè wines. They are resistant to abiotic factors, a moderate productivity and a high sugar content 202-230 g/L and the sensorial evaluation ranges betwenn 7.8-8.1/10.

Table 1

Agrobiological indices*, productivity and quality of the studied clones

No.	Name of clone	R.g* %	L.f, %	K.a	m,s g	P.b kg/b	P t/ha	Z, g/L	A, g/L	N.d
1	Feteasca N, II -18 -10	13	88.0	1.2	220	7.8	11.7	230	8.3	8.0
2	Feteasca N, IX -21 -7	11	90.0	1.1	239	5.6	9.3	221	9.4	7.9
3	Pinot noir SMA201	25	88	1.7	139	5.1	11	230	8.8	7.7
4	Pinot noir INRA 115	17	79	1.6	119	4.0	8.6	216	8.7	7.8
5	Malbec INRA 594	15	65	1.6	106	4.1	8.7	177	7.8	7.65
6	Cabernet Sauv.- FV-5	19	75	1.6	132	5.0	9.6	202	8.2	8.1
7	Cabernet franc VSP 10	16	75	1.3	144	6.0	10	202	8.2	7.8
8	Merlot INRA 314	26	67	1.5	180	4.4	9.3	216	7.4	7.8

-R.g** –frost resistance (dead buds, %) **L.f** – fertile shoots; **K.a** –absolute coefficient of fertility, **m.s** –grape mass; **P.b** –productivity / vine, **P** – productivity/ha, **Z**-sugar concentration, **A** - acidity, **N.d** – sensorial evaluation, 10/10.*

Of the presented clones, a good percentage of fertile shoots and absolute fertility coefficient was registered in the case of Pinot noir and Fetească neagră. The mass of a grape is higher in both Fetească neagră clones, while the sensorial evaluation was better for Fetească and Cabernet.

Studies covering the last 10 years (Vacarciuc, 2008) underline some specific eco-climatic requirements. For obtaining rosè wines, active temperature sum of 2700-3200 ^{o}C and rainfall between 400-600 mm are needed. The analysis of quality indices in the raw matter is recommended: full maturity (I.m.c.) and technical maturation (I.m.t.=% sugars x pH ^{2}) ranges between: Imc=100-115;-Imt=160-220.

Relief, slope, terrain exposition, altitude, all influnce the climatic factors, different in space and time, plants have to adapt to these factors, but of course, this is limited by their genetic profile. The complex of vegetation factors is very difficult to define. Theoretically, a good rosé is obtained on slopes with South-Eastern exposures, at altitudes of 100-300 m. The agro-phytotechnic system created by mankind in the three studied areas (Răzeni, Stăuceni, Romaneşti), underlines the need of using more local grape varieties for a better image and export (Vacarciuc *et. al.,* 2015).

Agrotechnical measures in viticulture, as bud concentration – Kc=2, ensures an early harvest, with sugar concentration of at least 180 g/L and acidity expressed in tartaric acid – 4 g/L (pH=3,0), with a production of 10-11 t/ha. Using fertilisers as nitrogen 60 kg/ha, but also Zn, Mg, Ni,Co, B – improving the photosynthethis and the respiration process; Mn $^{2+,\ 4+,7+}$ ions take part in oxido-reduction processes, increase the ration between fructose and glucose and the activity of ascorbic acid. The Moldavian viticultural products can be competitive on the Euopean wine market if the vinetds produce at least 10 t/ha, while wine quality is assured by 2,0 – 4,0 kg grapes/trunk, plant density -4000 plants /ha, Guyot or Royat, with a 60:40 ration between classic and local grape varieties.

The tendency of the current vineyard management is not favourable (turning from reduced labour of 100 h/ha to 1000 h/ha), with a very negative social impact. A correct design of vineyards areas, slope and altitude selection is therefore very important for maintaing the IGP and DOC wines.

Soil is an important factor, dependent on structure and composition and will determine the number of treatments, quantity of necessary fertilisers, good ventilation, use of irrigation in exceptional cases only. For quality ros*é* wines, soils with a good coefficient of heat trsnsmission will be chosen.

The technological factor* follows the formation and conservation of colour (Vacarciuc, 2008). Taking into account that three forms can appear A-H^+ , A-OH^- and La-OH^- it can be very difficult to obtain a certain colour.

Feteasca neagră grapes were used as follows: 1-pressing whole grapes; 2-destemming- crushing with enzymatic maceration for 8 h; 3- carbonic maceration for 48-72h at 20 ^oC. The control sample obtained by crushing and normal maceration for 12 h. The data can be seen in table 2.

Table 2

Composition and quality of rosè wines of the obtained technological variants

Physical-chemical indices Feteasca neagră	Control and technological variants			
	Control sample	1-Direct pressing	2-Enzymatic maceration	3-Carbonic maceration
Alcoholic concentration, vol,%	10.4	11.2	11.0	11.1
Remanent sugars, g/L	3.0	2.0	2.1	2.5
Non-reductive extract, g/L	19	18	17	19
Total acidity, g/L	7.1	7.0	7.2	7.3
Volatile acidity, g/L	0.6	0.4	0.3	0.3
Total SO_2, mg/L	50	50	50	50
Phenolic compounds (F), g/L	0.610	0.530	0.640	0.550
Anthocyans (A); mg/L	52	31	73	60
Leucoanthocyanidins (L), g/L	90	82	120	110
L/A ratio	1.73	3.9	1.64	1.83
A/F ratio x 100 %	8.52	5.8	11.4	10.9
Colour intensity (I), k -1 mm	0.33	0.25	0.40	0.54
Tone (T)	1.0	0.8	0.9	0.85
Polymerisation index, %	76	56	44	60
Sensorial evaluation 10/10 p	7.9	8.1	8.0	8.1

Regarding the typical model for a rosé wine, options 1 and 3 are recommended, following other conditions, as such.The maceration must not extract more than 600 mg/dm^3 – phenolic compounds (F), not more than 100 mg/dm^3 – coloured substances (A), not more than 130 mg/dm^3 – leicoanthocianidins (L), that will persist as L/A = 1,8...2,6 and – A/Fx100 = 4...10.

Prevention of oxidation is done by ascorbic acid (Vivas and Glories, 1979), while sulphitation, 40-60 mg/L, does stop condensation of chinions and its radicals.Acces of oxygen in new must is limited to 10 mg/l, redox potential – up to 250 mV, heavy metals up to 7 mg/dm^3 and pH up to 3,2, while grape processing should not pass over 4 hours:

Carbonic maceration of grapes, for 3 days, at ambient temperature, causes moderate extraction of colour, specific sensorial profile formation, polymer hidrolisation etc.

For rosé wines, the following chromatic charcteristics should be obtained: luminosity – (L =30-60 %), dominant wave length - (JId=590-610), colour purity – (15-45 %), intensity – (I = D_{420} + D_{520} + D_{620} = 0,25-0,45) and tonality – (T = D_{420} / D_{520} = 0,5-0,8).

Fermentation at 17 ^{o}C allows to keep the pigment complex, enriches the product with volatile acids, esters, terpenic compounds etc; maintaing the thin deposit will last up to 3 weeks, while acidity should not drop below 7,5 g/dm^3.

CONCLUSIONS

1. The 5 year mean regarding climatic factors, soild, altitude etc should be taken into conideration.
2. The variants obtained from Feteasca neagra with the best results are 1 and 3.
3. It is necessary to classify wines according to vineyards (IGP) of exceptional quality –„grand wines”.
4. Rural landscape – ecology – social relations on one side, and applied technologies – agrotechnics – cultural level – tradition – gastronomy are all connected.

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