

## INCIDENCE OF THE TREATMENT WITH OENOLOGICAL TANNINS ON THE RED WINES' SENSORIAL PROFILE

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Comparative experiments were done in order to study the influence of the treatment with various types of tannins of the latest generation on the red wines sensorial profile. It was noticed that the treatment with proanthocyanidolic tannins from grapes (seeds and skins) and from wood (oak) changes the sensorial profile of treated wines in a favourable manner, to the effect that it diminishes astringency and bitterness and enhances the persistence, roundness and taste structure, as well as the spicy notes. In their turn, treatments with proanthocyanidolic and ellagic tannins incorporating acetaldehyde diminished the olfactory sensations of the vegetal and the mineral, and the taste sensations of dryness and astringency, but enhancing the fruity taste, extractness and unctuousness, along with a barrel character; the evolution of some analytical and chromatic parameters (total polyphenols index, intensity of colour, D 420 %, D 520 %, D 620 %, nuance, DA %, degree of polymerization, degree of ionization, pink index) has confirmed a high polyphenolic stability and an improvement of the sensorial structure of the treated red wines.

*Keywords:* astringency, fruity taste, roundness, unctuousness, total polyphenols index, intensity of colour, degree of polymerization, degree of ionization.

### 1. Introduction

Addition of the proanthocyanidolic tannins from grapes seeds and skins into some red wines is always accompanied by a structuring effect signalled by most tasters, confirming the taste improvement of wine by a more enhanced persistence and expressiveness in the mouth, as if the treated wine associated progressively the exogenous compounds into its own phenolic structure.

#### *Origin of the structuring effect*

The mechanism according to which this structuring occurs following the treatment with proanthocyanidolic tannins has two origins: through direct participation of condensed tannins and formation of combinations with the proanthocyanidines and anthocyanins from wine; through indirect participation of hydrolysable tannins in the phenomena favouring the production of ethane during some oxidation reactions (Vivas N., 1999). In the case of proanthocyanidolic tannins incorporating an ethanal molecule, the latter possesses the capacity to rapidly bind of anthocyanins extracted from the skins as a result of the bridges achieved through the acetaldehyde molecules (ethanal bridges); as a result of this mechanism, these products have the capacity to achieve a rapid and lasting polyphenolic stabilisation and to form very stable macromolecular structures that enhance the structuring effect of the treated red wines (Vivas N., 2006).

### *The optimum stage for obtaining the structuring effect*

In the case of tannins from grape seeds, the most efficient use has been signalled through the treatments carried out during the alcoholic fermentation or prior to the separation of free run must and its transfer into barrels because this combats the enhancement of the dryness sensation in the mouth; for tannins from grape skins, the addition is recommended after the AF or prior to the starting of the MLF if the stabilisation of colour is pursued, or after the completion of the malolactic fermentation if the aim is to improve the wine structure (Crespy A., 2006).

In their turn, proanthocyanidolic and elagic tannins incorporating an acetaldehyde molecule are always added during the prefermentative stage after the completion of the enzymatic treatment that facilitates the extraction of anthocyanins from the skins of red grapes varieties (Vivas N. et al., 2006a).

### *Enhancement of the structuring effect*

The process of union of exogenous proanthocyanidolic tannins with polyphenols from wine (and with the other constituents from the composition of the latter) it is possible due to their identical nature allowing them to participate in the global tanninic structure of the treated wine (Vivas N., 2000; Croitoru C. et al., 2007a). It is worth mentioning the superior character of proanthocyanidolic tannins from grapes (both from skins and from seeds) regarding the influence on enhancing the structuring effect of treated wines (Lurton L., 2001; Vivas N. et al., 2006b; Croitoru C., 2008) when compared to proanthocyanidolic tannins of different vegetal origins (Peynaud E. et Blouin J., 1996).

The research purpose was to investigate the influence of treatment with proanthocyanidolic tannins of the latest generation upon the sensorial profile and the polyphenolic stability of treated red wines.

## **2. Materials and methods**

For the performance of comparative experiments, at the laboratory level, and then at the industrial level, the following materials have been used:

- Proanthocyanidolic tannins from grapes (from seeds, with the description of PROTAN PEPIN and from skins, with the description of PROTAN RAISIN) and from oak wood (with the description of PROTAN BOIS); the latter were added in association (PROTAN PEPIN with PROTAN BOIS and PROTAN PEPIN with PROTAN RAISIN) and in identical doses of 5 g/hl each; the treatment was carried out during the postfermentative stage on a wine from the Cabernet Sauvignon variety within the company Murfatlar România during the wine-making period of 2006 (figures 1 and 2).

- Proanthocyanidolic tannins associated with elagic tannins incorporating acetaldehyde; the TANETHYL EFFE product belongs to this category; this product was added in a dose of 5 g/hl during the prefermentative stage after the enzymatic treatment of extraction of anthocyanins from the skins; the treatment was carried out on a de-stemmed grapes type originating from the Cabernet Sauvignon variety, within the company of Murfatlar România during the wine-making period of 2008 (figures 3 and 4).

- Proanthocyanidolic tannins incorporating acetaldehyde; the TANETHYL product belongs to this category; this product was added during the prefermentative stage on de-stemmed grapes coming from the Syrah variety; the first comparative test studied the evolution of some analytical and chromatic parameters with respect to the control sample (not treated), of a treated sample of 40 g/hl BATONNAGE PLUS 150 kDa (a product based on cell walls from autolysed yeasts degraded thermoenzymatically) and of a sample treated with the same dose from that product and subsequently with a dose of 20 g/hl TANETHYL (Table 1); during another comparative test, the evolution of some analytical and chromatic parameters was studied, with respect to the control sample, of those treated with variable doses of TANETHYL from 15 g/hl to 100 g/hl (Table 2).

The evolution of some analytical and chromatic parameters was studied, which provided the possibility of evaluating the polyphenolic stability and of improving the sensorial profile of treated red wines.

The analysed parameters were:

1. Intensity of colour, IC, represents the sum of the components of the colours yellow, red and violet in which the values of the red components and especially violet must be very high in a red wine with remarkable chromatic characteristics.
2. The index of total phenols, IPT, expressing the richness in polyphenolic compounds whose increasing value outlines both an efficient extraction and a valuable potential due to either an advanced polyphenolic maturity, or to a correction with proanthocyanidolic tannins of the latest generation.
3. The chromatic components of colour, to which the value of the component of the yellow colour (D 420 %), the value of the red colour component (D 520 %) and the value of the violet colour component (D 620 %) are involved.
4. The nuance or colour tonality, given by the relation between the component of the yellow colour and that of the red colour,  $DO\ 420 / DO\ 520$ , which must have an increasing value up to a steady level marking the lasting stability of colour.
5. DA %, represents the level of intensity and brightness of the red colour, noticing that an increasing value of this parameter marks a favourable evolution of colour.
6. The degree of polymerization, defining the capacity of tannins to polymerize by forming macromolecular aggregates influencing favourably the sensorial profile of wine.
7. The degree of ionization is the percentage of free and combined antocyanins that are to be found under a coloured form in wine. Its value is increasing for a red wine with a favourable evolution.
8. RS or pinkness index, representing a measure of oxidability of red wine with oxygenated water, which must assume decreasing values during the evolution of the red wine.
9. E, value of extinction, quantitatively measuring the absorption of light for the wave length corresponding to the anthocyanins that have a slightly increasing value in the case of a favourable evolution of colour.

The comparative sensorial evaluations were carried out by a jury comprised of 6 certified tasters, using a marking system of up to 5 points.

### **3. Results and discussions**

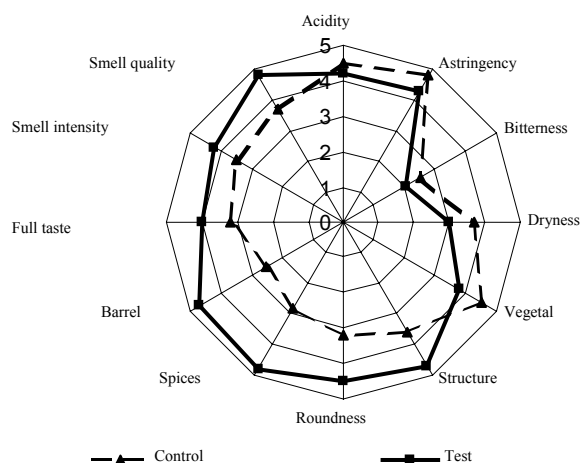
The analysis of the results obtained was structured over three parts, depending on the types of tannins used for the experiments.

#### ***3.1. Wines treated with proanthocyanidolic tannins***

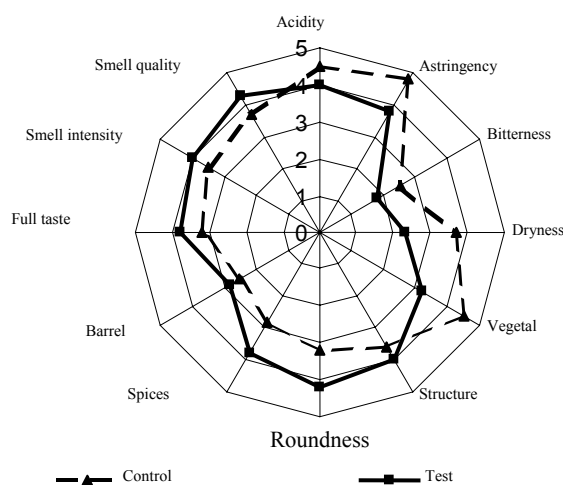
The comparative sensorial examinations carried out on a wine of the Cabernet Sauvignon variety, treated with proanthocyanidolic tannins from grapes seeds (PROTAN PEPIN in a dose of 5 g/hl) and from wood (PROTAN BOIS in a dose of 5 g/hl) outlined, after 30 days of performance of the treatments, a surprisingly agreeable and interesting olfactory profile dominated by exotic notes (vanillin, cinnamon, cloves, white pepper) as compared to the untreated control sample. It was noticed that by doubling the doses of added tannin, both the intensity and olfactory quality of wine were enhanced.

The results obtained at the laboratory and pilot level were duplicated at the industrial level for a quantity of 500 hl wine from the same variety. It should be admitted that the intensity of the exotic olfactory character ranged at a medium level (for a minimum dose of 5 g/hl selected for both tannins), its perception by the sense of smell was sufficiently strong to impress the 6 tasters participating in the comparative sensorial evaluation (Croitoru C. et al., 2007b). Besides the favourable enhancement of the olfactory profile, a remarkable enhancement of the barrel character, of the roundness and taste structure were signalled (Figure 1).

In the case of a similar test, where only proanthocyanidolic tannins from grapes were used (treatment with PROTAN RAISIN and PROTAN PEPIN by using the same doses of 5 g/hl), it was noticed, as compared to the control option, a diminishing of the sensations of astringency, bitterness, dryness, and vegetal character, and an enhancement of the notes of barrel and spices, and of the sensations of roundness, persistency, yet less perceptible than in the case of the previous test (Figure 2).



**Figure 1.** Comparative sensorial diagram with respect to the control sample for a Cabernet Sauvignon wine treated with 5g/hl PROTAN BOIS and 5g/hl PROTAN PEPIN



**Figure 2.** Comparative sensorial diagram in respect to the control sample for a Cabernet Sauvignon wine treated with 5g/hl PROTAN RAISIN and 5g/hl PROTAN PEPIN

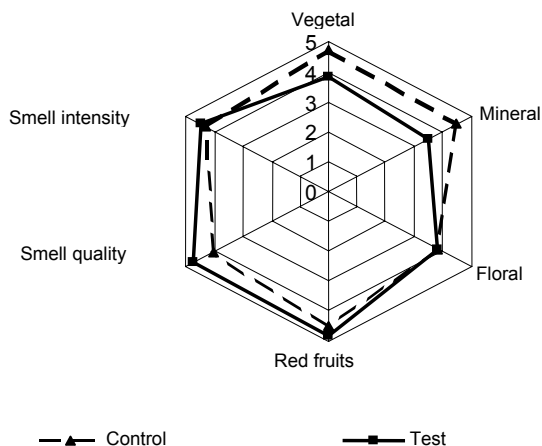
It can be noted that the proanthocyanidolic tannins (from grapes skins and seeds, along with those from wood) change the olfactory and taste profile of the treated red wine providing it a premature barrel-maturation character rendered superior by a remarkable phenolic architecture that is traditionally obtained through a long duration of maceration of the de-stemmed and crushed grapes resulted only from a harvest with a very advanced polyphenolic maturity.

### 3.2. Wines treated with elagic and proanthocyanidolic tannins incorporating acetaldehyde

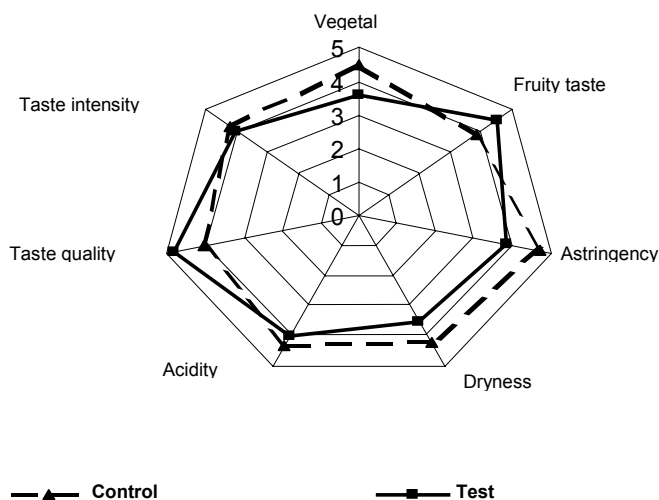
The TANETHYL EFFE product led to obtain remarkable results both for clarification of red musts, and for their protection against oxidation (remarkable preservation of the initial colour) as revealed

by the industrial test carried out by Kontek A. and Baciuc Gh. within the company Marcib Bacău during the year 2008 (Croitoru C., 2009).

Within the company Murfatlar România, the TANETHYL EFFE product was used at an industrial scale for 2000 hl destemmed grapes Cabernet Sauvignon, Pinot noir, Fetească neagră and Merlot varieties. The obtained results were remarkable for the rapid and long stabilisation of colour, and with favourable change of the sensorial profile of the treated wine. The most spectacular results were obtained on the Cabernet Sauvignon wines variety, as it can be seen in the diagrams presented in figures 3 and 4.



**Figure 3.** Comparative olfactory profile in respect to the control sample of a Cabernet Sauvignon wine treated with 5 g/hl TANETHYL EFFE



**Figure 4.** Comparative taste profile in respect to the control sample of a Cabernet Sauvignon wine treated with 5 g/hl Tanethyl Effe

The comparative analytical results obtained with wines from the Syrah variety are presented in Table 1 and represent the evolution of some analytical and chromatic parameters after 15 days from the treatment with TANETHYL during the first test.

The degree of polymerization and ionization also undergoes progressive increases when compared with the control sample. The evolution of the IC assumes a progressive increase, while the colour tonality stabilises, and D 620 % decreased insignificantly until it reaches a durable stabilization. In its turn, the RS index diminishes considerably on the sample treated only with BATONNAGE 150 KD

and undergoes a notable reduction, but less pronounced, for the sample treated with BATONNAGE 150 KD and also with TANETHYL.

**Table 1.** Evolution of some analytical and chromatic parameters for a Syrah wine treated with yeast derivatives (40 g/hl BATONNAGE PLUS 150 KDa) and TANETHYL (20 g/hl)

Analysed parameters	Control	Test with 40 g/hl Batonnage Plus 150 KDa	Test with 40 g/hl Batonnage Plus 150 KDa and 20 g/hl TANETHYL
Total polyphenols index (TPI)	54	52	53.5
D 420 %	30	29.2	29
D 520 %	60.3	61.2	61.5
DA %	67	68	69
Degree of polymerization	43	44	46
Degree of ionization	74	76	81
Intensity of colour (IC)	13.6	15.5	15.6
Tonality of colour	0.5	0.5	0.5
D 620 %	9.8	9.5	9.5
RS	727	532	605

Other comparative analytical results are presented in Table 2 and represent the evolution of some analytical and chromatic parameters after 10 days from the treatment with increasing variable doses of TANETHYL also performed on the Syrah variety during the second test.

**Table 2.** Evolution of some analytical and chromatic parameters for a Syrah wine treated with increasing doses of TANETHYL

Analysed parameters	Control	Test with 15 g/hl	Test with 25 g/hl	Test with 50 g/hl	Test with 100 g/hl
Total polyphenols index (IPT)	63.5	65.5	66	69	74
Extinction (E)	8.3	8.6	8.7	8.7	8.8
Degree of polymerization	72	73	73	73	74
Degree of ionization	14	25	25	26	28
Tonality of colour	0.9	0.9	0.9	0.9	0.8
RS	1050	1080	1080	1085	1100

The progressive increase of the TANETHYL dose induces: a proportional increase of the IPT (by the increase of exogenous tannins added); a relative steadiness of the degree of polymerization (because the period of the polymerization reactions was too short); compared to the control sample, a notable increase of extinction was obtained in case of the sample treated with 15 g/hl, followed by an insignificant increase for the samples treated with higher doses (because the quantity of anthocyanins is constant which means that the increase of the TANETHYL dose is not necessary); the value of the tonality of colour remains constant (that is, the stability of colour is maintained); an increase of the degree of ionization as compared to the control sample, in the sample treated with 15 g/hl, remaining at a relatively constant value for the samples treated with higher doses (because the quantity of anthocyanins is constant and an increase of the TANETHYL dose is not necessary); an insignificant RS index change, assuming a slight increase while the doses are increased from 25 g/hl to 50 g/hl and 100 g/hl. The analytical results obtained led to the conclusion that the optimal dose of TANETHYL was 15 g/hl.

#### 4. Conclusions

The optimisation of the taste profile of red wines by using the treatment with proanthocyanidolic tannins of latest generation with and without acetaldehyde was confirmed by the sensorial and analytical ways.

The benefic effect was observed on the decreasing of some unpleasant sensations, such as acidity, astringency, bitterness, dryness and vegetal character and on the enhancement of the structuring effect and of some agreeable sensations such as the barrel character, the spicy taste, roundness, extractiveness and unctuousness.

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