ABSTRACT

The main objective of the doctoral thesis is the study on the influence of some compositional corrections applied to the white and red wine technology from Iaşi vineyard, on wines' quality.

The research material was represented by the following grape varieties: Fetească albă, Fetească regală, Muscat Ottonel, Aligoté and Feteasca neagră harvested from Iaşi vineyard, harvest year 2009 and 2010.

To achieve the proposed objectives corrections were aplied in order to increase the content of reductive sugars by additive methods, such as the addition of concentrated must and rectified concentrated must on the Fetească albă and Feteasca regală variety, before and after their alcoholic fermentation, which was aimed at increasing the alcoholic concentration of wines and increasing the residual sugar content, in the case of wines' sweetening.

The used technology for obtaining Fetească albă and Fetească regală wines was identical and specific to that for obtaining white wines. During the alcoholic fermentation concentrated must and rectified concentrated must was added. Depending on the quantity of concentrated must and rectified concentrated must four variants of Feteasca albă wines have been used: **V1** – 40 g/L sugars rectified concentrated must; **V2** – 60 g/L sugars rectified concentrated must; **V3** – 40 g/L sugars concentrated must; **V4** – 60 g/L sugars concentrated must; **Control** sample – the wine production followed the same technology but no corrections were applied.

For obtaining Fetească regală wines different doses of concentrated must and rectified concentrated must were used, for obtaining wines with 20–40 g/L residual sugar and the following variants have resulted: **V1** – 20 g/L sugars rectified concentrated must, **V2** – 40 g/L sugars rectified concentrated must, **V3** – 20 g/L sugars must concentrated **V4** – 40 g/L sugars must concentrated; **Control** sample – the wine production followed the same technology but no corrections were applied.

To assess the influence of sugar corrections on the wine composition the main physico-chemical parameters (alcoholic strength, total acidity and volatile acidity, free sulfur dioxide, total dry extract and non reductive dry extract, pH, conductivity, the total residual reducing sugars in wine), chromatic parameters, the main organic acids contained in wine, glycerol, glucose and fructose were determined.

Another objective was to apply corrections in order to increase Muscat Ottonel wines' acidity by adding lactic acid, tartaric acid, and citric acid before and after the alcoholic fermentation. Muscat Ottonel wines were obtained according to the specific technology of obtaining aromatic wines. After application of acidity corrections at must for increasing the acidity were used six variants and a control sample (without acidity corrections): **V1** – 2 g/L tartaric acid; **V2** – 2,5 g/L tartaric acid; **V3** – 1 g/L citric acid; **V4** – 1,5 g/L citric acid; **V5** – 0,1 g/L lactic acid; **V6** – 0,3 g/L lactic acid; **Control** sample.

To view the impact of the acidity corrections made after the alcoholic fermentation, corrections with citric acid, lactic acid and tartaric acid were made and the following variants were obtained: **V1** – 2,5 g/L tartaric acid, **V2** – 1,5 g/L citric acid, **V3** – 0,3 g/L lactic acid, **Control** sample. To evaluate the influence of increasing acidity corrections the main physico-chemical parameters and major organic acids contained in wine were determined.

In order to achieve the aim of studying the influence of malolactic fermentation (biological deacidification) on wines' quality Fetească neagră wines were obtained, harvested from Iaşi vineyard, Copou center. The specific technological steps to obtain red wines have been respected and different extraction techniques were applied and the following technological variants have resulted: **V1** – maceration with ultrasound, 37 kHz for 15 minutes; **V2** – microwave irradiation at 750 W for 10 minutes; **V3** – microwave irradiation at 750 W for 15 minutes; **V4** – thermomaceration (80 °C); **V5** – classical maceration.

After completion of alcoholic fermentation, the Fetească neagră wines were inoculated with malolactic bacteria Oenococcus oeni (Producer AEB Spindal, France) 0,1 mg/L to achieve malolactic fermentation. To evaluate the influence of malolactic fermentation the following determinations were made: the main physico-chemical parameters, color parameters and phenolic compounds (D_{280} index, IFC index, total anthocyans, anthocyans profile, phenolic acids).

A color concentrate from Fetească neagră variety was obtained by concentrating the intensity of colors, meaning taking 60% parts of the total marc, obtained by crushing and destemming. The concentrating technology followed the same steps as the ones where wines are made by classic maceration. This concentrate was used to make color corrections: 5 ml concentrate

was added to 0,75 L wine from Fetească neagră variety produced by the above technologies, after malolactic fermentation. To highlight the impact of these corrections color parameters and phenolic compounds (D_{280} index, IFC index, total anthocyanin, anthocyanin profile, phenolic acids) were determined.

To achieve the objective aiming at studying the influence of tannin content correction on must and wine from Aligoté variety, the white wines technology was used. Tannin additions were made according to indications made by the producing company AEB Spindal, France. The tannin corrections were made to musts of Aligoté, where tannins were added during alcoholic fermentation and, thus, three variants have resulted according to the types of tannins used: **V1–M** Noxitan® (10 g/hL metabisulphite + tannin), **V2–M** Taniblanc® (15 g/hL ellagic tannins), **V3–M** Protan Pepin® (15 g/hL proantocianidolic tannins) and **Control** sample.

The same corrections were made to Aligoté wines after alcoholic fermentation and the following variants have resulted: **V1**–**V** Noxitan® (10 g/hL metabisuphite + tannin); **V2**–**V** Taniblanc® (15 g/hL ellagic tannins); **V3**–**V** Protan Pepin® (15 g/hL proantocianidolic tannins) and **Control** sample. In the case of control sample, the wines were obtained by same technology but no tannins were added. After evaluating the analitycal results of the obtained wines by applying compositional correction it was observed that the use of correction techniques with concentrated must and rectified concentrated must made before alcoholic fermentation, contributes to achieving superior physical-chemical properties comparative with the control sample, having a higher alcohol concentration and a higher content of non reductive dry extract. The concentrated must variants of Fetească albă and Fetească regală wines are more intensely colored due to the contribution of concentrated must composition as flavones, some phenolic acids, tannins and melanoide that give red traces to the color. The color of rectified concentrated must variants is weaker and gives a good visual aspect to wine.

The content of organic acids of Fetească albă and Fetească regală wines was influenced by the corrections made. The quantities of tartaric, malic, citric, acetic, fumaric and shikimic acid have an upward trend at concentrated must variants. Lactic acid evolution is independent of the correction type and it is largely influenced by the conditions of malolactic fermentation development. The correction with rectified concentrated must before the alcoholic fermentation enhances the synthesis of succinic acid, at Fetească albă wines, but at Fetească regală wines the same trend is not observed, as lower quantities of rectified concentrated must were used being also a characteristic specific to each grape variety. The glycerol content has higher values after alcoholic fermentation of variants where corrections with concentrated must and rectified concentrated must were applied,

comparative with the control sample, especially the variants with rectified concentrated must, at Fetească albă and Fetească regală wines. Glucose and fructose content in wines obtained by application sugar corrections did not have a uniform variation, in both varieties Fetească albă and Fetească regală, their report being subunitary. At the variants of Fetească albă variety, where 60 g/L rectified concentrated must were used, the reductive sugars report glucose/fructose has higher values and re-fermentation risk appears.

Sensory profile of Fetească albă and Feteasca regală wines is influenced by adjustments with concentrated must and rectified concentrated must, the wines having an aromatic profile with ripe fruit tendencies, dried flowers and honey and a definite taste profile.

Sweetening wines as Fetească albă and Fetească regală variety with concentrated must and rectified concentrated must lead to a reduction of alcoholic concentration and a pronounced decrease of the non-reductive dry extract, which is a disadvantage for a wine's quality. Total acidity decreases at rectified concentrated must wines whereas in concentrated must variants total acidity has an upward trend, proportional to the amount of must concentrate introduced into wine. Conductivity is influenced by adjustments of sugars, but values are not constant.

Real acidity or pH varies proportional to the total acidity. Free and total sulfur dioxide is influenced by the sweetening of wines, concentrated must increases the quantitative values, while in the rectified concentrated variants, the trend is downward. The amount of reductive sugars is proportional to the amount of concentrate must introduced into wine, and the ratio glucose/fructose is higher than one and leaves the possibility of wines' refermentation, which is an undesirable phenomen in wine.

The chromatic parameters of wines obtained by applying corrections with rectified concentrated must and concentrated must have a similar trend as wines corrected before alcoholic fermentation, but the intensity of color is more pronounced. Organic acids of the sweetened wines have similar changes comparative to wines obtained by applying sugar treatments before alcoholic fermentation, but the degree of dilution at the sweetened samples with rectified concentrated must is more pronounced.

Acidity corrections of Muscat Ottonel wine performed before alcoholic fermentation have a positive impact on the chemical composition and wine quality by increasing total acidity. Acidity is adjusted depending on the quantity and quality of used acid. Tartaric acid, citric and lactic acid of Ottonel Muscat wines have an increase evolution which is not equivalent with the dose of added acid because of the biochemical processes during alcoholic fermentation. Sensory profile of wines from Muscat Ottonel, obtained after the correction of increasing acidity is more prominent for the

control sample, correction of acidity contributes to the blurring of aromatic characteristics of wine. The acidification corrections of wine after alcoholic fermentation leads to a uniform increase in total acidity, resulting more precisely in the desired acidity, demonstrated from the determination of the physical-chemical and organic acids. The increase of the difference of tartaric acid, citric and lactic, after acidity correction is approximately equal to quantity of additional wine acid, with little loss insignificant.

The various maceration techniques used to obtain Feteasca neagră wines influence significantly the chromatic parameters of wines, the profile of anthocyans and total phenolic content, phenolic compounds with reductive properties, anthocyans and phenolic acids. This study shows that the heat treatment has an important influence on wine color extraction.

Biological deacidification of Fetească neagră wines by activation of malolactic fermentation leads to a total acidity decrease. These influence the chromatic parameters, the luminosity increases and the phenolic compounds decrease: anthocyans and phenolic acids. Anthocyans profile vary after malolactic fermentation, the percentage value of monoglucoside anthocyans decreases slightly in favour of acetilated and cumarilated anthocyans. There is a growing amount of acetilated anthocyans and a slight decrease of the ratio monoglucoside malvidine/esterified malvidine. Quality and quantity of phenolic acids is not constant, the variations is due to the different maceration technologies which favor in a different mode their extraction and after biological deacidification can be observed a slight decrease, whose values are not constant. Color correction applied to Fetească neagră wines contribute to increase of phenolic compounds content, intensify wines color and gives wine visually old aspect. Sensory characteristics of the Fetească neagră wines are influenced by macerate technologies, thermomaceration, microwave maceration and contribute to the amplification of descriptors parameters.

After making corrections to increase the tannin content of wines from Aligoté variety, total tannins, presents the most significant values for the variants treated with Protan Pepin® and Taniblanc®. Color parameters vary in relation to the tannin added, parameter **b** presenting the highest values in samples with added tannin. Total phenolic compounds have higher values because of the tannin addition and Folin-Ciocâlteu index values increase by the type of used tannin. The wines corrected with tannin, the sensoryal characteristics are superior comparative to control sample, added tannins having a positive influence on the quality of produced wines. Aromatic and taste profile of Aligoté wines is positively influenced by adjustments of tannin content and it contributes in intensifing flavor compounds and flavor characteristics.