“ LUCIAN BLAGA” UNIVERSITY OF SIBIU
FACULTY OF AGRICULTURAL SCIENCES, FOOD INDUSTRY AND ENVIRONMENTAL PROTECTION

Doctoral thesis

SUMMARY

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“ LUCIAN BLAGA” UNIVERSITY OF SIBIU
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„RESEARCH ON IMPROVING TECHNOLOGIES FOR AROMATIC WHITE WINES THE VINEYARD TÂRNAVE"

Scientific Coordinators
Prof. Univ. Dr. Ing. OVIDIU TIŢA

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APPRECIATION

The Doctoral Thesis "Research on improving the technology of aromatic white wines in the vineyard "Târnave" was developed under the high competence and professional integrity of the scientific coordinator, Prof. dr. ing. Ovidiu Tiţa.

I would like to express my gratitude to my coordinator; professor dr. Ovidiu Tiţa for sharing with me his rich experience gained over years of study, for the support offered to me in the doctoral program, and for the attitude of scientific rigor that inspired me all these years.

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In addition to all the foregoing, I have to thank my family for the moral support, encouragement and understanding they provided me with throughout these years of study.

I cannot conclude without expressing my thanks for all those who directly or indirectly supported me in carrying out and completing the study.

Eng. TANA MARIA CRISTINA

CONTENTS

Acestă lucrare a fost cofinanțată din Fondul Social European prin Programul Operațional Sectorial Dezvoltarea Resurselor Umane 2007-2013, proiect nr. 76851 "Armonizarea valențelor academice românești cu cele ale Comunității Europene, coordonator: Prof.univ. dr.ing. Ovidiu Tița.

SCIENTIFIC OBJECTIVES OF THE DOCTORAL THESIS

Through the scientific approaches of the thesis entitled "Research on improving the technology of aromatic white wines in the vineyard Târnave" I wanted to develop the improvement of the production technology of quality aromatic and semi aromatic white wines at Jidvei wine center, based on technological equipment within the wine centre, grape processing and fermentation process management in order to obtain wines with superior organoleptic qualities.

The research was conducted during the years 2010-2011-2012 in the Jidvei wine centre for Muscat Ottonel, Sauvignon Blanc, Chardonnay and Traminer roz varieties.

RESEARCH OBJECTIVES

Given that consumers are beginning to appreciate the naturalness and typicality of wine, the activities at the wine centre are aimed at improving technologies for quality aromatic and semi aromatic white wines under the conditions of hygiene required by law.

The objectives set were:

- Detailed presentation of the technological production of aromatic and semi aromatic white wines at Jidvei wine center
- Improved technological scheme for obtaining aromatic and semi aromatic white wines in Jidvei wine centre by:
- The study of the quality of grapes at Muscat Ottonel, Sauvignon Blanc, Chardonnay and Traminer roz varieties; development in sugar content; total acidity content development; determination of optimal gluco-acidimetric;
- Antioxidant protection of grapes and must to prevent oxidative processes;
- Maceration film before fermentation, separation of must types and their clarification;

- The use of pectolytic enzymes and types of pectolytic enzymes and the achievement in must during processing of grapes;
- The use of selected yeasts and wild flora, the development of new types of wine (ice wine);
- Variety specific determination of aromatic and semi aromatic wine compounds.

ABSTRACT

This doctoral thesis is intended to offer pieces of information relative to the research on improving the technology for production of flavored white wines in the Târnave wine estate.

Research was carried out on a three-year period (2010-2013), on the following varieties: Muscat Ottonel (MO), Sauvignon Blanc (SB), Pink Traminer (TR), Chardonnay (CH), in Jidvei Wine Centre.

I am a process engineer within the S.C. JIDVEI SRL, Wine Complex, having dedicated my first year to bibliographic studies. The experimental part was carried out in the doctoral research laboratories of the Faculty of Agricultural Sciences, Food Industry and Environment Protection within "Lucian Blaga" University of Sibiu, laboratories within the Molecular Biology/ Microbiology Research Institute within University of Nyíregyháza, Hungary and the laboratory of the Jidvei Wine Complex.

The following were monitored: the ripening process of grapes and the setting of the optimum harvesting time; ensuring the antioxidant protection for limiting oxidative processes and flavor preservation; application of the pre-fermenting film maceration for the extraction of flavor agents and the flavor precursors in the grape peel; influence of the enzymatic preparations; fermentation of must with yeasts from spontaneous flora and adequately selected yeast stems; obtaining flavored and semi-flavored wines. Sensorial properties, consisting of the flavour of one type of wine, lead in the end to it being chosen by the consumer.

The doctoral thesis is structured into twelve chapters: the general part, chapters 1 to 5, and the experimental part, chapters 6 to 12.

The general part presents wine and laws (Chap. 1) within the Jidvei Wine Centre, in the Târnave Wine Estate Complex (chap. 2); with a summing-up of research on the Târnave wine; presentation of the flavoured and semi-flavoured white wine varieties cultivated in Jidvei Wine Centre (Chap. 3); studies on the processing of flavored white grapes (Chap. 4). Particularities of the grapes processing for the production of quality flavored white wines (Chap.5).

The experimental part formulates the paper objectives and the material used (Chap. 6); establishes the quality of grapes / raw material (Chap. 7); presents researches performed on technological factors, for the optimization of the technology used to produce flavored and semi-flavored white wines and the physical, chemical and organoleptic properties of the produced

wines (Chap. 8); the sensorial profile of wines (Chap. 9), production of new types of wine (ice wines) (Chap. 10), outlooks to continue research (Chap. 11), bibliography (Chap. 12).

Wine is part of the human history, succeeding in crossing all the periods of civilizations run through by humans up to the present day. Wine benefits of the amplest and most rigorous legislation with regard to production technologies, but especially of quality regulations (Chap. 1).

Description of the of the Jidvei wine centre (Chap. 2). – it is placed at the intersection of geographical coordinates 46°11`` Northern latitude and 23°55`` Eastern longitude, in the Târnave Plateau, a distinct unit of the Transylvania Plateau , the surface cultivated with vine being of over 2100 ha (in 2012). Placed in the hydrograph hollow of the Târnava Mică river, the wine plantations are situated on fields around places such as Jidvei, Cetatea de Baltă, Bălcaciu, Tătârlaua and Sânmiclăuş. Climatic conditions are favourable for vine cultivation.

Ecological frame. The relief is pugged / hilly, with an average altitude of 400-600 m, slopes with South-Western orientation and 5-20% leaning. The vine plantations occupy the Southern, South-Eastern and South-Western versants.

Soils with wine usage are the brown umesobasic and anthropic ones, modified by turning. Carbonate regosoils (slope grey soil) can be found on limited areas.

The average daily temperature of over 10°C is registered in the spring, during the second decade of April, and in autumn it goes down under this limit, as of the second decade of October, the number of days with active temperatures being of 172, with limits within 154 and 182 days. The sum of the insolation hours within the vegetation period is within the range 1128 and 1859 hours, with an average value of 1371 hours.

The total of annual precipitations oscillates between 542 and 872 mm, and during the vegetation period it has the average value of 401 mm. Precipitations are distributed uneven throughout the year, leading to rainy periods that hardens the efficient elimination of cryptogrammic diseases.

Description of flavoured and semi-flavoured white wine varieties cultivated in the Jidvei Wine Centre (Chap.3)

Muscat Ottonel – Technological properties - production. The earliness at ripening highlights the great supra-ripening capacity, gathering naturally between 200 and 220 g/l sugar, reaching even 240-260 g/l. The average the average weight of a grape is of 101 g. Due to high fatness of the soil, productions of 8-9 t/ha can be harvested. The wine is gentle golden, giving off the perfume of lemon flowers, with slightly low acidity, having the flavour of a vector flavoured with sage and lemon peel essence, keeping Muscat delicacy.

Sauvignon blanc - Technological properties. The average weight of the grape is of about 70 g. It accumulates around 173 g/l sugar with a maximum potential at super-ripening of 220 g/l, acidity of 6,3 g/l H2SO4. The production is of 11-13 t/ha. The wines are obtained from Sauvignon Blanc and they are sec, fine, and discretely flavoured.

Traminer roz – capitalises very well the eco-climatic conditions of vine estates in Transylvania, situated on the Northern border of the vine culture, where the grapes flavour becomes delicate and unostentatious.

The ripening process of grapes for Pink Traminer lasts between 35 and 55 days. Harvesting the Pink Traminer grapes to obtain semi-dry and sweet wines shall take place 20 to 30 days after full ripening (Bellu O., Matran C., 1976).

Chardonnay - Chardonnay has little growing intensity, and fertilization is good, more than 70% fertile sprouts. In years with cool blossoming periods the variety is inclined to have unmaturated and beady grapes.

Good results are obtained upon heading on bilateral cordon semi-high shanks, with cutting in short fruit joint, the fruit load for the cutting being of 12-16 eye/m2. It reacts very well to fertilization and irrigation through production addition and prefers short plantation distances if 2/1 m (Gh., Metaxa Gr., 1980). Grape productions are small – 6 to 8 t/ha, but of an exquisite quality. When fully maturated, it accumulates 190-220 g/l sugars, if super-maturated it can reach 300 g/l and keeps the acidity in the grapes, at a level of 4,5-5,5 g/l H2SO4, ensuring the production of balanced wines, distinguished through delicacy and specific flavor (Macici M. Buia I., 1994).

Studies on processing of flavored white grapes (Chap. 4). Technology of flavored wines targets two fundamental objectives: extraction of primary flavors out of grapes (terpieneols) and favoring the formation of fermentation secondary flavors. To obtain flavored wines with variety specificity, the pre-fermenting stage is decisive. Târnave wines are known since medieval times (early feudalism, 10^{th} – 13^{th} cent.), when Transylvania was also called "Wine Country" (Weinland). Saxon colonization in Transylvania (12^{th} cent.) by Arpadian kings, contributed to the development of viticulture and winemaking.

Features in processing of grapes upon production of quality flavoured white wines (Chap. 5). It was designed and implemented with the construction of the Wine Complex I.A. Meanwhile, the wine production technology de producer evolved through quality wines of „varietal type" at which the aromatic note includes, in addition to the flavor of the fermentation, natural flavors of grapes. They are extracted by maceration before pre-fermentation film of the must and with the help of enzymes.

After privatization of I.A.S. Jidvei (in 1999), within the new company Jidvei, they proceeded to refurbishment of the Wine Complex. The technological line of primary winemaking of grapes with new equipment for destemming and crushing of grapes, pellicular maceration before fermentation of the must (automated winemakers), direct compression of the must with horizontal pneumatic presses, etc.

The technology of must fermentation was modernized and automated. The fermentation hall has a capacity of 20160 hL of must, it is equipped with stainless steel tanks and fully automated. The operator has the information on the monitor mounted in the control cabinet where the circuits are connected, with possibility to work on several circuits.

Research objectives and material used (Chap. 4). The scientific efforts of this work translates in my intention to develop the improvement of production technology for quality flavored and semi-flavored white wines in Jidvei Wine Centre, based on the technological equipment within the wine complex, in the processing of grapes and in the fermentative process management, in order to obtain wines with superior organoleptic properties.

Research were made in the years 2010-2011-2012, within Jidvei Wine Complex, for the varieties Muscat Ottonel, Sauvignon Blanc, Pink Traminer and Chardonnay.
The objectives set were the following:

- Presenting in detail the technology of production of flavoured and semi-flavoured white wines in Jidvei Wine Centre;
- Improving the technological scheme for obtaining flavored and semi-flavored white wines;
- Quality study for grapes as material for the varieties Muscat Ottonel, Sauvignon Blanc, Pink Traminer and Chardonnay; evolution of sugar content; evolution of total acidity content; evolution of terrene content, determination of the optimal gluco-acidimetric marker;
- antioxidant protection of grapes and must, for the prevention of the oxidative processes;
- film maceration before fermentation, separation of musts, their clarification;
- use of pectolytic enzymes and types of pectolytic enzymes and achieving efficiency of must when processing of grapes;
- using selected yeasts and those from spontaneous flora, obtaining new types of wine (ice wine);
- determining flavored varietal compounds specific to flavored and semi-flavored wines.

Determining the quality of grapes / raw material (Chap. 7). The ripening process of grapes was monitored for 3 years (2010-2012). The data refer to varieties of Muscat Ottonel, Sauvignon Blanc, Pink Traminer and Chardonnay adapted to local conditions in farms 3, 10, 7 Jidvei and 5 Sanmiclaus, specific to Târnave Wine Estate.

- The optimum index must be between 35 and 45, indicating the achievement of quality raw material to produce DOC wines.
- The climate conditions in the experimental period (2010-2011-2012) to accumulation in grapes of certain relatively constant and optimal amounts of sugars to obtain wines with controlled denomination of origin.
- In Jidvei Wine Centre full maturation of grapes sis commonly done during September 24^{th} – October 6^{th}. The ripening process of grapes for the studied varieties is carried out in a period of 35 to 55 days. Since the entry into first fruits to full maturity, sugars are accumulated of rapidly in a 25-to-35-day interval. Depending on variety and climatic conditions, the sugar quantity accumulated in grapes varies between 171-208 g/liter of must (2010), 177-209 g/liter of must (2011), and 180- 230 g/liter of must (2012).

- Acidity decrease occurs gradually, more rapidly in the first 2 - 3 weeks after first fruits and a little slower afterwards. Compared with the variation of grapes weight and their contents in carbohydrates, acidity develops in the opposite direction. In conditions of year2010, acidity of grapes for the Muscat Ottonel variety decreased from 11.32 g/l to 5.7 g/l, remaining relatively constant during the period September 10^{th} to 20^{th}, that is, while the sugar content stopped. In 2012 unusual water conditions resulted into low acidity.

  The Muscat Ottonel flavored variety accumulates in grapes large quantities of flavors. The precursor glycoside content remains at its highest level during maturation. Free flavors volatile increases significantly only after entry of grapes into first fruits and the pace of accumulation is closely linked to the evolution of sugar maturation, in case of grapes coming from the Muscat Ottonel variety, the content of free terpene showed an upward trend from 7, 99 to 13, 84 µg/L from first fruits to maturation in 2010, from 8.5 - 14.35 µg/L from first fruits to maturation in 2011, and in 2012 from 8.65 to 14.65 µg/L from first fruits to maturation.

The quality of the must is given by the sugar content and total acidity. Monitoring the ripening process of grapes and authorized composition corrections ensures every year the must quality necessary to obtain wines. And that, as it is much better to ensure the quality of the must before fermentation, rather that interfere with technological processes to improve the quality of wines.

Sauvignon Blanc variety. The composition parameters which characterize the quality of the must are as follows (average values): sugar content 198.33 g/L, total acidity 6,97 g/L sulfuric acid, alcoholic potential 12 % vol.

Muscat Ottonel variety. The composition parameters which characterize the quality of the must are as follows (average values): sugar content 197.67 g/L, total acidity 5,33 g/L sulfuric acid, alcoholic potential 12 % vol.

Pink Traminer variety. The composition parameters which characterize the quality of the must, are as follows (average values): sugar content 195.67 g/L, total acidity5,17 g/L sulfuric acid, alcoholic potential 12 % vol.

The Chardonnay variety. The composition parameters which characterize the quality of the must, are as follows (average values):sugar content 179 g/L, total acidity6,16 g/L sulfuric acid, alcoholic potential 12 % vol.

Total polyphenols are found in values ranged between 1,8g/L and 3, 8 g/L, and glycerol can be found in the largest amount in the must of Pink Traminer 95.2 mg/L.

The lowest glycerol is identified in musts of Sauvignon Blanc and Chardonnay (30,2 mg/L-38,9 mg/L), glycerol varies depending on the variety from 30.2 mg/L - 95.2 mg/L, these quantities giving pleasant, soft shades.

Volatile and highly volatile aromatic compounds are found in grapes, must and wine, both in free and combined form, particularly in the form of glycosides, as precursors of flavor.

Free volatile compounds can exist under different forms: aldehyde (linalal, Geranios), alcohol (linalool , geraniol), acid (linalic acid, geranic acid) or esters (linalyl acetate).

Musts from varieties: Muscat Ottonel (MO), Sauvignon Blanc (SB), Pink Traminer (TR), Chardonnay (CH), for years 2010, 2011 and 2012 in Jidvei Wine Centre. The results were grouped and summarized on classes of important compounds namely: terpene compounds, aldehyde, superior alcohols, volatile fatty acids, esters.

Following the determinations made, it was found that musts from the Jidvei Wine Centre accumulated terpene compounds which presented different values depending on the origin variety. It can be observed that the amount of free and bound terpene compounds in Muscat Ottonel variety goes up to 1,291 mg/L, in Pink Traminer up to 0.030 mg/L, in the two semi-flavored varieties of Chardonnay and Sauvignon Blanc 0,020 mg/L, in the harvest year 2010. The amount of aldehydes resulting from gas - chromatographic analysis is between 0,714 mg/L for Muscat Ottonel and 0,489 mg/L for Chardonnay, in the harvest year 2010.

The amount of free and bound terpene compounds in Muscat Ottonel goes up to 1,350 mg/L, in Pink Traminer up to 0.047 mg/L, in the two semi-flavored varieties Sauvignon Blanc and Chardonnay 0,027-0.050 mg/L, in the harvest year 2011.

The amount of aldehydes resulting from gas - chromatographic analysis is between 0,764 mg/L for Muscat Ottonel 0.515 mg/L for Chardonnay, in the harvest year 2011.

The amount of free and bound terpene compounds in Muscat Ottonel goes up to 1,409 mg/L, in Pink Traminer up to 0.085 mg/L, in the two semi-flavored varieties Sauvignon Blanc and Chardonnay 0,086-0.090 mg/L, in the harvest year 2012.

The amount of aldehydes resulting from gas - chromatographic analysis is between 0,823 mg/L for Muscat Ottonel and 0.612 mg/L for Chardonnay, in the harvest year 2012.

Superior alcohols fall into the harvest year 2010 between 297,555 mg/L, for the Chardonnay variety and a maximum of 440,186 mg/L for the Muscat Ottonel variety. It can be observed that in case of flavoured varieties this amount is with 27-47% higher than in case of semi-flavoured varieties.

The volatile fatty acids vary depending on the variety with percentages ranging from 5% and 42%, values characterizing these musts. Minimum values of 151,166 mg/L were found in case of Sauvignon Blanc semi-flavoured variety, and maximum values of 229,540 mg/L of volatile fatty acids resulted in case of the flavoured variety Muscat Ottonel.

The amount of esters in Figure 51 leads to the assumption that flavoured varieties have the highest content, one that varies between 224,525 mg/L, for semi-flavoured varieties Sauvignon Blanc, Pink Traminer and Chardonnay the resulting esters amount ranges from 114,666 mg/L and 133,706mg/L, these values being lower by 67%-95% than values determined in case of flavoured varieties Muscat Ottonel.

Superior alcohols fall into in the harvest year 2011 between 311,080 mg/L, for the variety Chardonnay and a maximum of 460,195 mg/L for the variety Muscat Ottonel. It is observed that in case of flavoured varieties this amount is by 27-47% higher than in case of semi-flavoured varieties.

The volatile fatty acids vary depending on the variety with percentages ranging from 5% and 51%, values characterizing these musts. Minimum values of 158,038 mg/L were found in case of Sauvignon Blanc variety, soil semi-aromatic, and maximum values of 239,974 mg/L Volatile fatty acids resulted in case of the flavoured variety Muscat Ottonel.

Amount resulting ester in figure 52 leads to the assumption that flavoured varieties have the highest content, one that varies between 234,730 mg/L, for semi-flavoured varieties Sauvignon blanc, Pink Traminer and Chardonnay the resulting esters amount ranges from 119,879 mg/L and 139,784 mg/L, these values being lower by 80%-95% than values determined in case of flavoured varieties Muscat Ottonel.

Superior alcohols fall into in the harvest year 2012 between 342,198 mg/L, for the variety Chardonnay and a maximum of 506,215 mg/L for the variety Muscat Ottonel. It is observed that in case of flavoured varieties this amount is by 30 - 48% higher than in case of semi-flavoured varieties.

The volatile fatty acids vary depending on the variety with percentages ranging from 5% and 51%, values characterizing these musts. Minimum values of 173,842 mg/L were found in case of Sauvignon Blanc semi-flavoured variety, and maximum values of 263,972 mg/L of volatile fatty acids resulted in case of the flavoured variety Muscat Ottonel.

The resulted esters amount leads to the assumption that flavoured varieties have the highest content, one that varies between 258,204 mg/L, for semi-flavoured varieties Sauvignon blanc, Pink Traminer and Chardonnay the resulting esters amount ranges from 131,867 mg/L and 135,763 g/L, these values being lower by 68%-95% than values determined in case of flavoured varieties Muscat Ottonel.

- identification of volatile aromatic compounds in aromatic and semi-aromatic varieties in Jidvei Wine Centre leads to the establishment of typical characteristics for these varieties in their area of cultivation, a basis for comparison for future studies;
- terpene compounds were found in higher amounts, effectively contributing to the achievement of its own aromatic profile;
- determined values lead to the conclusion that flavored and semi-flavored varieties in Jidvei Wine Centre have a well defined aromatic potential, which can be improved by applying alternative biotechnologies with the purpose of its optimization and balance.

Experienced technological factors experimentation (Chap. 8)
It covers the main technological processes of primary winemaking stage:

- Antioxidant protection of grapes/ must;
- Processing of grapes and determining the yield in must;
- Film maceration before fermentation of the must;

- The enzymatic treatment of the must improves the performance of certain operations and technological processes, extraction and settling of the must, clarification, extraction and color stabilization, extraction and release of varietal aromas. Lafazym CL in dose of 2 g/L, www.laffort.com, Lallzyme HC in dose of 1 g/L, www.lallemandwine.com and Rapidase CB in dose of 1-2 g/L, www.oenobrands.com.

In 2010, the content of α terpineol increases by an average of by an average of 23% in version V2 compared to the sample, while in version V3 the percentage goes up to 35%. Linalool increases in version V3 by 23% compared to the sample, followed by variant V4, and the lowest value is recorded in case of the version V2. Figure 55 shows that the variation of free terpene identified in the musts in the study, that the best option is maceration with the enzyme Lallyzme HC respectively version V3.

From the point of view the accumulation of free terpene can be seen that they are found in higher concentrations in the case linalool, above 0,17mg / L, while the lactone concentration is very low in 0.0109 mg / l. α terpineol, citronellol, polyolii and aldehydes are found with values between 0.01 mg / L and 0.04 mg / L, while nerol, and geraniol hotrienolul oscillator Between 0.06 mg / L and 0.03 mg / L. It is noted that the enzyme treatment leads to an accumulation of volatile substances which must ultimately lead to increasesrea the sensory quality of the wine. As beacon as terpene glycoside related accumulation is found in the gas-chromatographic determinations that they are present in wine with values exceeding 30% that of free terpenes.

From the point of view of the accumulation of linked terpene, it can be seen the amount of exisiting β-glucosides that reaches values of 0,9254 mg/L, in case of variants V2 and V3 0,7590 mg/L, variants in which enzymes Lafazyme CL and Lallyzme HC were used.

In 2011, the content of α terpineol increases by an average of 35% in the variant V3 compared to the sample, while in the variant V4 the percentage reaches 10%. Linalool increases in the variant V3 by 23% compared to the sample, and the lowest values is registered in case of variant V2 by 11%. Figure 57 shows the variation of free terpene identified in studied musts, being observed that the best variant is that of maceration with enzyme Lallyzme HC respectively variant V3.

The amount of existing β-glucosides that reaches values of 0,9646 mg/L, in case of variants V2 and V3 by 0,712 mg/L, variants where enzymes Lafazyme CL and Lallyzme HC were used.

In 2012, the content of α terpineol increases by an average of 35% in the variant V3 compared to the sample, while in the variant V4 the percentage reaches 10%. Linalool increases in the variant V3 by 23% compared to the sample, and the lowest value is registered in case of variant V2 by 11%. Figur 59 shows the variation of free terpena identified in studied musts, being observed that the best variant is that of maceration with enzyme Lallyzme HC respectively variant V3.

The amount of existing β-glucosides that reaches values of 1,0073 mg/L, in case of variants V2 and V4 with 0,7828 mg/L, variants where enzymes Lallyzme HC and Rapidase CB were used.

- The study demonstrated that the use of enzymatic preparations lead to significant increases of free terpena and those linked to must, the recommended enzyme being Lafayzm CL and Lallyzme HC.
- as far as the wine quality is concerned, it presents more intense fruit features, through a more pronounced esters accumulation.

For grapes in Sauvignon Blanc variety the maximum accumulation of free and linked terpene compounds is observed in case of variant V4, where values reach amounts of 0,1678 mg/L, respectively 0,4051 mg/L. For grapes in the Pink Traminer variety the maximum accumulation of free and linked terpene compounds is observed in case of variant V4, where values reach amounts of 0,205 mg/L, that 0,411 mg/L. For grapes din the Chardonnay variety the maximum accumulation de free and linked terpene compounds is observed in case of variant V4, where values reach amounts of 0,1958 mg/L, respectively 0,4765 mg/L (in 2010).

For grapes in the Sauvignon Blanc variety the maximum accumulation of free and linked terpene compounds is observed in case of variant V4, where values reach amounts of 0,1737 mg/L, respectively 0,4193 mg/L. For grapes in Pink Traminer variety the maximum accumulation of free and linked terpene compounds is observed in case of variant V4, where values reach amounts of 0,225 mg/L, respectively 0,4200 mg/L. For grapes in the Chardonnay variety the maximum accumulation of free and linked terpene compounds is observed in case of variant V4, where values reach amounts of 0,2026 mg/L, respectively 0,4930 mg/L(in 2011).

For grapes in the Sauvignon Blanc variety the maximum accumulation of free and linked terpene compounds is observed in case of variant V4, where values reach amounts of 0,1664 mg/L, respectively 0,4017mg/L. For grapes in the Pink Traminer variety the maximum accumulation of free and linked terpene compounds is observed in case of variant V4, where values reach amounts of 0,270 mg/L, respectively 0,4305 mg/L. For grapes in the Chardonnay variety the maximum accumulation of free and linked terpene compounds is observed in case of variant V4, where values reach amounts of 0,2099 mg/L, respectively 0,5108 mg/L(in 2012).

Aldehydes are flavored compunds with an important role in the formation of the wine aroma and is formed especially during the alcoholic fermentation, through oxidation or enzymatic processes. The content of aldehydes oscilates around the value of 1mg/L, the results being summarized in the range of 0,5 mg/L and 1,1 mg/L (2010).

Maceration enzymes contribute actively to the potentiation of compounds important to wine aroma, namely: superior alcohols, volatile fatty acids and esters. It is observed that in 2010, for the variety Sauvignon Blanc determined values of superior alcohols are ranged between 349,614mg/L and 352,245 mg/L, the recommended value being V2, V4, maceration with enzyme Lafazym CL and Rapidase CB. For the variety Pink Traminer determined values of

superior alcohols are ranged between 345,35 mg/L and 426,67 mg/L, the recommended value being V4, maceration with enzyme Rapidase CB. For the variety Chardonnay determined values of superior alcohols are ranged between 260,358 mg/L and 340,983 mg/L, the recommended value being V3, maceration with enzyme Lallzyme HC.

Volatile fatty acids can give floral notes. It is observed that fatty acids values are ranged between 170,275 mg/L and 193,325 mg/L for the variety Chardonnay, for the variety Sauvignon Blanc between 160,504 mg/L and 214,470mg/L, and for the variety Pink Traminer 198,68 mg/L and 253,80/L.

Esters have a well defined role in the aroma formation so that their accumulation leads to production of wines with moche more pronounced aromas. For the variety Sauvignon Blanc variant V4 leads to an increase of 18% of esters concentration compared to sample V1, the maximum value detected reach 167,042 mg/L. For the variety Pink Traminer maximum values obtained were situated at 184,92 mg/L for variant V4, with an increase of around 38% compared to sample, which presented an amount of 133,70 mg/L. For the variety Chardonnay maximum values obtained were situated at 165,37 mg/L for variant V2, with an increase of around 26% compared to sample, which presented an amount of 130,74 mg/L.

In 2011 for the variety Sauvignon Blanc, determined values of superior alcohols are ranged between 349,614mg/L and 352,245 mg/L, the recommended value being V4, maceration with enzyme Rapidase CB, at Pink Traminer variety determined values of superior alcohols are ranged between 390,50 mg/L and 425,17 mg/L, the recommended value being V3, maceration with enzyme Lallzyme HC, and for the variety Chardonnay determined values of superior alcohols are ranged between 269,336 mg/L and 352,74 mg/L, the recommended value being V3, maceration with enzyme Lallzyme HC.

Volatile fatty acids can give floral notes. In 2011 it is observed that (in figures 82-83-84) fatty acids values are ranged between 176,146 mg/L and 199,991 mg/L for the variety Chardonnay, for the variety Sauvignon Blanc between 167,543 mg/L and 223,877 mg/L, and for the variety Pink Traminer 180,35 mg/L and 205,70 mg/L.

Esters have a well defined role for the aroma formation, leading to pleasant aroma wines. For the variety Sauvignon Blanc variant V4 leads to an increase by 18% of esters concentration compared to sample V1, detected maximum values reach 174,36mg/L. For the variety Pink Traminer maximum values obtained were situated at 190,20 mg/L for variant V2, with an increase of around36% compared to sample, which presented an amount of 139,78 mg/L. For the variety Chardonnay maximum values obtained were situated at 171,07 mg/L for variant V2, with an increase of around26% compared to sample, which presented an amount of 135,25 mg/L.

In 2012 for the variety Sauvignon Blanc determined values of superior alcohols are ranged between 343,83 mg/L and 365,05 mg/L, the recommended value being V4, maceration with enzyme Rapidase CB, for the variety Pink Traminer determined values of superior alcohols are ranged between 412,40 mg/L and 420,10 mg/L, the recommended value being V4, maceration with enzyme Rapidase CB, and for the variety Chardonnay determined values of

superior alcohols are ranged between 281,46 mg/L and 368,63 mg/L, the recommended value being V3, maceration with enzyme Lallzyme HC.

Volatile fatty acids can give floral notes. In 2012 it is observed that (in figures 85-86-87) fatty acids values are situated for the variety Sauvignon Blanc between 173,63 mg/L and 232,01 mg/L, for the variety Pink Traminer between 195,62 mg/L and 215,35 mg/L, and between 184,08 mg/L and 209,00 mg/L for the variety Chardonnay.

Esters have a well defined role for the aroma formation leading to production of wines with elegant, fine and pleasant aroma. For the variety Sauvignon Blanc variant V4 leads to an increase by 18% of esters concentration compared to sample V1, detected maximum values reach 180,70 mg/L. For the variety Pink Traminer maximum values obtained were situated at 205,05 mg/L for variant V3, with an increase of around 33% compared to sample, which presented an amount of 153,76 mg/L. For the variety Chardonnay maximum values obtained were situated at 178,78 mg/L for variant V2, with an increase of around 26% compared to sample, which presented an amount of 141,34 mg/L.

Superior alcohols contribute to the formation of primary and secondary aromatic range so that their weighing constitutes a very important marker in the technological processes of producing semi-flavored white wines in varieties Chardonnay and Sauvignon Blanc.

Esters have a well defined role in aroma formation so that their accumultion leads to obtaining wines with much more pronounced aromas.

Musts in 2010: the shortest clearing length of 9 hours for variants V3. at MO, V.2 at SB, V4 - TR and V2 CH for which the musting was treated with enzymatic preparations. The longest clearing duration of 19-24 hours for variants V1 of each variety for which the musting was not enzyme treated

Musts in 2011: the shortest clearing length of 9 hours for variants V3 at MO, SB, TR and CH for which the must was treated with enzymatic preparations Lallzyme HC. The longest clearing duration of 19-24 hours for variants V1 of each variety for which the musting was not enzyme treated

Musts in 2012: the shortest clearing length of 9 hours for variants V2 at MO, SB, TR and CH at which the must was treated with enzymatic preparations Lafazym CL. The longest clearing duration of 19-24 hours for variants V1 of each variety for which the musting was not enzyme treated.

For cleared musts the fermentation speed is moderate and as a result the product shall keep better the aromatic substances leaving wines with typical fruit features.

The following types of yeasts are used for varieties Muscat Ottonel, Pink Traminer and Chardonnay:

1. Saccharomyces cerevisiae, strain Premium Blanc;
2. Saccharomyces cerevisiae, strain Elite Muscato/ Grande Bianco;
3. Saccharomyces cerevisiae/ Torulaspora delbrueckii, strain ZYMAFLORE® VL2
4. Saccharomyces cerevisiae yeast strain 99/3, strain Oenoferm® PinoType (ice wine);

The following types of yeasts are used for the variety Sauvignon Blanc:

1. Saccharomyces cerevisiae, strain IOC Révélation Thiols ;
2. Saccharomyces cerevisiae/ Torulaspora delbrueckii, strain ZYMAFLORE® VL3
3. Saccharomyces bayanus, strain Qa-23;

Among the advantages of using yeasts suitable for the must composition and the technological purposes pursued, we mention sugars uniform and advanced fermentation, to achieve a better yield in alcohol, reduced foaming during fermentation, avoid fermentation stops and easy removal of yeast in wine after alcoholic fermentation end, achieving harmonious composition wines and pleasant fermentation bouquet.

Fermentation of the must of Sauvignon blanc. The starting of the alcoholic fermentation took place in the first 24 hours, excpet variant V1 (spontaneous flora yeasts). For selected yeasts variants, fermentation happened uniformly and in a sustained pace. The fermentation duration varied between 12 to 14 days;

Fermentation of the must of Pink Traminer. The starting of the alcoholic fermentation took place in the first 24 hours, excpet variant V1 (spontaneous flora yeasts). For selected yeasts variants, fermentation happened uniformly and in a sustained pace. The fermentation duration varied between 12 to 14 days;

Fermentation of the must of Muscat Ottonel. The starting of the alcoholic fermentation took place in the first 24 hours, excpet variant V1 (spontaneous flora yeasts). For selected yeasts variants, fermentation happened uniformly and in a sustained pace. The fermentation duration varied between 12 to 13 days;

Fermentation of the must of Chardonnay. The starting of the alcoholic fermentation took place in the first 24 hours, excpet variant V1 (spontaneous flora yeasts). For selected yeasts variants, fermentation happened uniformly and in a sustained pace. The fermentation duration varied between 12 to 13 days;

Physical and chemical assessment of flavored and semi-flavored wines fermented with selected yeasts - by using several strains of yeast for fermentation, aimed to select that which lead to obtaining a v It is tus observed that in case of variety Muscat Ottonel an increase of the alcohol concentration in case of variant V3, and slightly lower in case of variants V4, values being ranged between 11.9 % and 12.3% in 2010, 13.09%-13.53% in 2011 and 12.2-12.5% in 2012. Residual sugar decreases thus demonstrating the glucosidase activity of yeasts used, weighed values oscilating between 3,9 g/L and 1,6 g/L.

Volatile acidity was low for all wines. From this point of view all yeasts cand be classified as low producers of volatile acids, which is conducive to producing quality wines with more pronounced aromatic qualities.

Residual sugar decreases thus demonstrating glucosidase activity of yeasts used, weighed values oscilating between 3,9 g/L and 1,3g/L.

Volatile acidity decreases by 14% compared to the sample V1, values obtained being ranged between 0,2 g acetic acid/L and 0,34 g acetic acid/L. Total acidity increases by 20%, resulting in values that oscilate between 4,08 g tartaric acid/L and 5,1 g tartaric acid/L.

Residual sugar decreases thus demonstrating glucosidase activity of yeasts used, weighed values oscilating between 3,7 g/L and 1,8g/L for Pink Traminer.

Volatile acidity decreases by 13% compared to the sample V1, values obtained being ranged between 0,17 g acetic acid/L and 0,3 g acetic acid/L. Total acidity increases by 30%, resulting in values that oscilate between 4,08 g tartaric acid/L and 5,1 g tartaric acid/L.

Residual sugar decreases thus demonstrating glucosidase activity of yeasts used, weighed values oscilatin gbetween 3,9 g/L și 1,4g/L, la Chardonnay.

Volatile acidity decreases by 10% compared to the sample V1, values obtained being ranged between 0,2 g acetic acid/L and 0,4 g acetic acid/L. Total acidity increases by 10%, resulting in values that oscilate between 4,2 g tartaric acid/L and 5,0 g tartaric acid/L.

The amount of glycerol practically doubles goig from 4,08 g/L to 8,118.08 g/L for SB in 2010, a benefic aspect for the onctuous character of wines. In 2011 for the variety Muscat Ottonel from 4.10 g/L doubles to V4 reaching 8.10 g/L, and in 2012 for the variety Muscat Ottonel from 4.00 g/L reaches in ase of V4 8.21 g/L.

Polyphenols values fall into between 164.06 mg/L and 268.52 mg/L. It is observed an increase of the polyphenol amount of around 9%-12% in case of use of yeasts selected from variants V4-V3, while these increases do not affect thw final wine quality.

As far as the evolution of superior alcohols is concerned in 2010 they fall into between 475.4 mg/L and 479.93 mg/L, final results being appreciated for the aromatic character of Muscat Ottonel flavored wines. Volatile fatty acids present values that are ranged between 250.8 mg/L and 241.24mg/L, significant values for the aromatic description of wines in the series of Muscat Ottonel. Minimal values are found in the variant V2 where the amount of volative fatty acids is situated at about 238.2 mg/L.

Following the esters evolution it is observed that selected yeasts lead to significant increases, values obtained being set between 337.61 mg/L and 313.82 mg/L variants V4 and V3 lead to a modest esterification in the fermentation process, obtained values being situated between 229.3 mg/L and 245.2 mg/L variants V4 and V3.

As far as the evolution of superior alcohols is concerned, in 2011, they fall into between 462.05 mg/L and 511.47 mg/L, final results being appreciated for the aromatic character of flavored wines Muscat Ottonel.

Volatile fatty acids present values that are ranged between 262.40mg/L and 254.28mg/L, significant values for the aromatic description of wines in the series of Muscat Ottonel. Minimal values are found in the variant V2 where the amount of volative fatty acids is situated around 251.1 mg/L. Following the esters evolution it is observed that selected yeasts lead to significant increases, values obtained being set between 355.86 mg/L and 330.79 mg/L variants V4 and V3 lead to an modest esterification in the fermentation process.

As far as the evolution of superior alcohols is concerned in 2012, they fall into between 530.59 mg/L and 524.78 mg/L, final results being appreciated for the aromatic character of flavored wines Muscat Ottonel.

Volatile fatty acids present values that are ranged between 272.21 mg/L and 263.78/L, significant values for the aromatic description of wines in the series of Muscat Ottonel. Minimal values are found in the variant V2 where the amount of volative fatty acids are situated around 260.5 mg/L.

Following the esters evolution it is observed that selected yeasts lead to significant increases, values obtained being set between 369.17 mg/L and 343.15 mg/L variants V4 and V3 lead to o modest esterification in the fermentation process.

Considering the values in Figure 132, it is observed that in sample V1, valueso of free and linked terpene compounds do not exceed 1517 mg/L, while in the variant V3 an increase of 3% can already be observed.

Involving selected yeasts in the release of terpene compounds is visible in variants V3-V4 where it is observed a significant increase of the latter for the variety Muscat Ottonel.

- By using several strains of yeast for fermentation it was pursued to select the one that leads to obtaining a quality wine, with more pronounced aromatic qualities.
- The acidity of the wine is a particularly important marker both for physico –chemical steadiness of it, and for its sensorial characterisation. The acidity gives the wine freshness taste, but meanwhile I can make colours bright.
- The amount of glycerol Practically doubles going from 4,08 g/L to 8,23 g/L, a benefic aspect for the onctuous character of wines.
- Total polyphenols take part at colour formation, taste and wine aromas, during the vine process about 30%-50% of the phenolic compounds being extracted from grapes depending on the maturation degree of the grapes amd duration of the maturation process of the must as well as the maceration process duration (Salinas and colab., 2005).
- evaluation of aromatic wines, terpene compounds are basic elements in the characterization of flavored ands semi-flavored wine, weighing being very important.
- Following the physico-chemical determination of wines resulting from the four technological varients the following are observed:
- using selected yeasts increases the alcoholic strength of wines.
- doubling the amount of glycerol is found, which lead to achievement of harmonious, unctuous , sweet wine;
- decreases residual sugar, which demonstrates the ability of yeasts to assimilate large quantities of carbohydrates;
- Total acidity increases giving wines fresh and revigorating character;
- volatile acidity decreases, this having as effect on taste and smell of wines;
- It is observed an increase of the polyphenol total amount not altering the final wine quality;
- from the point of view of aroma compounds it can be appreciated a percentage of around cca. 20% of the free and linked free terpinics;

- superior alcohols and fattu acids are still decreasing in variants V1-V3, variants which have been used in yeast selected, yet it is observed a significative majoration of esters, vital components for the formation of young wine aroma;
- Esters actively participate in the characterization of wine aroma, conferring to the latter fruit aromas and contributing to sensorial definition;
- using selected yeasts of commercial origin ultimately leads to the production of aromatic wines harmonious, pleasant odor notes of fruit, fragrance of flowers, and fresh sour notes;
- harvests in 2010, 2011, 2012 can be considered as very good from the point of view grapes quality, as there are no rainy years or years with significative temperature variations. Wines presents physicochemical and sensory qualities balanced with harmonious structure, that define them from the point of view of the area of origin

Sensorial profile of wines (Chap. IX) Organoleptic testing is performed by specialized tasters who know the wine components and each one's role, are experienced in a oenologia and they will be trained on wine tasting and grading techniques. Tasters shall have the mission to detect quality characteristics of wines and to be able to express himself in adequate terms.

- Sensorial testing was performed within the enology laboratory from S.C. Jidvei. For interpretation of results graphical representations in Figures 133-144 were used, grading scale from 1 to 7.
- Chardonnay: flower and fruit sensorial profile balanced acidity
- Sauvignon Blanc: complex sensorial profile, highlighting the plant varietal flavors nature pyrazine; harmonious taste thanks to the balance of chemical components; fruitiness , taint nasal drip volatile compounds;
- Pink Traminer: complete sensorial profile, highlighting fine floral varietal aromas, balanced acidity, harmonious taste and nasal smell intensity of volatile compounds;
- Muscat Ottonel: complete sensorial profile, highlighting fine floral varietal aromas, balanced acidity, harmonious taste and nasal smell intensity of volatile compounds.

Producing new types of wines (ice wines) (Chap. 10). Ice Wine" (ice wine in English or eiswein in German) is a special liqeure, very expensive, produces with care and only under certain conditions. It is a variety of dessert wine which originates in more than 200 years ago in Germany.

Grapes used for the production of this piece of art in the art of vinification (Traminer) are usually left on the vine – sometimes until the end of Decemberof even Janaury – with the purpose of reaching high levels of sugra beause of low temperature scazute at the end of the susan.

Wine bottled immediately after preparation shows harmony between components, a favorale repport as to the content of dioxide of free sulfurine and total. Also, the vine with specific organoleptice characteristics specifice soiului din care provine.

TRAMINER - ICE WINE 2011 analysis: alcoholic concentration % vol14.8,Total acidityH2SO4 g/l-5.39, Volatile acidityg/l CH3-COOH -0,35, Sugar g/l -40.3, SO2 free mg/l -14, SO2 total mg/l-252, Extract g/l - 23.3.

Sample	**Identified compound**	**Concentration (µg/l)**
Traminer 2011	Butirat de etil	9874,2
	2-Metil-1-butanol + 3-Metil-1-butanol	4447,8
	1-Hexanol	ID
	Ethyl octanoate	10625
	2- Phenylethanol	44,1
	Linalool	35661
	Terpineol	15442
	Ethyl acetate	100024
	Isoamyl acetate	25558
	Isoamyl acetate	36647
	Dodecanoic acids	36668,2

Of all the compounds identified phenylethanol, Ethyl octanoate, Isoamyl acetate are the strongest flavoring agents. Responsible for the nuances of coriander and orange blossom is linalool, and for the shades of lilac, the α-terpineol.

Young wine is yellow- green has a slightly pronounced perfume, a floral aroma that gives it personality, a taste full of flavor and elegance, subtle and persistent, is a balanced wine having a high (14.8 % vol. alc.), acidity gives it a touch of liveliness, it is a savory, sweet and liqueur-like wine and has the flavor of honey from the flowers of the forest.

Prospects for further research (Chap. 11)

- It is recommended further research on obtaining varieties of domestic and foreign wines, with superior and specific organoleptic properties, to preserve the typical character of the wine varieties and country estate;
- other technical specifications can also be addressed in order to improve the production of aromatic and semiaromatic wines;
- studies on related themes can be addressed to talk about specific varieties of the vine estate, already knowing a number of factors acting as flavor enhancers and inhibitors;
- Tests with varieties from other vine estates can performed in comparison to identify the specific local conditions of soil and climate influence on aromatic and sensory characteristics of wine

Bibliography (Chap. 12).

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