“ LUCIAN BLAGA” UNIVERSITY OF SIBIU

FACULTY OF AGRICULTURAL SCIENCES, FOOD INDUSTRY AND ENVIRONMENTAL PROTECTION

Doctoral thesis

SUMMARY

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Ph D. Candidat

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SIBIU 2014

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Optimization researches of the white wine technology from the Dragasani vineyard

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FOREWORD

Related research the thesis has been carried out with a view to providing information relating to optimize technology for obtaining the white wines in vineyard Drăgășani. For this purpose they have been followed by two directions in the framework of research carried out, directions which converge in a study be carried out smooth, with extensive possibilities for further training. First point shall be guided on the documentary, indispensable for any study, the second has in view the experimental contributes effectively to originality of research.

First point shall be guided on the bibliographical and experimental research has been carried out in the period 2010-2013.

The results are condensed in this sentence, which contains 197 pages, containing 9 tables and 91 figures.

The content is split into two distinct parts: the first part, theoretical, includes three chapters in which it is addressing the ecological and terroir of the vineyard area Drăgășani, notions about the aromatic quality white wines, notions about winemaking in white and a second part, experimental, which develops aspects of technological procedures which may lead to emphasize characteristics of physic-chemical and aromatic wines in the strictest selected, the validation of the results by modern methods, the determination of isotopic fingerprint wines in the area which technology to enable the selection of optimal processing of grapes which a view to obtaining the wines of superior quality.

Sentence may contain, in addition, bibliographic references consults, abbreviations and notations encountered in the course thesis, figures and photos submitted, as well as to tables accompanying information in the text.

To carry out this sentence have contributed, along with the author of the report, teaching staff of the University “Lucian Blaga” in Sibiu city whose ideas, suggestions, information literature, participation in discussion, raw materials for Experimenting were essential for the good process of work, and which the author wishes to thank them particularly.

Also, obtaining important results to achieve practical party would have been impossible without the aid of the owner and to the staff at the *Casa de Vinuri Iordache Drăgășani,* which supplied raw material, of the ensemble of researchers at the National Institute for Research and Development for isotopic and cryogenic Technologies- INC-DTCI ICSI Rm. Vâlcea in particular ladies Dr. eng. Roxana Ionete, drd. chemist Irina Geana,

chemist drd. Raluca Popescu, drd. eng. Diana Stegăruș and dr. fiz. Diana Costinel, and Mrs. dr. eng. Ecaterina Lengyel, dr. eng. Otto Ketney, from the Research Center for Biotechnology and Microbiology of the Faculty of Agricultural Sciences, Food Industry and Environmental Protection of the University "Lucian Blaga" from Sibiu , which have helped to carry out the testing, they have made available to the laboratory method and a part of the equipment needed for the experimental, personal which the author wanted to thank him in particular.

Last but not least, the author wishes to thank this sentence coordinator Mr. Ph D. eng. Ovidiu Tiţa for all the support on which it was granted in carrying out this thesis.

PROPOSED SCIENTIFIC OBJECTIVES

Definition of a wine in a substantial contribution to technological procedures used in obtaining it, in the formation of aroma compounds, compounds which causes it to a large extent quality olfactory perception and sensory awareness.

Through the study and optimize these procedures may be proposes a new parameters which may lead to the high-class wines.

Research has focused on identifying the flavor compounds in order to improve further the technologies for obtaining quality wines have lodged a theme frequency over the past few decades.

On a worldwide level progress has been made in the discovery of fundamental new flavors, but also for the establishment of the role of processes in their fears-wine-growing zone.

The application still higher than wines best requires in addition to routine tests such as pH, acidity, the concentration of sugars and any other information on which to characterize quality grapes, of musts, with an increasing interest in broadening the range of determinations, and in particular those that provide information about their flavor.

The vineyards are grown from Drăgăşani town approximately 3/4 varieties for white wines and 1/4 varieties for red wines.

Of the varieties distributed along white Fetească regală, Crâmpoşie selected, Riesling Italian, Sauvignon, Pinot girs, Chardonnay, white aroma Muscat Ottonel and Romanian Tămâioasă, red Novac, black Drăgăşani, Burgund Mare, Merlot, Pinot noir, Cabernet Sauvignon, Syrah, Fetească neagră.

Technology for the acquisition of such wine is specific to each variety individually, particular attention being paid to establish the optimum moment harvesting, but also the procedures later in the year.

In this context y proposes following specific objectives:

- Optimizing the pressure operation with a view to obtaining quality white wines
- Optimizing the maceration operation and its interpretation of statistics with a view to obtaining the white wines of quality
- Optimizing the fermentation operation and the interpretation of the statistics with a view to the manufacture of quality white wines
- Analysis and interpretation of isotopic fingerprint of white wines from Drăgăşani

OPTIMIZING THE PRESSURE OPERATION WITH A VIEW TO OBTAINING QUALITY WHITE WINES

Modern methods of squeezing grapes involves the use membrane pnuematic packers, features of which techniques must coincide with the results that I want to be produced. In this respect proper use of these mills in the technology for obtaining the white wines in the Drăgășani vineyardrequires knowledge of the conditions that lead to increased yields, but the control of certain physico-chemical indicators important as well as the concentration of phenols obtained. Due to the structure of the heterogeneous berry grape-pressing technology must take into account the compounds that exist in the three areas, in such a way as to issue of first intermediate zone, rich in carbohydrates and tartaric acid, and then with the center area, rich in carbohydrate and malic acid, and by the end of the peripheral zone is polyphenols and mineral salts.

4.2. Materials and methods

- Ottonel Muscat grape varieties (MO), Tămâioasă Românească (TR) Fetească Regală (FR), Italian Riesling (RI), hand-picked, fully ripe, the production of 2012, Drăgăşani winery.
- Semi-open membrane presse -0.5 bar, 1.1 bar and 1.6 bar
- Closed membrane presse, pressing 8h /0.6 bar, 1.2 bar and 1.8 bar
- PH was determined using pH meter AHR 213
- Total acidity was determined according to SR 6182-1/2008 and expressed in g / l (tartaric acid)

- Carbohydrate concentration was determined according to SR 6182-25/2009 and expressed in g/L

- Glycosyl-content of glucose was determined according to the procedure:

Investigations made on grape must and wine samples on the amount of glycoside was carried out based on the method of extraction Analytical glycosyl-Glucose (Williams et al. 1995, Iland et al., 1996).

-Polyphenol content was determined by Folin-Ciocalteu method, results are expressed in g / L

Data obtained from measurements were summarized in two tables 4.1 and 4.2 which are of selected indicators to characterize the evolution of the four varieties taken so namely: Muscat Ottonel, Tămâioasă Românească, Fetească Regală, Italian Riesling.

Each indicator in part contributes to the achievement of an image must be processed, but also in respect of wine what will result.

Table 4.1 . Physico-chemical characterisation of musts pressed for 1 hour at pressures of 0.5, 1.1, 1.6 bar in semi-open membrane press

Pressure (Bar) V1	Variety	pH	Total acidity (g tartaric acid/L)	Carbohydrate (g/L)	Glycosyl-glucose (μmoli/L)	Total polyphenols (g/L)	Turbidity (NTU)
Grape must ravac	MO	3,35	4,9	225	245	4,8	830
	TR	3,86	4,8	218	253	4,7	816
	FR	3,21	3,9	198	178	3,1	678
	RI	4,22	4,1	176	169	3,9	712
0,5	MO	3,42	4,7	210	244	4,9	834
	TR	3,89	4,5	202	251	4,8	818
	FR	3,36	3,8	183	179	3,2	681
	RI	4,26	3,9	165	172	4,1	713
1,1	MO	3,58	4,6	185	234	5,2	835
	TR	3,89	4,4	178	215	5,6	818
	FR	3,39	3,6	166	154	5,3	680
	RI	4,29	3,8	143	152	5,5	714
1,6	MO	3,62	4,5	162	132	11,4	720

	TR	3,91	4,2	134	125	12,1	716
	FR	3,41	3,5	112	117	10,6	540
	RI	4,30	3,7	123	112	10,9	620

Table 4.2. Physico-chemical characterization of the wort pressure for 1 hour at a pressure of 0.5, 1.1, 1.6 bar soak for 8 hours in the closed membrane press

Pressure (Bar) V2	Variety	pH	Total acidity (g tartaric acid/L)	Carbohydrate (g/L)	Glycosyl-glucose (μmoli/L)	Total polyphenols (g/L)	Turbidity (NTU)
Must	MO	3,39	4,9	232	251	10,8	450
	TR	3,91	4,8	225	259	10,7	446
	FR	3,58	3,9	204	209	10,1	328
	RI	4,42	4,1	189	199	10,9	333
0,6	MO	3,40	4,7	228	249	14,9	774
	TR	3,69	4,5	212	256	14,8	768
	FR	3,22	3,8	189	182	13,2	561
	RI	4,12	3,9	185	188	14,1	559
1,2	MO	3,52	4,5	220	254	15,2	635
	TR	3,80	4,7	208	219	15,6	618
	FR	3,31	3,8	179	174	15,3	580
	RI	4,20	3,7	180	172	15,5	514
1,8	MO	3,44	4,7	215	155	19,4	420
	TR	3,76	4,5	200	167	19,1	412
	FR	3,32	3,8	162	123	19,6	345
	RI	4,22	3,9	169	138	19,9	329

4.4. Conclusions

-pH determined for the four varieties Muscat Ottonel, Tămâioasă Românească, Italian Riesling, Fetească Regală and increases slightly with each fraction pressing the variations in acidity determined inverse relationship

-Total acidity shows a gradual decrease with increasing pressure direct compression option, the values obtained are favorable to obtain high quality wines

-The amount of sugars determined four types is balanced, observing slight decreases proportional to increasing pressure applied to grapes in the press

-The amount of glucose-glycosyl decreases with increasing pressure in the selected direct compression, but at the same time is more increased in the maceration as compared to the first version of embodiment 20%

-Grow polyphenols version maceration, version 2, this procedure is recommended if you want wine rich flavors

-Turbidity is influenced by the pressure-pressing the grape variety and involvement in the process of maceration stage

-Evaluation must yield without pressing the grapes in the two systems monitored pressure leads to superior results by maceration of the must. The amount of wine without pressing the grapes grow on average by 30% by the method of maceration, pressing discontinuous due to endogenous pectolytic enzyme activity grapes than the amount of wine without pressing the grapes produced by direct compression.

OPTIMIZING MACERATION OPERATION A VIEW TO OBTAINING OF QUALITY WHITE WINES

Influence of time and maceration enzymes on white wines from wineyard Drăgăşani

In this study we used grape varieties Muscat Ottonel, Tămâioasă Românească, Italian Riesling Fetească Regală and picked at full maturity in 2012 Enozym aroma pectolytic enzymes, yeast *Saccharomyces cerevisiae* selected Optimum-White, polygalacturonase enzyme activity and β-glucosidase A Sihazym.

The maceration time was 2 hours, 12 hours and 36 hours, denoted by T1, T2, T3. Alcoholic fermentation was performed in micro wine making system at 18°C for 10 days, with the addition of SO_2 to 40mg / L, in four.

5.3.Results and discussion

The view of the results as objective assessment, analysis was performed on white varieties Muscat Ottonel , Tămâioasă Românească , Italian Riesling Fetească Regală and the studied variants V1, V2, V3, V4 proposed.

They watched indicators characterizing white wines, but they quantify specific substances flavor variety. Physico-chemical analysis of wines resulting in the four options proposed, leading to the selection of the optimal alternative processing grapes in order to get higher quality wines. Maceration time is particularly important in processing varieties Muscat Ottonel and Tămâioasă Românească primarily for successful extraction of aromatic components in grapes. Esters are very important in the formation of sensory palette of wines in that they confer pleasant fragrances such as isoamyl acetate banana flavor , ethyl butyrate - pineapple flavor, benzyl acetate peach flavor, ethyl octyl - orange flavor or methyl butyrate the fresh apples. Sum up all these esters reach values oscillating around 300mg / L.

5.4. Conclusions

-maceration has a positive effect on the quality of white wines from wineyard Drăgăşani

-during maceration, contact is made between the grape skins and selected the optimal time leads to wines with more pronounced floral character

- from the point of view aromatic of aromatic extraction maceration leads to a more pronounced terpenes compounds, the maceration time is very important in this case

-macerating enzymes lead to increased fruity notes of aromatic wines thus increasing their potential

- Maceration enzymes lead to emphasize the fruitiness notes of wines thereby increasing their aromatic potential

- The content of glycerol and esters increases in variants where they have been used in addition to enzymes and yeasts selected

- By variants subject to study could be established by statistical methods correlations between the factors physico-chemical and biological agents

- Maceration process optimization lead to selecting that alternatives to reveal correct management of the process of wine-making for the purpose of obtaining a white wines of superior quality in Drăgășani vineyard

- Optimizing maceration process leading to the selection of alternatives to reveal the content of polyphenols increases with maceration variant, underrated up within the maximum limits approved

- Optimizing maceration process leading to the selection of alternatives to reveal maceration lead to optimize and selective extraction of the fractions odorante so that wines will show a panel more complex aromatic

- The maceration process optimization lead to the selection of alternatives to reveal the dry nereducator increases to the version of work, which may lead to wines corpolente, more savory

OPTIMIZATION OF THE FERMENTATION OPERATION WITH A VIEW TO OBTAINING WHITE QUALITY WINES

6.2. Isolation of indigenous yeasts for obtaining the white wines in Drăgășani vineyard

6.2.1 Materials and Methods

Strains of yeasts studied have been isolated from spontaneous microflora varieties taken in the study, namely: Muscat Ottonel, Tămâioasă Românească, Fetească Neagră, Fetească Regală Riesling Italian and identified as belonging to the genus *Saccharomyces cerevisiae* with the API 20 AUX C method.

Figure 6.1. Tests API 20 AUX C for the identification of wine yeasts to genus *Saccharomyces cerevisiae*

6.2.2.Results and discussion

By spontaneous fermentation of the musts is the aim of developing wine lees Saccharomyces cerevisiae var. ellipsoideus which were submitted by colonies isolated white to cream-colored.

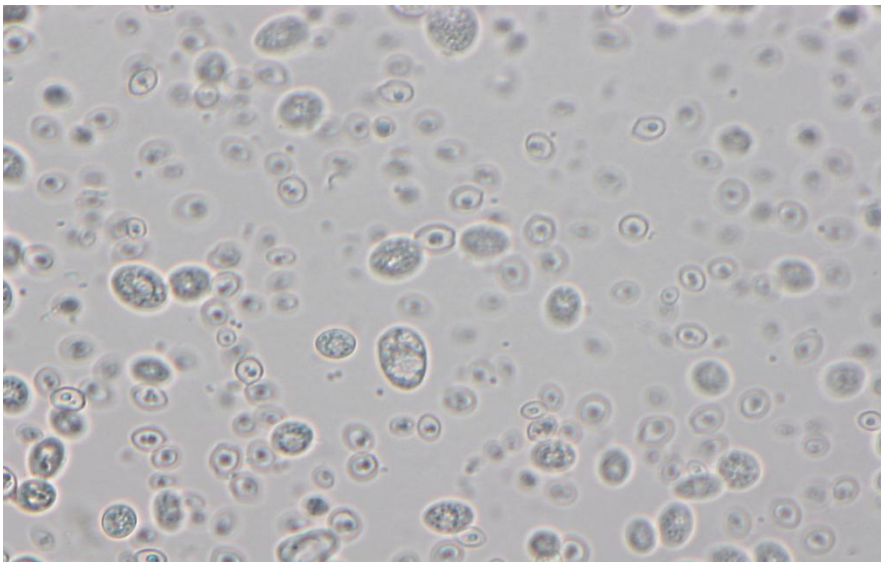

Figure 6.6. Live yeast *Saccharomyces cerevisiae var. ellipsoideus* isolated from the *Muscat Ottonel* variety

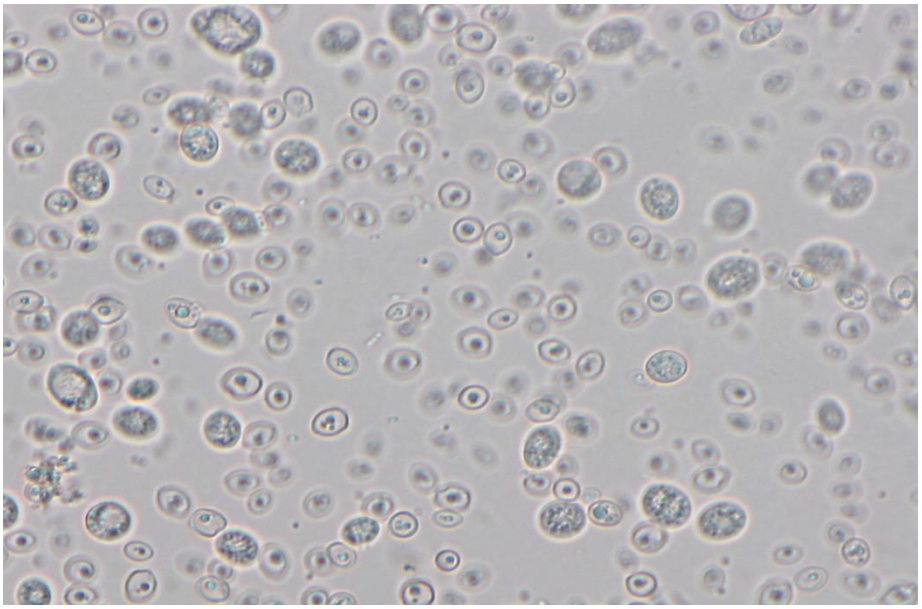

Figure 6.7. Live yeast *Saccharomyces cerevisiae var. ellipsoideus* isolated from the *Tămâioasă Românească* variety

6.2.3. Conclusions

Yeasts *Saccharomyces cerevisiae var. ellipsoideus* observed under the microscope have a form ellipsoid, white-gray, or appear in the form of cells spherical, cylindrical, yeasts *Saccharomyces cerevisiae* var. elongated, arranged alone or in pairs and occasionally form chains and agglomerations.

Physical characteristics of cells depend on how and the time of division of nutrients held by cell. It has been found that stems have sizes between 4 and 7,58 μm, and with a smaller surface, thus have a productivity less.

Assessing a population level microbial activity is required in biotechnological research and microbial load determination is an index important to follow. The cell of yeast *Saccharomyces ellipsoideus,* in contrast to the other types of yeast, has the greatest number of cells/ml of the sample analyzed.

6.4. Heat regime influence on alcoholic fermentation and sensory characteristics of the white wines of Drăgășani vineyard

6.4.2 .Materials and methods

Fermenting Muscat Ottonel and Tămâioasă Românească fermentor equipped with temperature sensors, O2 , biomass, CO2 , pH, fitted with double mat system and thermostat, maceration for 10 hours with the enzymes pectolitice Enozym aroma, fermentation under the action epifite microflora for 8/15 days at temperatures of 12^0 C, 15^0 C, 20^0 C, 22^0 C, 25^0 C.

6.3.4. Results and discussion

Noting the results obtained in figure 6.21 it is found that the value volatile acids increases with temperature of fermentation at both variety Muscat Ottonel and Tămâioasă Românească variety. It is natural because their specific extent of accomplishments given their volatility. This increase also appears in statistical analysis 6.11 and covariatie factor is set to value of 0.18 .

Terpenic compounds are a fundamental indicator in the description sensory awareness of aromatic white wines of quality, in such a way that their quantification is of particular interest. Seen in the figure 6.22 and in statistical analysis 6.12 as extraction terpenes compounds at temperatures 45 15 ^{0}C for the variety muscat Ottonel and 22 ^{0}C for Tămâioasă Românească variety. These values may lead to optimal extraction of 500-600mg/L terpenes compounds,

values which confer such wines strong, specific, harmonious and natural flowers, fruit with slight spice accents.

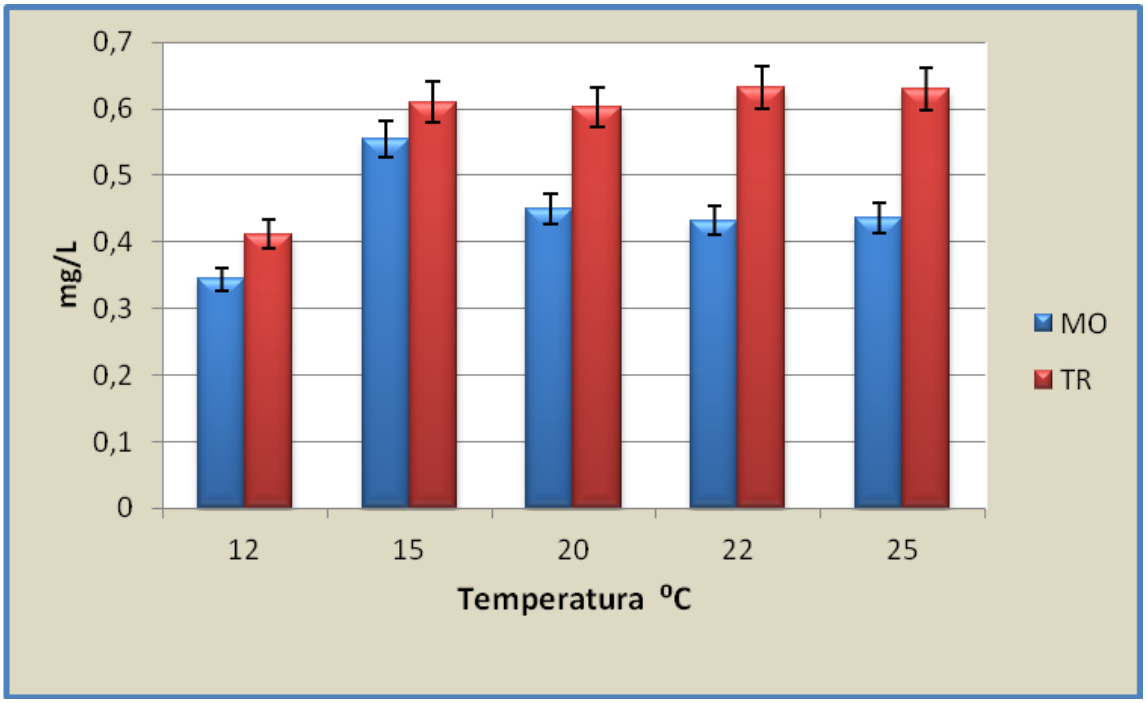

Figure 6.22 .Variation of terpenes compounds in the Muscat Ottonel and Tămâioasă Românească variety fermented at temperatures of 12^{0}C, 15^{0}C, 20^{0}C, 22^{0}C, 25^{0}C

6.12. Statistical analysis of terpenic compounds

SUMMARY

Groups	*Count*	*Sum*	*Average*	*Variance*
0,344	4	1,871	0,46775	0,003359
0,412	4	2,473	0,61825	0,000212

ANOVA

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	0,045301	1	0,045301	25,37014	0,002364	5,987378

Within Groups	0,010714	6	0,001786
Total	0,056014	7	

Esters influence certainly aromatic profile for the wine, taste qualities of which is usually carried out in an inversely proportional relation with the increase in temperature. The esterification reactions occur on two different routes, namely: On the way biological when this is done by levuri and bacteria under the action enzymes and chemical, but both types lead to their formation in wine. Wine esters gives a pleasant smell, refreshing. For the study has accumulated esters which varied between 250mg/L and 340g/L noting your that their value decreases slightly while the temperature is increasing. Optimum temperature is between 15^0C and 20^0C.

6.4.4 . Conclusions

-temperature of fermentation of wines has an important role in the process of have demonstrated potentiation or inhibition of sensory qualities of their

-for the increase in the temperature increases and the concentration of volatile acids and the concentration of aldehydes which reduces the characters taste buds of wine

-all the increase in the temperature lead to bring the concentration of higher alcohols and esters, in fact with negative repercussions on the quality of wine

-a temperature of fermentation too high results in the reduction of concentration of volatile substances in wine as they affect their aromatic characters, but at the same time decreases and the concentration of alcohol, in such a way that, from the point of view physico-chemical quality reductions occur.

6.5 .Optimization of the alcoholic fermentation process through the use of selected yeasts

6.5.2. Materials and methods

-White grapes Muscat Ottonel, Tămâioasă Românească, Fetească Regală, Riesling Italian harvested at full maturity of Drăgășani vineyardtown in 2012. Average content of sugar has been between 198g/L- 227g/L, pH between 3.34 - 3.48, and the acidity between 5.7 - 7.62 g/L tartaric acid.

-Technology parameters: peliculara enzyme maceration maceration, Enozym aroma at a temperature of 15 ^{0}C, for 2 h -

-alcoholic fermentation controlled at a temperature of 20 ^{0}C, for a period of 10 days the micro wine making system

-enzymes with beta-glukosyl action Sihazym A, *www.begerow.com*, 2g/hl

Variants of study:

V1- alcoholic fermentation in the presence of *Saccharomyces cerevisiae* yeast, isolated from local strains code: SCDR134, 20g/hl, isolated and tested in the microbiological laboratory of the Center for Research from the Faculty of Agricultural Sciences, Food Industry and Environmental Protection, Sibiu

V2- alcoholic fermentation in the presence of *Saccharomyces cerevisiae* yeast, isolated from local strains code: SCDR187, 20g/hl, isolated and tested in the the microbiological laboratory of the Center for Research from the Faculty of Agricultural Sciences, Food Industry and Environmental Protection, Sibiu

V3- alcoholic fermentation in the presence of *Saccharomyces cerevisiae* yeast, Optimum-White , www.lallemand.com, 20g/hl

V4- alcoholic fermentation in the presence of *Saccharomyces cerevisiae* yeast, Lalvin BM4x4, www.lallemand.com, 20g/hl,

V5- alcoholic fermentation in the presence of yeasts SCDR134, SCDR187, Optimum-White , Lalvin BM4x4, Innoculation into equal amounts in technological conditions presented above

- determination of thiols - 3-mercaptohexanol conferring flavors of fruit wines.

Method of analysis is based on extraction and chromatographic analysis according to the method developed and enhanced by Tominaga et al. , 2000, in which thiols are isolated with benzoic acid para-hidroximercuric, under conditions GC-MS with column BP 20, at a temperature program of 40 ^{0}C, 1 minute, and at 230 ^{0}C 10 minutes. Injector has ^{0}temperature of 240C, the Infused volume is 3 ml, with FPD. Detection.

6.5.3. Results and disscutions

In the case of aromatic varieties as Muscat Ottonel, Tămâioasă Românească, terpenic compounds content is about two times higher than in the varieties Fetească Regală, Riesling Italian varieties. Indigenous yeasts lead to build up of 0.2 mg/L-0,6mg/L terpenes compounds, in exchange trading lees provides an amount of up to 0.7 mg/L-1,25mg/L terpenes

compounds. In the variant V5 which involves coinoculation of yests, the amount of terpenes compounds presents values between 0.3 mg/L-0,7mg/L.

6.5.4.Conclusions

Yeasts strains used in alcoholic fermentation of wine lead to the formation of secondary aromatic lever with its major implications in final sensory palette. Isolated yeasts from indigenous strains do not show yet commercial potential of those devoted, but under the aspect of final determinations we can affirm that they can be used with success in the manufacture of white wines of superior quality. On the whole the amount aromatic compounds is balanced eccentric notes, so that we can affirm that have contributed optimum in their build-up, giving for wine balance, harmony, rigidity and tipicity. Commercial use of yeasts devoted produces superior wine but they lack that note typical genuine wine-growing zone. Coinoculate lees had a great importance because it combines qualities of wine lees biotechnological trade and conferring product is typical and and authenticity for wines of Drăgășani vinery.

CONCLUSIONS AND PERSPECTIVES FOR THE FUTURE RESEARCHES

8.1. Final conclusions

White wines quality in Drăgășani vineyard is strongly influenced by the approach of each phase technology, major importance having primary winemaking. Use of enzymatic preparates in the processes of crushing, maceration, fermentation, lead to optimum extraction of flavor and aroma compounds, giving such white wines in Drăgășani vineyard notes higher quality. Determining correct time and optimal temperature maceration is validated by modern methods of interpretation, statistical methods which lead to optimize technological processes for the production of white wines of superior quality.

The yield into musts ravac increases with selecting optimum variant maceration, reported on time , type of enzyme and the temperature. Optimal maceration lead to emphasize floral characters, fructuozitate notes of wines thereby increasing their aromatic potential, in particular through the upper extraction triterpene compounds and esters.

They set the physico-chemical and statistical correlations enzyme which can lead to selecting that option which is to be obtained. Maceration operation leads to optimize and

selective extraction of the fractions odorante and accumulation of dry residue upper nereducator, a fact which leads to wines may corpolente, more savory spices.

The content of polyphenols and glycerol increases with maceration variant, that's good for wine quality desired.

Isolation of yeasts of indigenous strains is beneficial in preserving the tipicity and authenticity varieties of Drăgășani vineyard , but it is recommended that the comercial yeasts coinoculation trade with a view to optimizing fermentativ process.

Combined use of enzymes and selected yeasts are influences of the aromatic characters of wines, onctuozity, their rigidity.

8.2. Personal contribution

- Have been assessed physico-chemical characteristics and aromatic white wines and aromatic semiaromate of Drăgășani vineyardobtained by a number of different technological options
- Teach mode of action of enzymes pectolitice and beta-glucozidazice time variation in the context of the maceration and in four different versions of technological procedures
- They were isolated and identified yeasts of indigenous varieties with a view to preservation and authenticity tipicitatii wines of vineyard Drăgășani vineyard
- It has evaluated the dynamic fermentation wine lees isolated froom Drăgășani vineyard town with a view to improving their biotechnological properties
- They have been studied technological variants with different parameters in order to optimize fermentativ process but also of the extraction of aromatic compounds in upper amounts
- The results have been interpreted by statistical methods resulting in optimal variants which have led to the promotion of a new technological diagrams for the acquisition of white wines in Drăgășani vineyard
- The isotopic fingerprinting of such wine, the results obtained being required in addition to the national database

8.3. Perspectives for the future researches

- It is recommended that further research with respect to the manufacture of yeasts indigenous upper biotechnological properties but, in order to maintain their typical character varieties of this vineyard.

- May be dealt with and other technical specifications with a view to making the wine production in upper Drăgășani vineyard, by covariatia elements to converge to establish technology parameters.
- May carry out studies on the same topic by addressing and other varieties specific to this vineyard, knowing it is already a series of factors and inhibitors enhancers.
- Studies may be continued on sphere other compounds which compete in the formation flavors in wine, and in particular the area of sulfur compounds.
- Can study a series of correction factors leading to the white wines of superior quality in Drăgășani vineyard.

SELECTIVES REFERENCES

1. Bayonove, C, Baumes, R., Crouzet, I., Gunata. Z. (1998). Arômes. In: Flanzy, C. (Ed.) Oenologie, fondements scientifiques et technologiques. Lavoisier, Tec & Doc. London, Paris, New York, 163-235
2. Bidan, P., Collon, Y. (1985). Métabolisme du soufre chez la levure. Bulletin de l'O.I.V. 652/653, 544-563.
3. Blanchard, L., Darriet, P., Dubourdieu, D. (2004). Reactivity of 3-mercaptohexanol in red wine: Impact of oxygen, phenolic fractions, and sulfur dioxide. Am. J. Enol. Vitic. 55,115-120.
4. Caruzzo, C.-H. (1991). Cépages du Valais. Ketty & Alexandre, Chapelle-sur-Moudon. Switzerland
5. Darriet, P. (2002). Caractérisation de composés volatiles associés à la vigne et au vin - Applications technologiques. Habilitation, Université de Bordeaux.
6. Darriet, P., Bouchilloux, P., Poupot, C, Bugaret, Y., Clerjeau, M., Sauris, M., Medina, B., Dubourdieu, D. (2001). Effects of copper fungicide spraying on volatile thiols of the varietal aroma of Sauvignon blanc, Cabernet Sauvignon and Merlot wines. Vitis 40, 93-99.
7. Darriet, P., Tominaga, T., Lavigne, V., Boidron, J.N., Dubourdieu, D. (1995). Identification of a powerful aromatic component of Vitis vinifera L.var. Sauvignon wines: 4-Mercapto-4-methylpentan-2-one. Flavour Fragr. J. 10,385-392.,
8. De Revel, G., Lonvaud-Funel A., Bertrand, A. (1996). Etude des composés dicarbonylés au cours des fermentations alcoolique et malolactique. In: Lonvaud-Funel,

A. (Ed.) Oenologie 95; 5e Symposium international d'oenologie de Bordeaux. Lavoisier-Tec & Doc, Paris, France, 321-325

9. Delfini, C, Cocito, C, Bonino, M., Schellino, R., Gaia, P., Baiocchi, C. (2001). Definitive evidence for the actual contribution of yeast in the transformation of neutral precursors of grape aromas. J. Agric. Food Chem. 49, 5397-5408.
10. Etiévant, P.X. (1991). Wine. In: Maarse, H. (Ed.) Volatile Compounds of Food and Beverages, Marcel Dekker, New York, Basel, Hong Kong. 483-546
11. Fisher, C, Scott, T. R. (1997). Food flavours, biology and chemistry. RSC Paperbacks, the Royal Society of Chemistry, Herts, UK
12. Gunata, Y.Z., Bayonove, C.L., Baumes, R.L. (1985). The aroma of grapes. I. Extraction and determination of free and glycosidically bound fractions of some grape aroma components. J. Chromatogr. A 331, 83-90,
13. Lengyel, E.**,** Oprean,L., Ketney O., Iancu, R., Bociu, D., Tița O, (2012) Physical and chemical characterization of flavored and demy flavored wines from Recas vineyard, Progress of cryogenics and isotopes separation, vol 15, issue 1, 41-46
14. Lengyel, E., Primary aromatic character of wines, (2012), Acta Universitatis Cibiniensis, Series E : Food Technology , Issn: 1221 – 4973, vol.16(1), 3-18
15. Larsen, G.J., Steven, J.L. (1986). Cysteine conjugate ß-lyase in the gastrointestinal bacterium Eubacterium limosum. Mol. Pharmacol. 29, 97-103.
16. Lopez, R., Ortin, N., Perez-Trujillo, J.P., Cacho, J., Ferreira, V. (2003). Impact odorants of different young white wines from the canary island. J. Agric. Food Chem. 51, 3419-3425.
17. Murat, M.-L., Tominaga, T., Dubourdieu, D. (2001). Assessing the aromatic potential of Cabernet Sauvignon and Merlot musts used to produce rose wine by assaying the cysteinylated precursor of 3-mercaptohexan-l-ol. J. Agric. Food Chem. 49, 5412-5417.
18. Murat, M.-L., Tominaga, T., Saucier, C, Glories, Y., Dubourdieu, D. (2003). Effect of anthocyanins on stability of a key odorous compound, 3-mercaptohexan-l-ol, in Bordeaux rosé wines. Am. J. Enol. Vitic. 54, 135-138.
19. Nielsen, J.C., Richelieu, M. (1999). Control of flavor development in wine during and after malolactic fermentation by Oenococcus oeni. Appl. and Environ. Microb. 65, 740-745

20. Nissen, P., Arneborg, N. (2003). Characterization of early deaths of non-Saccharomyces yeasts in mixed cultures with Saccharomyces cerevisiae. Arch. Microbiol. 180, 257-263
21. Noble, A.C., Elliottfisk, D.L., Allen, M.S. (1995). Vegetative flavor and methoxypyrazines in cabernet sauvignon. In: Rouseff, R.L., Leahy M.M. (Eds.) Fruit flavors. ACS Symposium series 1596, American Chemical Society Washington, 226-234
22. Patel, S., Shibamoto, T. (2002). Effect of different strains of Saccharomyces cerevisiae on production of volatiles in Napa Gamay wine and Petite Sirah wine. J. Agric. Food Chem. 50, 5649-5653
23. Rapp, A., Guntert, M., Ulmeyer, M. (1984). Über Veränderungen der Aromastoffe während der Flaschenlagerung von Weissweinen der Rebsorte Riesling. Z. Lebens. Unters. Forsch. 180, 109-116
24. Schneider, R., Kotseridis, Y., Ray, J.-L., Augier, C, Baumes, R. (2003). Quantitative determination of sulfur-containing wine odorants at sub part per billion levels. 2. Development and application of a stable isotope dilution assay. J. Agric. Food Chem. 51, 3243-3248
25. Senfton, M.A., Francis, I.L., Williams, P.J. (1993). The volatile composition of chardonnay juices - a study by flavor precursor analysis. Am. J. Enol. Vitic. 44, 359-370
26. Strauss, CR., Wilson, B., Gooley, P.R., Williams, P.J. (1986). Role of monoterpenes in grape and wine flavor. In: Parliament, T.H., Croteau, R. (Eds.) Biogeneration of aromas. ACS Symposium series 317, American Chemical Society Washington, 222-242
27. Thorngate, J.H. (1998). Yeast strain and wine flavor: Nature or nurture? In: Waterhouse, A.L., Ebeler, S.E. (Eds.) Chemistry of wine flavor, ACS symposium series 714, American Chemical Society Washington, 66-80
28. Tita O., (2009), Obţinerea vinurilor speciale şi a distilatelor din vin , Editura Universitatii Lucian Blaga, Sibiu
29. Ugliano, M., Genovese, A., Moio, L. (2003). Hydrolysis of wine aroma precursors during malolactic fermentation with four commercial starter cultures of Oenococcus oeni. J. Agric. Food Chem. 51, 5073-5078

SUMMARY

Scientific papers published by eng. Dan Constantin Mutu on thesis topics

Ovidiu Tiţa, Ecaterina Lengyel, **Dan Mutu**, Letiţia Oprean, Ramona Iancu, Daniela Gabor, Comparative studies regarding phenolic compounds in musts coming from Recas, aromatic, semi-aromatic and red varieties, Conference proceeding, International Multidisciplinary Scientific Geoconference, SGEM 2013, www.sgem.org, Thomson Reuters, ISI Web of Science, ISI Web of Knowledge, în evaluare, Albena Bulgaria, Advances in Biotechnology, **ISSN 1314-2704, 121-128, 2013**

Ovidiu Tiţa, Ecaterina Lengyel, Ramona Iancu, Mariana Pacala, Cecilia Georgescu, **Dan Mutu**, Cristina Batusaru , Mihaela Tita, The determination of the chromatic intensity of Cabernet Sauvignon, Merlot, and Pinot noir red wine, through rapid methods, Conference proceeding, International Multidisciplinary Scientific Geoconference, SGEM 2013, www.sgem.org, Thomson Reuters, ISI Web of Science, ISI Web of Knowledge, în evaluare, Albena Bulgaria, Advances in Biotechnology, **ISSN 1314-2704, 311-316, 2013**

Ecaterina Lengyel, Ovidiu Tița, Diana Stegărus, Dan Mutu, Ramona Iancu**,** Potentiation of flavor substances in Drăgăşani (Romania) wines using selected autochtonous and commercial yeasts, Mitteilungen Klosterneuburg, http://bundesamt.weinobstklosterneuburg.at/seiten/index.php/view.408Thomson Reuters, ISI Web of Science ISSN: 0007-5922, 2014, in press

Dan Mutu, Diana Stegăruș, Ecaterina Lengyel, Adina Frum, Gabriela Raducan, Ovidiu Tița, Physical chemical characterization of wines produced from Feteasca Regala and Riesling Italian processing by four different technological, Acta Universitatis Cibiniensis, Serie E, Food Technology http://saiapm.ulbsibiu.ro/rom/cercetare/ACTA_E/1AUCFT.html Vol.XVIII, (1), ISSN 1221-4973, 2014

Diana Stegăruș, Ecaterina Lengyel, Daniela Șandru, **Dan Mutu**, Ramona Iancu, Gabriela Raducan, Ovidiu Tița, Optimizing the operation of maceration to obtain quality white wines, Acta Universitatis Cibiniensis, Serie E, Food Technology http://saiapm.ulbsibiu.ro/rom/cercetare/ACTA_E/1AUCFT.html Vol.XVIII, (1), ISSN 1221-4973, 2014

Ecaterina Lengyel, Letiția Oprean, Diana Stegăruș, Ramona Iancu, Irina Geana, **Dan Mutu**, Ovidiu Tița, The chromatographic detection of the rutin in the aromatic and semi aromatic autochthonous musts variety, Acta Universitatis Cibiniensis, Serie E, Food Technology http://saiapm.ulbsibiu.ro/rom/cercetare/ACTA_E/1AUCFT.html Vol.XVIII, (1), ISSN 1221-4973, 2014