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Influence of the Distillation Process on the Aromatic Compounds of the Distillate Produced by "Muschat Hamburg" Cultivated in Durres.

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ABSTRACT: The study is applied on Muscat Hamburg an aromatic grape variety that is cultivated in Durres- Albania in 2012. The study aims to identify the aromatic compounds in the fermented must (wine) before distillation process and in the distillate obtained from this wine. The analytical control for determining the aromatic compounds in the wine and the fresh distillate was conducted with the official methods of OIV, SPE and REG-CE 2870/2000 GC-MS and GC-FID. The study aims to identify the volatile compounds in the fermented must (wine without using SO2) before distillation process and in the distillate obtained from this wine, the distillation is carried out by two tipe of alambics: direct steam alembic and water bath alembic. And then to compare the results obtained for the different allambics. According to the organoleptic evaluation it results that the distillate produced shows pronounced flower fragrance that is attributable to the variety and the lower changes of the aromatic compounds under the effect of the distillation process. According to the analytical results performed respectively to the wine and the distillate produced from it, we see that some compounds such as: superior alcohols, acetic aldehydes have a significant increase also we detected a decrease of linallol, citronellol, in both tipe of alambics. Geraniol decrease only by the water bath alambic, but does not change in contempt with the direct steam alambic both before and after distillation.

KEYWORDS: Direct steam alambic, Distillation process, Muschat Hamburg, geraniol.

I. INTRODUCTION

The distillation process is used to transform the wine into an alcoholic distillate. The purpose of this research is to identify traditional distillation alambic which performs a better transformation of wine in distillate mass by maintaining the characteristics of the grape variety that we used in the research. The Muschat Hamburg variety cultivated in Hamallaj-Durres area in 2012 is characterized like a very fragrant variety, the wines produced by this variety is aromatic and therefore produced distillate is very good features identified aromatic flower fragrance. Most important in this research is the study of the progress of malo lactic fermentation which affects the organoleptic characteristics of the wine and subsequently the distillate produced from it. The characteristic fruit flavours of wine are primarily due to a mixture of hexyl acetate, ethyl caproate, ethyl caprylate, isoamyl acetate and 2-phenylethyl acetate. Some of these aroma compounds have specific functions in the yeast cell, while others are still speculative (Pretorius and Lambrechts, 2000)[1]. Tropical fruit notes are linked to acetates of higher alcohols, i.e. alcohols with carbon numbers greater than that of ethanol, such as isobutyl, isoamyl and active amyl alcohol. In winemaking, it is one of the most difficult processes to control and can affect the final aroma and tastebalance of the product by modifying fruit derived aromas and producing aroma active compounds (Nielsenand Richelieu, 1999).[2], whereas in wine production, it is traditional for malolactic fermentation to occur after alcoholic fermentation, and frequently it happened automatically when wines

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were stored in barrels for ageing and maturation. The impact of malolactic fermentation on the taste of wine as a result of deacidification is well recognized, but the effect on wine aroma and mouthfeel/body is ill-defined (Liu, 2002)[3]. Davis and coworkers (1985)[4] reviewed the contribution of MLF to wine aroma and found no consistent impact of MLF on wine aroma. Nielsen and Richelieu (1999)[2] cite studies (including that of Davis) that may be used to support the argument that malolactic fermentation does not significantly affect the flavor of wine other than to adjust the acidity.What is undeniable is that lactic acid bacteria produce a diverse range of products during their activities (including succinate, acetate, acetoin, lactate, diacetyl, mannitol, higher alcohols and a number of the biogenic amines) depending on available substrates and the strain of bacteria. Tipical bacterial spoilage index in such kind of distillates is an increased level of some of such compounds as ethyl-lactate, ethyl acetate, 1- propanol. The distilling behaviour of some classes of volatile compounds in different kinds of traditional alambics was referred by Versiniet.al., 1989.a . [5]

II. MATERIAL AND METHODS

Cultivation and production of wine and distillate has been made in Durres- Albania. This ecosystem is characterized as Mediterranean climate with the annual temperature is 11ºC, the amount of active temperatures 3705°C, relative humidity 76-80%. The Muschat Hamburg grape variety has its plant time during the months April-August. The variety taken in the study is characterized from the pronounced flower fragrance. The raw material is in good condition, it undergoes to the alcoholic fermentation for the production of alcoholic distillate. When the alcoholic fermentation has finished the wine undergoes to the malo lactic fermentation, by this time the wine is in good condition for the distillation process. The study aims to identify the volatile compounds in the fermented must (wine without using SO2) before distillation process and in the distillate obtained from this wine, the distillation is carried out by two tipe of alambics: direct steam alembic and water bath alembic. And then to compare the resultes obtained for the different allambics.In this study we have used two tipe of Copper alambicsDirect steam alembic and water bath alembic, this are the main equipment used to produce traditional distillates. The equipment used for distillation is simple in principle: it consists of a container (or series of vessels) where wine can be heated, an enclosed headspace (or series of headspaces) above the pot where vapor can collect, cooling conduits where volatiles condense and reception vessels for condensateThe identification of the wine component is made with SPE and distillate components with OIV, GC-FID, GC-MS as is refered in Reggulation2870/2000 GC-MS of European community. The production of the wine and the distillate is according with Council Regulation (EEC) No. 1576/89 of 29 May 1989, EEC, 1989 [6]

1. Solid-phase extraction (SPE) is a sample preparation process by which compounds that are dissolved or suspended in a liquid mixture are separated from other compounds in the mixture according to their physical and chemical properties. The Gas chromatographic technique is very importante to identify the components both in wine and in the distillate produced from it. The components in the alcoholic distilates are determined by direct injection of this beverage, into a gas chromatography (GC) system without need of extraction after adding of an internal standard. The column used for this determination is (6ft x 2mm i.d, packed 5% Carbowax 20 M on 80 – 100 Carbopak B. Gase flow: He, 300- 30 ml/min)and are detected using a flame ionisation detector (FID). The concentration of each component is determined with respect to the internal standard from response factors, which are obtained during calibration under the same chromatographic conditions as those of the alcoholic drink analysis. As it is dictated from REG-CE 2870/2000 all reagents are in high purity more than 97%. For the malo lactic fermentation we use the paper cromatografy for this tipe of determination is used the Cromatografic paper Whatman Nr.1.
2. Sensory analysis Sensory analysis, sometimes called organoleptic analysis, involves the assessment of the beverage by what is often loosely called ‘tasting’, but other than in its simplest form. It is an attempt to assess and describe the character of a drink in universally understandable terms using the natural senses of vision (for color, clarity), smell (for aroma/flavor), taste and touch (for texture and temperature). For the assessment we have used this scale (10, no perception; 20, very low; 30, low; 40, middle; 50, high and 60, very high intensity).

III.RESULTS AND/OR DISCUSSION

The condition of the raw material was: Sugar content was 19 °Brix, Acidity gr/ltac.tartric was 4, State of raw material was undamaged. In general the fermentation is good undertaken, the temperature has not gone above 22° C it shows that fruit fragrances are stored during fermentation were carried out four pumping ventilation to cool wine and not

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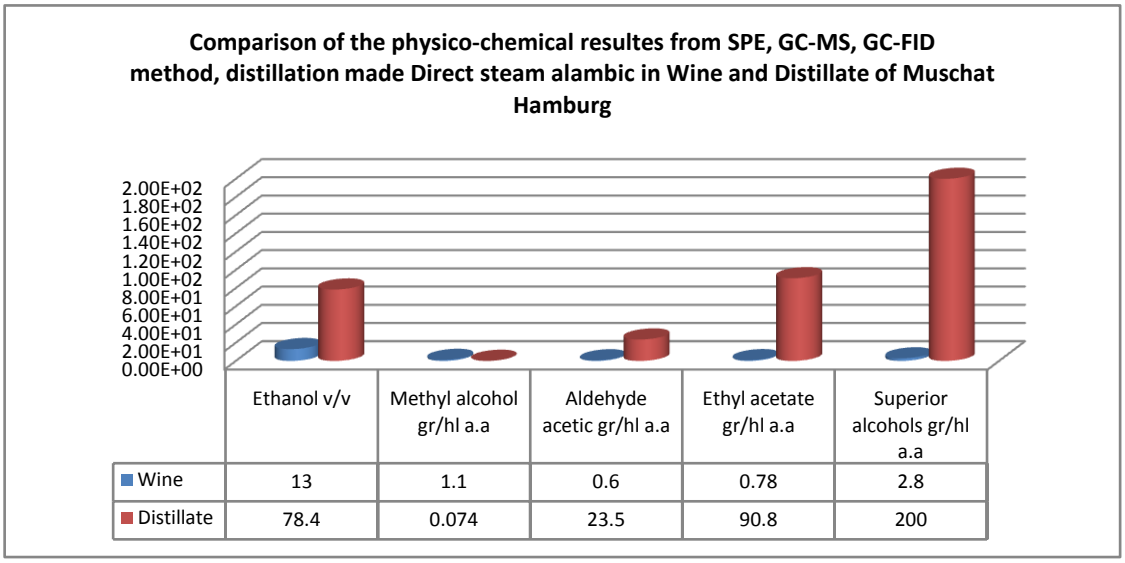
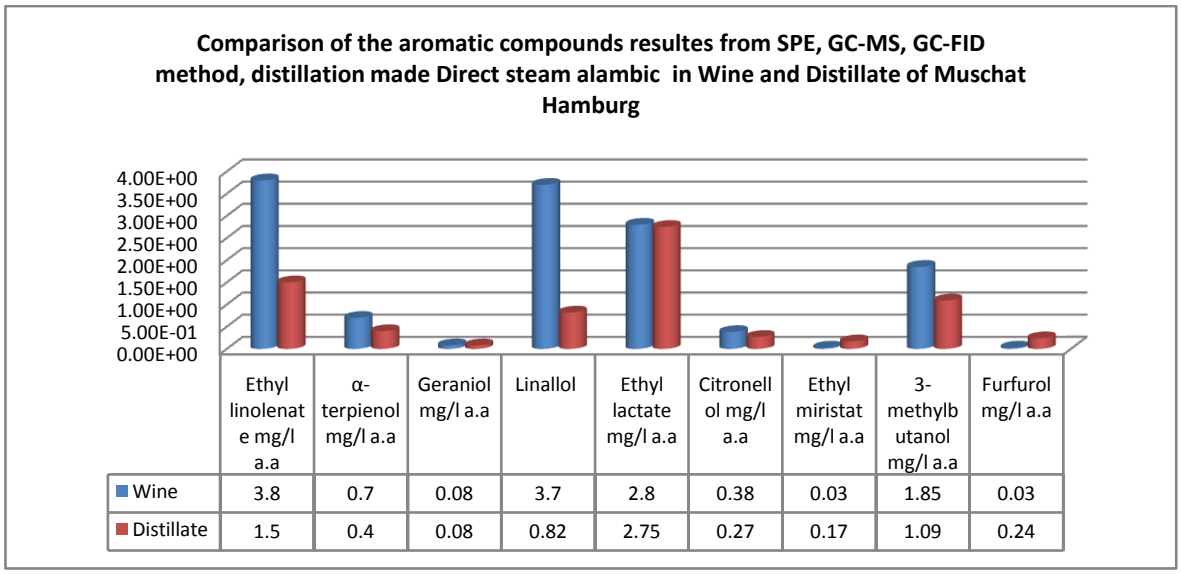
alienating the origin of fruit fragrances. The wine undergo the malo lactic fermentation it is dertermined by paper cromatografywith Whatman Nr 1. The results obtained from SPE methode for the wine and GC-MS, GC-FID method for distillate is given in the charts below.

Chart 1.Comparison of the physico-chemical results from SPE, GC-MS, GC-FID method, distillation made Direct steam alambic in Wine and Distillate of Muschat Hamburg



	Ethanol v/v	Methyl alcohol gr/hl a.a	Aldehyde acetic gr/hl a.a	Ethyl acetate gr/hl a.a	Superior alcohols gr/hl a.a
Wine	13	1.1	0.6	0.78	2.8
Distillate	78.4	0.074	23.5	90.8	200

Chart 2.Comparison of the aromatic compounds results from SPE, GC-MS, GC-FID method, distillation made Direct steam alambic in Wine and Distillate of Muschat Hamburg



	Ethyl linolenate mg/l a.a	α-terpienol mg/l a.a	Geraniol mg/l a.a	Linallol	Ethyl lactate mg/l a.a	Citronellol mg/l a.a	Ethyl miristat mg/l a.a	3-methylbutanol mg/l a.a	Furfurol mg/l a.a
Wine	3.8	0.7	0.08	3.7	2.8	0.38	0.03	1.85	0.03
Distillate	1.5	0.4	0.08	0.82	2.75	0.27	0.17	1.09	0.24

According to the analytical results performed respectively to the wine and the distillate produced with direct steam alambic, we see that some compounds such as: ethanol, acetic aldehyde, ethyl acetate and superior alcohols increase significaly ethyl linoleate have a significant decrease from 3.8 mg/l (at the wine) to 1.5 mg/l a.a (at the distillate), the acetic aldehydes increase from 0.6 gr/hl (at the wine) 23.5 gr/hl a.a, Ethyl miristat 0.03 mg/l (at the wine) to 0.7 mg/l a.a (at the distillate). It is noted a decrease of linallol from 3.7 mg/l a.a in the 0.82 mg/l a.a, decrease of citronellol from 0.38 mg/la.a in the 0.27 mg/l a.a. also α-terpinol decrease from 0.7 mg/l a.a in 0.4 mg/l a.a, also the methyl alcohol

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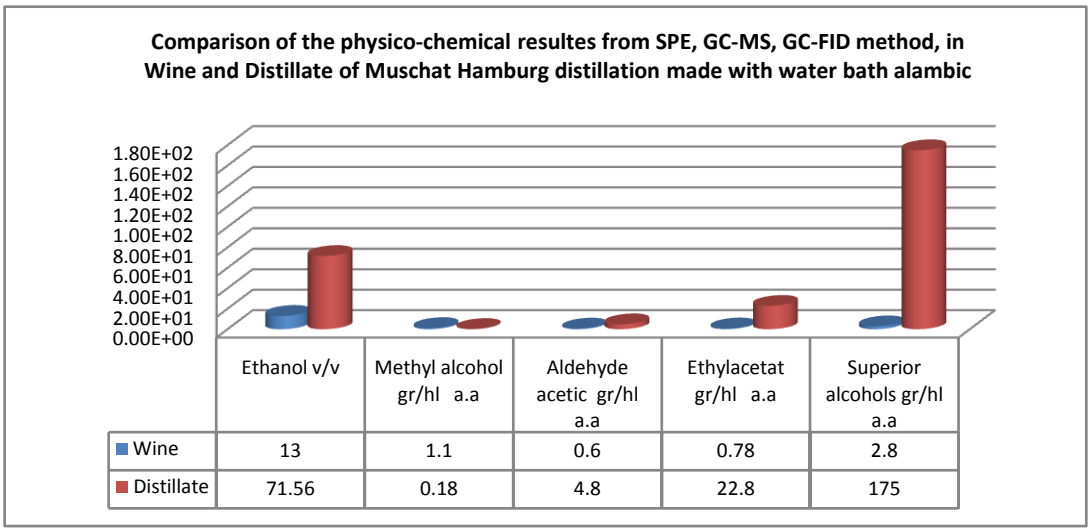
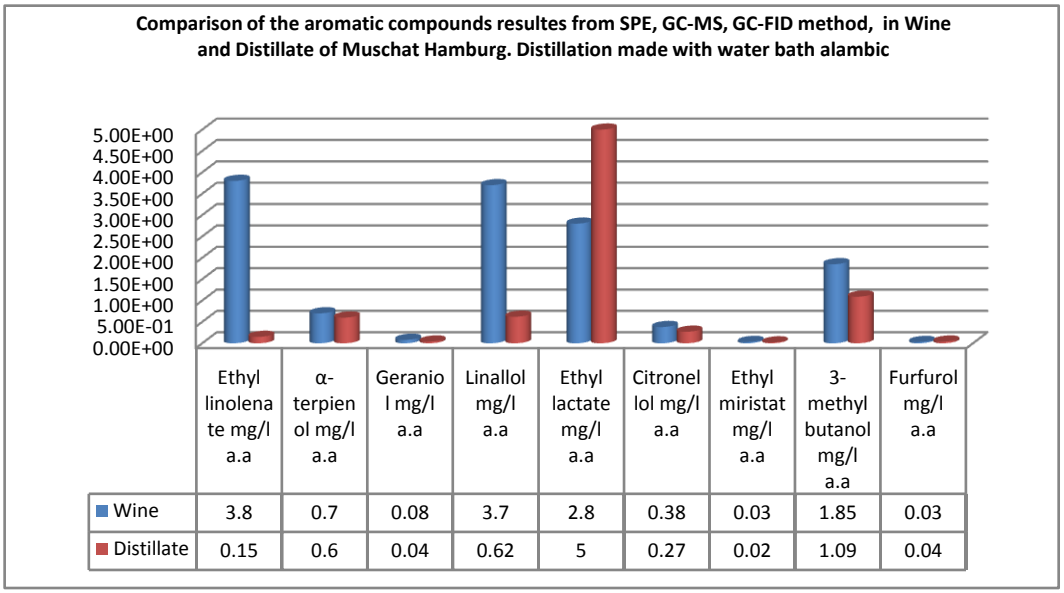
decrease. Furfurol increase in contempt from 0.03 in 0.24 mg/l a.a.Among the compounds analyzed results that geraniol does not change in contempt both before and after distillation

Chart 3.Comparison of the physico-chemical resultesfrom SPE, GC-MS, GC-FID method, in Wine and Distillate of Muschat Hamburg distillation made with water bath alembic



	Ethanol v/v	Methyl alcohol gr/hl a.a	Aldehyde acetic gr/hl a.a	Ethylacetat gr/hl a.a	Superior alcohols gr/hl a.a
Wine	13	1.1	0.6	0.78	2.8
Distillate	71.56	0.18	4.8	22.8	175

Chart 4.Comparison of the physico-chemical resultesfrom SPE, GC-MS, GC-FID method, in Wine and Distillate of Muschat Hamburg distillation made with water bath alembic



	Ethyl linolenate mg/l a.a	α-terpienol mg/l a.a	Geraniol mg/l a.a	Linallol mg/l a.a	Ethyl lactate mg/l a.a	Citronellol mg/l a.a	Ethyl miristat mg/l a.a	3-methyl butanol mg/l a.a	Furfurol mg/l a.a
Wine	3.8	0.7	0.08	3.7	2.8	0.38	0.03	1.85	0.03
Distillate	0.15	0.6	0.04	0.62	5	0.27	0.02	1.09	0.04

According to the analytical results performed respectively to the wine and the distillate produced with water bath alambic, we see that some compounds such as: ethanol, ethyl acetate and superior alcohols increase significaly but methyl alcohol decrease in contempt. Ethyllinoleate have a significant decrease from 3.8 mg/l (at the wine) to 0.15 mg/l a.a (at the distillate), the acetic aldehydes increase from 0.6 gr/hl (at the wine) 4.8 gr/hl a.a, Ethyl lactate from 2.8 mg/l (at the wine) to 5 mg/l a.a (at the distillate). It is noted a decrease of linallol from 3.7 mg/l a.a in the 0.62 mg/l a.a, decrease of citronellol from 0.38 mg/la.a in the 0.27 mg/l a.a. also α-terpinol decrease from 0.7 mg/l a.a in 0.6 mg/l a.aFurfurolhave a little incresement from 0.03 in 0.04 mg/l a.a. Geraniol decrease from 0.08 in 0.04 mg/l a.a. The

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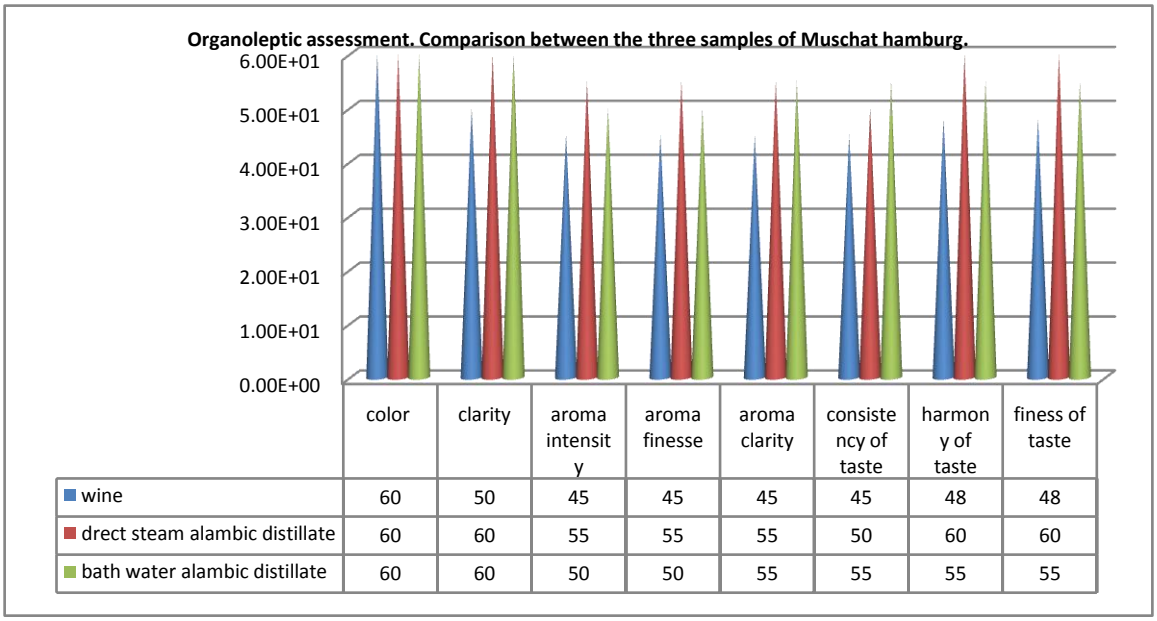
organoleptic assessment of the wine and both of the distillates produced by the different alambics is showed in the charts below.

Chart 5.Organoleptic assessment. Comparison between the three samples of muschat Hamburg grape variety produced in Albania in 2011: wine, direct steam alambic distillate and bath water alambic distillate.



	color	clarity	aroma intensity	aroma finesse	aroma clarity	consistency of taste	harmony of taste	finess of taste
wine	60	50	45	45	45	45	48	48
drect steam alambic distillate	60	60	55	55	55	50	60	60
bath water alambic distillate	60	60	50	50	55	55	55	55

According to the organoleptic evaluation it results that the distillate produced by both of the alambicsshows pronounced flower fragrance that is attributable to the variety and the lower changes of the aromatic compounds under the effect of the distillation process.

III. CONCLUSION

Based on the results obtained from the study with the aim of producing alcoholic distillates from MuschateHamburgegrape we got the following conclusions. The raw material was in good health which enabled producing of a high quality and very aromatic wine, which after the distillation process provides the production of an aromatic distillate with low acidity with both the alambics used for the scope. SPE, GC/MS, GC-FID analytical parameters evaluation indicates the presence in levels of esters and aldehydes and the measured parameters are within permitted rate of the europenstandart at the Muschatehamburge distillate that we have produced. The distillate produced with the different distillatoresresulted in very good parameters that expressed both in physical-chemical assessment and in the organoleptic one. In both cases of distillation process the distillate appear translucent, aromatic, with noted flower and fruit flavor characteristic of the variety used to produce the distillate.From the analitichal results logfile we conclude that alcoholic distillate obtained from the direct steam alambic expresses better characteristics in quality than the alcoholic distillate obtained from the water bath alembic.

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