Quality assessment of alcoholic distillates produced and marketed in Albania.

Klotilda Marku[1], Renata Kongoli[1]

Department of Agro-food technology, Agricultural University of Tirana.

Alcoholic distillates are obtained from any sugar-bearing substance, but the processing, fermentation, and distillation techniques make the difference. This paper aims to highlight the impact of these techniques on the quality of distillates produced and marketed in Albania, evaluating their physico-chemical and organoleptic parameters. 20 samples of different distillates from grapes and fruits were taken in the study. The methods used for evaluation are the standards of OIV, OAV, Reg. 2870/2000. The assessment shows a high content of: esters, which evidences preservation of varietal aromas and fermentation even after distillation, these are 2 times higher than the standard, mainly this of fruit and aromatic grape distillates; aldehydes, which indicates the poor health condition of the raw material, in 3% of the samples taken, this level is 4 times higher than the standard. All samples have a low level of methyl alcohol, which indicates a good separation of the head fraction, but 20% of them have a high level of superior alcohols, which indicates a poor separation of the tail fraction or its use for reducing alcoholic grade of the heart fraction. All samples have very good organoleptic assessment.

Key words: Alcoholic distillates, distillation, grape, fruits.

1. Introduction

Alcoholic distillates are obtained from any sugar-bearing substance, but the processing, fermentation, and distillation techniques make the difference. This paper aims to highlight the impact of these techniques on the quality of distillates produced and marketed in Albania, evaluating their physico-chemical and organoleptic parameters. The production of distillates in Albania is consolidating every day and more, this can be seen in the different types of distillates, production techniques and their quality. In general, the quality depends on the type of fruit and the technique of their fermentation, distillation and aging. [1,2]. This quality is attributed to the content of a series of volatile and fixed compounds that directly affect their aroma, taste and physico-chemical characteristics [2]. The main volatile compounds are usually formed during the fermentation process, these mainly include alcohols, fatty acids and esters and these organoleptic substances can be present in relatively large amounts (up to 3 g/L) [3]. The secondary compounds occurring in the highest amount are fusel alcohols, fatty acid esters, together with acetaldehyde and its acetal with ethanol [4]. Among the components originating from the metabolism of alcohol produced during fermentation is acetaldehyde, which is one of the most toxic metabolites[5] it gives an acid character to alcohol when its concentration is higher than 180 g/hl a.a [5,6,7]. High alcohols constitute the group with the highest concentration in alcoholic distillates [5,6]. The levels of these compounds depend on the grape variety, fermentation conditions, and distillation techniques [5], in this group the most important are 1-pentanol, 2-pentanol, 2-propanol, n-propanol, 3-methyl-1-butanol, 2-hexanol, 3-pentanol, n-butanol, 2-butanol, and 2-heptanol [8], ethyl lactate produced by lactic acid bacteria [5]. Ethyl acetate is the most abundant acetate in the distillates derived from the secondary metabolism of the yeast during the alcoholic fermentation of grape. However, it is the product of acetic acid esterification and thus its concentration increases during the aging process [9]. A high content of ethyl acetate in the distillate, more than its perception threshold of 180 g/ hl a.a, has a negative impact on sensorial characteristics and is perceived as

having a solvent character [10]. Ethyl acetate has a significant effect on the organoleptic characteristics of the product, it is described as having "fingernail polish remover" aroma properties and at a level of 150–200 mg/L can add spoilage "notes" to the wine. At lower concentrations, ethyl acetate contributes to fruity properties of the wine. Ethyl acetate derives mainly from bacterial spoilage of the marc distillates. Esters are the largest group of compounds contributing to the aroma of distillates [11,12], among them isoamyl acetate is responsible for the characteristic aromas of flowers and fruits [5], here we can distinguish 1-Hexanol it originates only from the raw material and is not a product of alcoholic fermentation [7]. Methanol is formed by pectinolytic enzymes that split the methoxyl group from the pectin present in the crushed fruit, the concentration of methanol in the final distillate spirit increases with the extraction time of the pomace [6].

2. Material and Methods

The study was conducted on 20 different samples of grape and fruit distillates, to determine their quality and organoleptic elements standard methods are used according to OAV [13], OIV-MA-AS312-01A, OIV-MA-AS313-01[14]; REG-CE 2870/2000 [15]. All distillates have been randomly selected from different producers, obtained from different typologies (from grapes, pome fruits and seed fruits), in non-aging condition, this to understand the quality of the distillates after production without the influence of obsolescence, which is a very important process for changing all the elements of their quality, as well as to see if the producers respect or not the time of stillness of the distillates before trade and consumption. The organoleptic analysis is based on the intensity of descriptive and qualitative parameters in: appearance, aroma, taste, aftertaste and general impression) all samples were analyzed and the results were determined according to the evaluation form, all samples were tasted in tasting glasses, at temperature environment. The assessment was made according to a structured scale (10, no perception; 20, very low; 30, low; 40, medium; 50, high and 60, very high intensity).

1. Table 1. Samples of distillates and their production areas.

Type of distillates	Production area	Sample code
Cherry 1	Kukes-Has	Q1
Apple	Kukes	M1
Pear 1	Kukes-Has	D1
Blackberry 1	Kukes	MF 1
Plum 1	Kukes-Has	K1
Shesh white grape 1	Kukes	RSB1
Peach	Kukes-Has	P 1
Colbezol	Durres	MR1
Strawberry 1	Durres	L1
Muschat Hamburg	Durres	MH
Pearl of csaba	Durres	PR
Cherry 2	Durres	Q2
Apple 3	Durres	M3
Apple 2	Tirane	M2
Pear 2	Tirane	D3
Wild pear	Tirane	DE
Blackberry 2	Tirane	MF2
Plum 2	Kukes	K2
Strawberry 2	Kukes	L2
Shesh white grape 2	Lushnje	RSB2

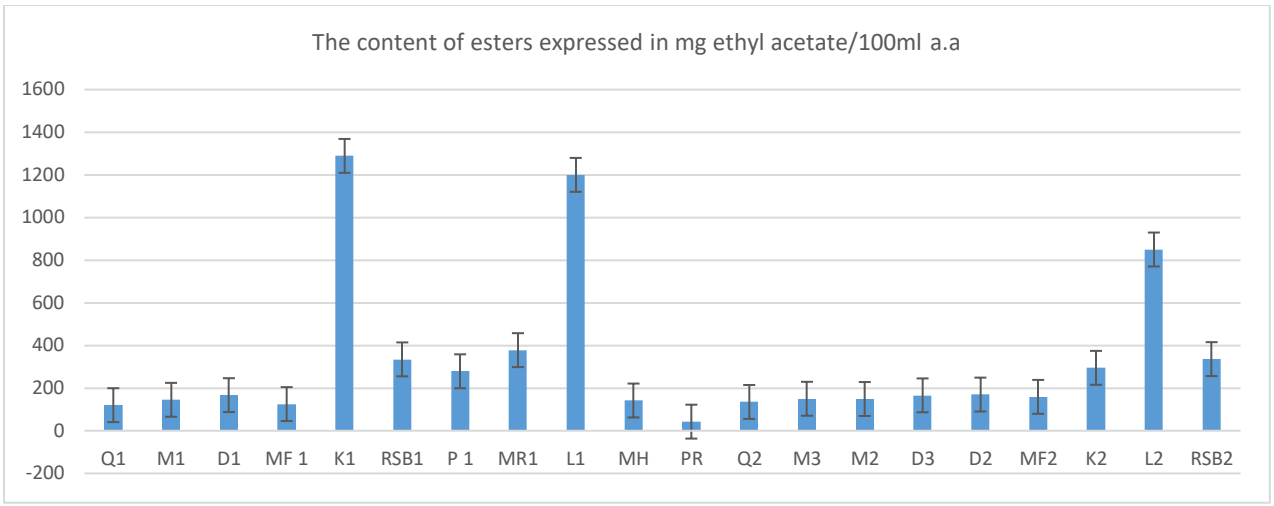
3. Results and Discussion

From the obtained results, we see that the analyzed physico-chemical indicators of alcoholic distillates indicate generally high-quality distillates.The Regulation Council (37.5–50% v/v) established that the alcoholic degree of distillates for human consume have to be (37.5–50% v/v) all analyzed distillates are within this limit.

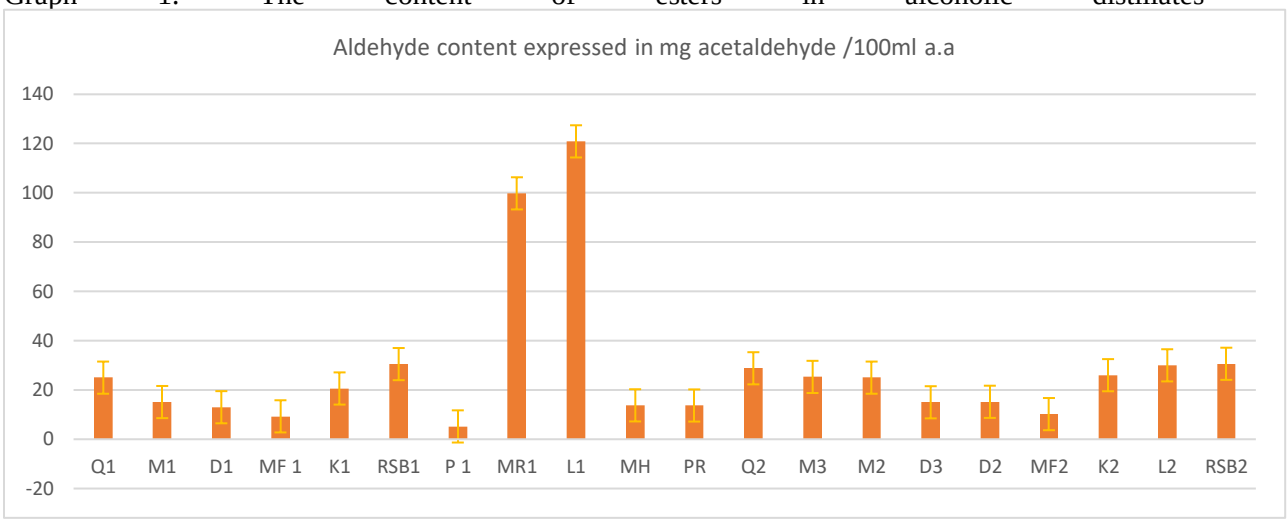
Table 2. Summary of the results obtained from the evaluation of alcoholic distillates

Samples code	Ethyl alcohol %vol.alcohol	Total acidity mg/100cm 3 a.a.	Methanol in mg/l a.a.	The content of esters expressed in mg ethyl acetate/100ml a.a	Aldehyde content expressed in mg acetaldehyde /100ml a.a	The content of high alcohols expressed in mg of isobutyl alcohol / 100 cm^3 a.a.	Furfurol content expressed in mg / 100 cm^3 a.a.
Q1	41.5±0.7	55±0.7	550±0.7	120±0.7	25±0.2	503±0.1	5±0.07
M1	39.8±1.06	90.45±0.6	477±0.9	145±0.2	15.1±0.07	250±0.1	1.2±0.02
D1	37.5±1.06	52±0.7	581±0.7	167±0.1	13±0.1	159±0.3	1.6±0.01
MF 1	43.4±0.7	35.4±0.1	113±0.7	125±0.3	9.3±0.07	250.1±0.1	5±0.01
K1	42.2±0.7	35.4±0.07	699±0.7	12890.7±0.3	20.6±0.01	520±0.1	2.1±0.07
RSB1	42.3±0.6	63.8±0.07	89.1±0.7	334.75±0.3	30.5±0.03	220±0.7	0.5±0.07
P 1	36.7±0.14	63.8±0.2	699±0.07	278.9±0.21	5.2±0.07	120±0.3	2.4±0.03
MR1	42±0.35	35.4±0.1	221±0.7	378±0.1	99.8±0.02	512±0.3	5±0.08
L1	42±0.5	34.4±0.7	449±0.7	1200±0.3	120.9±0.02	509±0.2	5.1±0.02
MH	47.6±0.7	60.8±0.1	131±0.14	141.84±0.2	13.76±0.04	222.4±0.2	0.2±0.02
PR	47.9±0.12	59.8±0.07	131.75±0.01	42.75±0.1	13.7±0.07	284±0.2	0.9±0.05
Q2	41.5±0.7	57±0.2	548±0.14	135±0.6	28.8±0.1	265±0.1	1.6±0.03
M3	39±0.4	92.45±0.3	387±0.7	150±0.6	25.3±0.2	198±0.07	1.8±0.06
M2	39.5±0.4	91.45±0.1	475±0.3	148.9±0.4	25±0.5	210±0.2	1.9±0.01
D3	38±0.35	54±0.3	578±0.7	166±0.1	15±0.1	155±0.2	2.3±0.01
D2	37.9±0.35	53±0.1	480±0.4	169.7±0.1	15.2±0.06	168±0.1	2.4±0.04
MF2	44±0.21	37±0.2	120±0.4	159±0.7	10.2±0.06	261±0.2	3±0.07
K2	42.5±0.35	37.4±0.07	590±0.7	295±0.6	26±0.2	360±0.7	2.1±0.02
L2	42.2±0.14	35.4±0.14	430±0.7	850±0.07	30±0.7	155±0.07	1.96±0.02
RSB2	37.11±0.5	64.8±0.4	89.2±0.07	336±0.1	30.63±0.1	380.25±0.03	2.3±0.02

According to the results, a high content of esters is observed, this is an indicator that verifies good fermentation and distillation conditions, since the esters formed during fermentation and the varietal aromas are preserved even after distillation. It is evident that they are 2 times higher than the standard (which specifies that the level of esters should not be higher than 600 mg of ethyl acetate / 100 cm3 of ethyl alcohol), mainly in the distillates of K1 with 12890.7±0.3, L1 with 1200 ±0.3, L2 with 850±0.07.

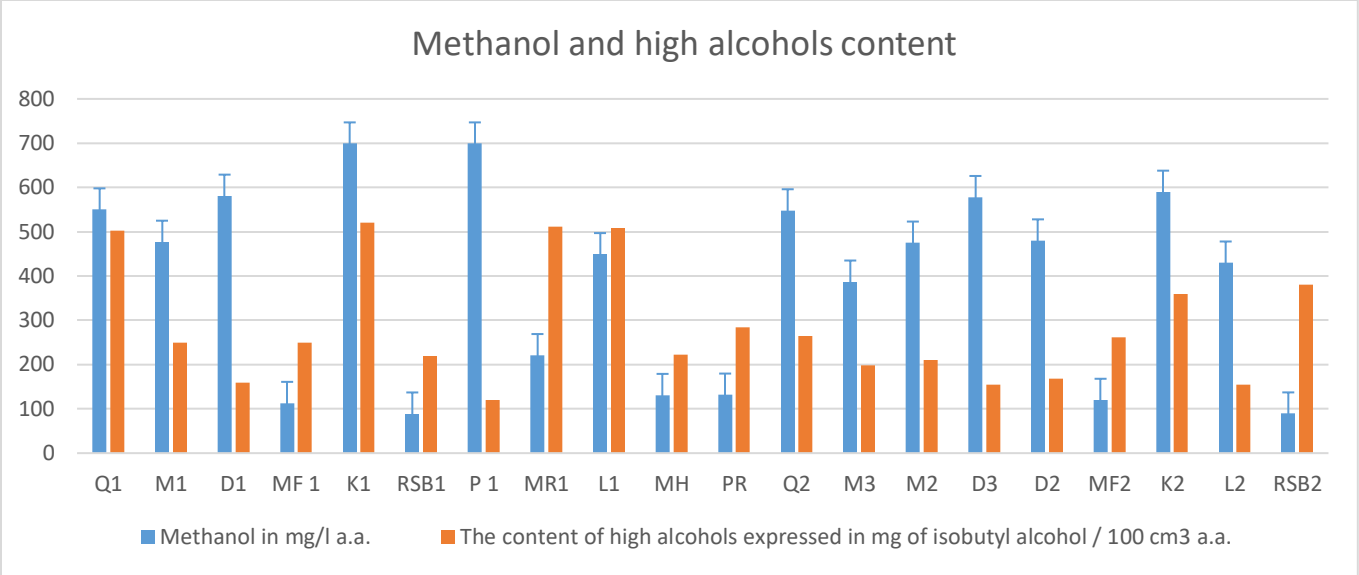


Graph 1. The content of esters in alcoholic distillates



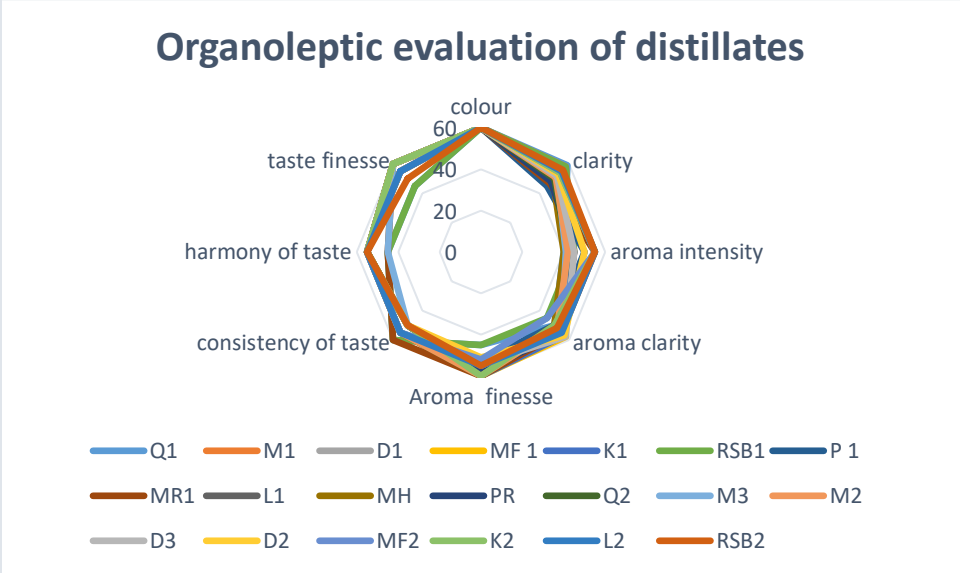
Graph 2. The content of aldehydes in alcoholic distillates

The level of aldehydes represented by acetic aldehyde, the presence of which indicates the high level of poor health of the raw material and its lack of control for further growth during fermentation by not performing regular mixing. In 3% of the samples taken: MR1 with 99.8±0.02; L1 with 120.9±0.02; this level is 4 times higher than the standard (where it is specified that the level of aldehydes in alcoholic distillates should be no more than 40 acetaldehyde / 100 cm3 anhydrous ethyl alcohol).



Graph 3. The content of Methanol and high alcohols in alcoholic distillates

The level of methyl alcohol is observed to be low in all samples referring to the standard, this level is no more than 700 mg / 100 cm3 of anhydrous ethyl alcohol for fruits and no more than 550 mg / 100 cm3 of anhydrous ethyl alcohol for grapes, this refers to a good separation of the head fraction. 20% of them have a high level of superior alcohols represented by: Q1 with 503±0.1; K1 with 520±0.1; MR1 with 512±0.3; L1 with 509±0.2; which indicates a poor separation of the tail fraction or its use for reducing the alcoholic degree of the heart fraction.



Graph 4. Organoleptic evaluation of distillates

The organoleptic evaluation of the distillates is positive, all the distillates have a typical color, and they are clear without turbidity and foreign matter. The aromas are generally expressed, the distillates of fruits and aromatic grapes have very pronounced aromas of the variety, they have a high persistence of aroma and taste.

4. *Conclusions*

The assessment shows a high content of: esters, which evidences preservation of varietal aromas and fermentation even after distillation, these are 2 times higher than the standard, mainly this of fruit and aromatic grape distillates; aldehydes, which indicates the poor health condition of the raw material, in 3% of the samples taken, this level is 4 times higher than the standard. All samples have a low level of methyl alcohol, which indicates a good separation of the head fraction, but 20% of them have a high level of superior alcohols, which indicates a poor separation of the tail fraction or its use for reducing alcoholic grade of the heart fraction. All samples have very good organoleptic assessment. The organoleptic evaluation of the distillates is positive, all the distillates have a typical color, they are clear without turbidity and foreign matter. The aromas are generally expressed, the distillates of fruits and aromatic grapes have very pronounced aromas of the variety, they have a high persistence of aroma and taste.

5. *References*

1. Versini, G., Dalla Serra, A., Falcetti, M., Sferlazzo, G.: "Role of clone, vintage year and period of harvesting on the aromatic potential of the Chardonnay grape". Vitis, Vol. 32., No 2, abstract p. 58, 1993.
2. Marku K., Kongoli, Assessment of quality parametres of alcoholic distillate produced by aromatic variety cultivated in Durres – Albania. ICRAE 2012
3. Cole, V. C. and Noble, A. C.,"Flavor chemistry and assessment. In: Fermented Beverage Production" A. G. H. Lea and J. R. Piggot, Eds. Blackie Academic and Professional: London, p.p. 361–385. 1997
4. Silva, M. L. and Malcata, F. X., "Effects of time of grape pomace fermentation and distillation cuts on the chemical composition of grape marcs".ZeitschriftfürLebensmittel-Untersuchung und Forschung A, Vol. 208, p.p. 134–143, 1999
5. Ferreira, V., Hernandez-Orte, P., Escudero, A., Lopez, R. and Cacho, J., "Semipreparative reversed-phase liquid chromatographic fractionation of aroma extracts from wine and other alcoholic beverages'. Journal of Chromatography A, Vol. 864, 77–88.1999
6. Silva, M. L. and Malcata, F. X., "Effects of time of grape pomace fermentation and distillation cuts on the chemical composition of grape marcs".ZeitschriftfürLebensmittel-Untersuchung und Forschung A, Vol. 208, p.p. 134–143, 1999
7. Fidan, I. and Anli, R. E., YüksekAlkollüİçkiler (Distilled Beverages, in Turkish). In: Kavaklidere Kultur Yayinlari, Vol. 6, p.p. 206 p, 2000.
8. Mateo, J., Aguirrezabal, M., Dominguez, C. and Zumalacarregui, J. M., "Volatile compounds in Spanish paprika". Journal of Food Composition and Analysis, Vol. 10, p.p. 225–232,1997.
9. Onishi, M.J., Guymon, J.F., and Crowlell, A. (1977) Changes in some volatile constituents of brandy during aging. Am. J. Enol. Vitic., 28, 192–198.
10. Silva, M.L., and Malcata, F.J. (1998) Relationships between storage conditions of grape pomace and volatile compounds of spirits obtained therefrom. Am. J. Enol. Vitic., 49(1), 56–64.
11. Soufleros, E. H., Mygdalia, S. A. and Natskoulis, P., "Production process and characterization of the traditional Greek fruit distillate "Koumaro" by aromatic and mineral composition". Journal of Food Composition and Analysis, Vol.18, p.p. 699–716, 2005
12. Silva, M. L., Malcata, F. X. and De Revel, G., "Volatile contents of grape marcs in Portugal". Journal of Food Composition and Analysis, Vol9, p.p. 72–80, 1996
13. OAV: Odor Activity Value methodes
14. OIV: OIV - International Organisation of Vine and Wine
15. REG-CE 2870/2000; Commission Regulation (EC) No 2870/2000 of 19 December 2000 laying down Community reference methods for the analysis of spirits drinks