Cercetări Agronomice în Moldova
Vol. XLII , No. 3 (139) / 2009

A COMPARATIVE STUDY OF AN ASSORTMENT OF PLUM DISTILLED DRINKS, MADE IN ROMANIA

D. BECEANU*, M. NICULAUA

University of Agricultural Sciences and Veterinary Medicine, Iaşi

Received March 17, 2009

ABSTRACT - The Romanian assortment of alcoholic drinks distilled from fruits, homologated in Romania, consists in *ţuica* (brandy) of different assortments, fruit brandies and specific natural liqueurs. According to the existing legislation, the alcoholic concentration of 37 vol. % makes the difference between the superior distilled drinks that may have specific names, and the inferior assortments that may be called spirits. The traditional *ţuica* is a plum distillate, made in copper still with open fire by simple distillation, having its origin in a region situated in the Subcarpathians of Muntenia. According to Ord. 362/2008, *palinca* (strong plum brandy) is a traditional Romanian alcoholic drink, obtained exclusively by alcoholic fermentation and distillation of fleshy fruits, mixture of fruits or from marc of fruits or juice made of these fruits or fruit mixture, with or without stones. *Şliboviţa* (strong plum brandy) is a 38 % vol. or 40% vol. drink, obtained by distillation and redistilation of plum marc, in the same areas as superior brandy assortments, followed by ageing. It is produced in Balkans. In Serbia, almost 70% of the harvested plums (late varieties, Damask plums or quetsches, *Prunus domestica* subsp. *insititia*) are changed into *şliboviţa.*

Key words: plum distillates, brandy, authenticity, analytic constants

REZUMAT - Studiul comparativ al unui sortiment de băuturi distilate din prune produse în România. Sortimentul românesc de băuturi alcoolice distilate din fructe, omologat în România, constă în ţuică de sortimente diferite, rachiuri de fructe şi lichioruri naturale specifice. Conform legislaţiei existente, concentraţia alcoolică de 37 vol. % separă băuturile distilate superioare, care pot purta denumiri specifice, de sortimentele inferioare, care pot fi nominalizate numai ca băuturi spirtoase. Ţuica tradiţională este un distilat de prune obţinut la cazane de cupru cu foc direct, prin simplă distilare, provenind dintr-o zonă situată în Subcarpaţii Munteniei. Conform Ord. 362/2008, palinca este o bautură alcoolică tradiţională românească, obţinută exclusiv prin fermentarea alcoolică şi distilarea unui fruct cărnos sau a unui amestec de fructe ori a unui marc de fructe sau a unui suc din acest fruct ori dintr-un amestec de fructe, în prezenţa sau în lipsa

* E-mail: dumitru.beceanu@gmail.com

sâmburilor. Şliboviţa este o băutură de 38 % vol. sau de 40% vol., obţinută prin distilarea şi redistilarea marcului de prune, în aceleaşi zone ca şi sortimentele de ţuică superioară, urmată de învechire. Este produsă în Balcani. În Serbia, cca 70% din prunele recoltate (din varietăţi tardive, prune de Damasc sau quetsches, *Prunus domestica* subsp. *insititia*) se transformă în şliboviţă

Cuvinte cheie: distilate de prune, ţuică, autenticitate, constante analitice

INTRODUCTION

The traditional ***ţuica*** is a plum distillate, made in copper stills with open fire by simple distillation, having its origin in a region situated in the Subcarpathians of Muntenia. Initially, its alcoholic strength was low (about 20 vol.% ± 3vol. %) (Beceanu, 1994;1995; 2008).

According to Nicoleanu and Brezeanu (1900), the samples (20), shown at the International Exhibition from Paris (1900), had the alcoholic strength comprised between 15.27 vol. % (Bujoreni, Vâlcea) or 15.35 vol. % (Resvad, Dâmboviţa) and 31.75 vol %. (Valea Călugărească, Prahova). The total dry extract was below 0.1 g/100 mL, excepting one sample from Rogova Commune, Mehedinţi (0.108 g/100 mL). The mineral content (ashes) was practically inexistent (over 0.005 in only two samples from Florica, Muscel and Viforâta, Dâmboviţa). Acidity, expressed in g/L carbonic acid, has shown higher values than 0.1 at Valea Călugărească, Prahova; Pucioasa, Dâmboviţa, Pietroşiţa, Dâmboviţa and Rogova, Mahedinţi. Traces of free cyanhydric acid were identified only in six samples: four samples originating from Jiblea, Vâlcea; Pietroşiţa, Dâmboviţa (0.00042 g/L); Răzvad, Dâmboviţa; Tohan, Buzău and two samples from Leordeni, Muscel. The values of combined cyanhydric acid varied between 0.00102 g/L at Jiblea, Vâlcea and were not found in the sample from Pucioasa, Dâmboviţa.

Authors characterize *ţuica* (old plum brandy) as a yellow coloured drink, which, by ageing, becomes dark yellow coloured and with a very pleasant flavour. The samples from the installations belonging to great owners were very clean (without traces of HCN). The localities where the best plum brandies could be found are Vălenii de munte, Prahova, Topologul, Argeş, Târgovişte, Dâmboviţa and Câmpulung, Muscel. The mean production of *ţuica* that could be obtained from one plum tree cultivated hectare was evaluated at 22 hL (on the average), but the variation limits were higher. The price of an hL varied between 30 and 80 francs (currency used at the beginning of the XX-th century), being higher for old assortments. The statistics at the end of the XIX-th century showed the existence of an area of 55,280 ha cultivated with plum trees. Greater areas were found in counties Prahova (8900 ha), Vâlcea and Muscel (over 7000 ha), Argeş and Buzău (over 6000 ha), Dâmboviţa and Gorj (over 5000 ha). The mean annual

production of *ţuica* was found in Wallachia (385.5 thousands hL) while in Moldavia, it was of only 35.9 thousands hL (calculating 20 hL *ţuica* per ha). We also mention that the production of *ţuica* was tripled at the end of the XIX-th century, because of phylloxera invasion, which caused the temporary destruction of the national viticulture patrimony. The consumption of *ţuica* is traditional; its production brings great incomes while the production expenses are low. The highest incomes were obtained in Muscel or Dâmbovița, because of the special quality of the obtained brandies. In other areas, there is a clear difference of productions and the obtained *ţuica* was valorised at lower prices (Nicoleanu and Brezeanu, 1900).

Nowadays, the Romanian assortment of distilled drinks from fruits, homologated in Romania, consists in different assortment *ţuica,* fruit brandies and specific natural liqueurs (Beceanu, 2000).

According to Ord. 362/2008, ***ţuica* is a Romanian traditional alcoholic drink, obtained exclusively by alcoholic fermentation and plum distillation (various varieties), wholes or crushed, or from the plum juice, with or without plum stones.**

The plum fermentation is done in wooden baths, fermentation vats or stainless vessels, according to the region where plums were produced, to variety or specific applied technology. Distillation is done in copper stills with open fire or in distillation equipments, at an alcoholic concentration of maximum 86% vol., so that the distillation product should have fruit flavour and taste; redistilation is authorized at the same alcoholic strength. It should have the content in volatile substances higher or equal to 200 g per ***hectolitre*** of ***100*** % ***vol alcohol*,** the content in cyanhydric acid (in *ţuica* obtained from plums) of maximum 7 g per ***hectolitre*** of ***100*** % ***vol alcohol*** and a maximum content in methyl alcohol of 1.200 g per ***hectolitre*** of ***100*** % ***vol alcohol***.

According to ageing duration, the name of *ţuica* may be replaced by other names: old *ţuica*, obtained from distillates aged of at least 3 years and extra *ţuica*, obtained from distillates aged of at least 7 years.

In the geographical areas of Maramureş and Oaş, *ţuica* is also named *horincă* or *turţ*.

For making *ţuica,* the use of sweetener products, flavouring substances, flavouring preparations, colorants, agricultural origin ethylic alcohol or agricultural origin distillate is not allowed. Blending is allowed.

The lowest alcoholic concentration differs according to the technological process typical of the region, but it should not be lower than 24% vol. at consumption trading. Product storage, preservation and ageing are done in wooden, stainless or glass vessels (Beceanu, 2002, 2003).

Domine (2008) wrote the following lines: “Lasting since the XV-th century, this distilled drink has

become common in our days, so in the rural areas, a small glass of *ţuica* is drunk at the beginning of most of dinners while in family anniversaries, it is used to toast like wine".

This Romanian distillate with an alcohol content of 45 vol % is distilled from a regional plum variety, cultivated for this purpose. The census from 2003 evaluated the cultivated area at 55,000 ha, of which 75% are harvested for the *ţuica* production.

After 6-8 weeks of fermentation, the double distillation is done in copper stills with open fire (woods), and then the distillate is aged in oak tuns for a period varying between 6 months and 10 years. The best known production regions are Buzău, Câmpulung, Valea Mureşului and the mountainous area near Piteşti. *Ţuica* is known as an origin controlled product in EU.

The denomination of ***palinca*** has its origin in Slovakia ("paliti" means to burn). It is a drink with high alcoholic content, traditionally produced in Transylvania. There are some consecrated zones, among which Maramureş, Mureş and Sălaj, although in the entire Ardeal, there is hundreds of year popular tradition of the production and consumption of this distillate. In Oaş, there is still preserved a traditional plum assortment. The *Mistreţe* Variety of plums, without juice, gives a higher alcohol production (9-10%), while the *Penighei (Nemţeşti)* Variety, which is juicier, gives a lower alcohol production (7-8%). Producers consider that the installation and the material of which it is made contribute at greater extent to obtain a quality product (Pătrăşcanu, 1935; Gasnier, 2005; Glover et al., 1998).

According to Ord. 362/2008, ***palinca*** **(strong plum brandy) is a traditional Romanian alcoholic drink, obtained exclusively by alcoholic fermentation and distillation of a fleshy fruit, a mixture of fruits or marc of fruits, a juice obtained from this fruit or from a mixture of fruits, with or without stones.**

Palinca can be made of all types of fruits. If it is made of plums, the following mention should be done: "plum *palinca"*. In Sălaj County, the *Entrepreneurs Association of Natural Plum Palinca* was made up.

Fruit fermentation is done in wooden baths, fermentation vats or stainless vessels, according to the region where plums are produced, to varieties or specific applied technology.

Distillation is done in copper stills with open fire or in distillation equipments, at a maximum alcoholic concentration of 70% vol., so that the distillation product should have fruit flavour and taste; redistilation is authorized at the same alcoholic strength. It has the content in volatile substances higher or equal to 200 g per hectolitre of 100 % vol alcohol, a content in cyanhydric acid (in palinca obtained from plums) of maximum 7 g per hectolitre of 100 % vol alcohol and a maximum content in methyl alcohol of 1,000 g per hectolitre *of* 100 % vol alcohol. In eight fruit

species, among which plums (*Prunus domestica L.*) and cherry plums (*Prunus domestica L.* subsp. *Syriaca-Borkh.*, *Janch. Ex. Mansf.*), the content of methyl alcohol is maximum 1,200 g per hectolitre of 100 % vol alcohol.

For making *palinca,* the use of sweetener products, flavouring substances, flavouring preparations, colorants, agricultural origin ethylic alcohol or agricultural origin distillate is not allowed. The use of caramelized sugar is not allowed in making *palinca,* neither to adjust its colour, yellow or golden yellow colour being obtained by ageing in oak tuns. In exchange, blending is allowed. The lowest alcoholic concentration at consumption trading is of 40% vol. Product storage, preservation and ageing are done in wooden, stainless or glass vessels.

According to the actual legislation, the alcohol concentration of 37 vol. % makes the difference between *superior distilled drinks* that may have specific denominations, from inferior assortments that may be called only *spirits.*

By adding other substances than those authorized by the Community or the national legislation, the alcoholic drink loses its right to the reserved denomination. Food additives, technological complexes of auxiliaries and their ways of usage will correspond to in force regulations.

Adding water, which may be distilled or demineralised for correcting the alcoholic concentration by volume, is authorized only if it does not cause the modification in the nature of the product. In the preparation network, only agricultural origin ethylic alcohol will be used, inclusively for diluting or solving some colorants, flavours or other allowed additives. Adding agricultural origin ethylic alcohol is not allowable in natural distillates, like *ţuica,* which results in taking away the trade denomination (Pomohaci et al., 1999; 2002; Pomohaci, 1999).

At the negotiations with EU, Romania has won recognition and Denomination of Controlled Origin or defined geographical area for a) 13 *ţuica* assortments :*ţuică Zetea de Medieşu Aurit, ţuică de Valea Milcovului, ţuică de Buzău, ţuică de Argeş, ţuică de Zalău, ţuică ardelenească de Bistriţa, horincă de Maramureş, horincă de Camarzana, horincă de Seini, horincă de Chioar, horincă de Lăpuş, Turţ de Oaş* and *Turţ de Maramureş* and b) 21 *palinca* assortments: *palincă de Bihor, Rieni palincă de Bihor, palincă de Zalău, palincă de Ardeal, palincă de Maramureş, palincă Carpaţii Apuseni, palincă Transilvania, palincă românească Tricolor, palinca de Brad, palincă de Banoviţa, palincă de Câlnău, palincă Crai Nou, palincă de Valea Vinului, palincă de Medieşul Aurit, palincă de Camarzan, palincă de Oaş, palincă de Cluj, palincă de Focşani, palincă de Dragosloveni, palincă de Vrancea* and *palincă de Jariştea.*

Producers or processors that benefit of the Denomination of Controlled Origin or defined

geographical area must observe a charge notebook that includes name of the product, specific place of origin, technological description (raw matters, physical-chemical and sense characteristics), zone of raw matter production, processing area, way of authenticating the origin, obtaining method, elements of packing, labelling and mode of quality evaluation (Beceanu, 1999; Stănciulescu, 1973; Stănciulescu et al., 1975).

Among plum distillates, there is another one, ***şliboviţa,*** a drink of 38 % vol. or 40% vol., obtained by distillation and redistillation of plum marc, in the same areas as superior *ţuica* assortments, followed by ageing. The obtaining technology and quality conditions are the most exigent, compared to the other similar assortment (Tanner and Brunner, 1982) .

According to Domine (2008), *şliboviţa* is a distilled plum drink ("sliva" means plum), produced in the Balkans. In Serbia, 70% of the harvested plums (late varieties, Damask plums or quetsches, *Prunus domestica* subsp. *insititia*), about 425 thousand tonnes are transformed every year into *şliboviţa.* The most frequently used variety is *Pocegaca*, which is very rich in sugars. During fermentation, they often use buried basins that influence marc quality and, implicitly, distillate quality. The distillates obtained immediately from freshly fermented marc differ from those achieved later (Spätbrand). Some of them are bottled immediately, while a certain quantity becomes older in oak, locust or mulberry tuns In 2007, the Czech Republic loosed its right of *slivovice* denomination for its own plum distillate, by an amendment to the EU standards. In 2007, many countries from EU that speak Slave languages protected their denominations of *slivovitz* with Denomination of Controlled Origin.

MATERIALS AND METHODS

The study was carried out comparatively on eight samples, purchased from commercial network, fair of biological products and a homemade distillate.

Comparing data from *Tables 1 and 2* to data from *Table 3*, we found that the values mentioned on label did not always show the alcoholic concentration resulting from determinations (vol.% alcohol).

Analyses and determinations were carried out according to in force standards, mentioned in References (*** 1998; *** 1999).

Table 1 - Identification of studied assortments according to data mentioned on the label, respectively communicated by manufacturer

Product	Type of package	Weight mL	Declared alcohol % vol	Real alcohol % vol	Producer-Distributor
Bucium plum *țuica*	bottle	750	40	36.82	Bucium Trade Co.
Vinia old plum *țuica*	bottle	700	32	37.4	Vinia Trade Co.
Vlad extra fine *țuica*	bottle	700	45	**44.5**	Provinalco Trade Co.
Tomeşti plum *țuica*	bottle	700	50	**42.2**	Vinia Trade Co.
Maramureş *şlivoviț*a	bottle in basket	500	38	37.3	Valco Trade Co.
Maramureş *palinca*	bottle in basket	700	40	39.8	Valco Trade Co.
Zalău *palinca*	PET	1000	50	**50.15**	APPP Sălaj*
Bocşiț*a palinca*	PET	1000	50	**49.4**	APPP Sălaj*
Plum traditional distillate less than a year	bottle	1000	38	38	Trufanda Liliana Albeşti, Botoşani

*Entrepreneurs association of natural plum *palinca* manufacturers from Sălaj County

Table 2 - Assortment under study and indications written on the label

Product	Observations according to label
Bucium collection *țuica*	Producer Bucium Trade Co.; Alcoholic concentration: 40 % vol.; Weight of package: 750 mL. A traditional beverage with the flavour of the fruit of which it is made, obtained by double distillation in the Carente installation, by separating toxic fractions from the beginning until the end of distillation.
Vinia old plum *țuica*	Producer Vinia Trade Co. ; Alcoholic concentration: 42 % vol.
Vlad-extra fine plum *țuica*	Produced and bottled by Provinalco Trade Co. Cluj Napoca; Alcoholic concentration: 45 % vol.; Package weight: 700 mL. Vlad plum *țuica* is obtained from plums picked up at maturity, by a classical technology of fermentation and distillation. The entire technological process of processing takes place in modern plants, being rigorously controlled by ageing of at least one year, thus obtaining an extra fine plum *țuica* that keeps the unique flavour and specific taste.
Tomeşti plum *țuica*	Producer Vinia Trade Co.; Alcoholic concentration: 42 % vol.; Package weight: 700 mL
Maramureş *şlivoviț*a	Producer VALCO Trade Co. Baia Mare; Alcoholic concentration: 38 % vol.; Package weight: 500 mL. Maramureş *şlivoviț*a is obtained by a traditional method of double distillation or rectification, from carefully selected and fermented plums. It is served fresh before meals.
Maramureş *palinca*	Producer Valco Trade Co. Baia Mare; Alcoholic concentration: 40 % vol. ; Package weight: 700 mL. *Palinca* is one of the most popular drinks in Romania. Produced especially in Transylvania, where Maramures also belongs, *palinca* is highly appreciated in all areas of the country. Maramureş *palinca* is a 100% natural drink obtained by traditional methods.

Product	Observations according to label
Sălaj *palinca*	Entrepreneurs union of natural *palinca* manufacturers from Sălaj county; Area of origin – Zalău; Alcoholic concentration: 50 % vol.; Package weight: 1000 mL. A natural traditional product from plums, Sălaj *palinca* is attested by documents since 1540. The quality of this natural and traditional product has many secrets: it is obtained from naturally fermented plums; it is distilled and redistilled in a copper installation with open fire; it is kept in wooden barrels to get old and natural colour; consumed in small quantities, it is a traditional remedy.
Sălaj *palinca*	Entrepreneurs union of natural plum *palinca* manufacturers from Sălaj county Area of origin – Zalău; Alcoholic concentration: 50 % vol.; Package weight: 1000 mL. A natural traditional product from plums, Sălaj plum *palinca* is attested by documents since 1540. The quality of this natural and traditional product has many secrets: it is obtained from naturally fermented plums; it is distilled and redistilled in a copper installation with open fire; it is kept in wooden barrels to get old and natural colour; consumed in small quantities, it is a traditional remedy.
Traditional distillate	Area of origin - Albeşti, Botoşani County; Alcoholic concentration 38 % vol.; Package weight 1000 mL. It is produced traditionally, in a copper installation (boiler) with open fire

RESULTS AND DISCUSSION

Table 3 -Relative density and alcoholic concentration

Name of sample	Alcoholic concentration % vol. alcohol	Relative density
Vinia old plum *ţuica*	37.43	**0.956305**
Tomeşti plum *ţuica*	**42.23**	0.944499
Bucium plum *ţuica*	36.82	0.951426
Vlad-extra fine plum *ţuica*	**44.5**	0.939788
Maramureş *şliboviţa*	37.3	0.951421
Maramureş *palinca*	39.8	0.947692
Sălaj *palinca*, Zalău area	**50.15**	**0.933955**
Sălaj *palinca*, Bocşiţa area	**49.4**	0.933956

The alcoholic determined concentration varied between 36.8 vol% (Bucium plum *ţuica*) and 50.15 vol% (Sălaj *palinca*, Zalău area). We may notice that the first three assortments were not integrated in the minimum limit of 37.5 vol%, which is compulsory for the classification of such a product to a superior category (according to the law, they should be called "spirits" without any other observations).

As for the relative density, Vinia old plum *țuica* stands out, since it has the highest values, values that can be explained by the existence of a significant extract and the highest polyphenol index.

Table 4 - Total acidity and volatile acidity

Name of samples	Total acidity		pH
	meq/L	3.03	g acetic ac./L
Vinia old plum *țuica*	15	3.65	**0.24**
Tomeşti plum *țuica*	**19**	**7.37**	**0.269**
Bucium plum *țuica*	**1**	3.97	0.015
Vlad-extra fine plum *țuica*	5	3.91	0.067
Maramureş *şlivoviţa*	10	3.86	0.157
Maramureş *palinca*	9	4.30	0.135
Sălaj *palinca*, Zalău area	10	4.59	0.199
Sălaj *palinca*, Bocşiţa area	13		**0.157**

The values for total acidity may be grouped in four categories: minimum values recorded by Bucium plum *țuica* (1 meq/L); mean values between 5 and 9 meq/L recorded by Vlad-extra fine plum *țuica* and Maramureş *şlivoviţa*. Values between 10 and 13 meq/L are recorded by the two assortments of Sălaj *palinca* and Maramureş *şlivoviţa*. The highest values were recorded by Vinia old plum *țuica*, Albesti traditional plum *țuica* and Tomeşti plum *țuica*.

Only Bucium plum *țuica* had a higher pH whereas the rest of the assortments had a relatively acid pH (over four for Sălaj *palinca* and below four for the rest of assortments).

The volatile acidity (*Table 5*) had important values correlated to a higher content in total esters, except Albeşti traditional plum *țuica,* which is a raw distillate. Much smaller values of the ester content were recorded by Bucium *țuica*, and mean values were recorded by the two assortments of Sălaj plum *palinca* and Vlad-extra fine plum *țuica* about which we might say that they did not know a maturation period, comparable to the initially mentioned assortments. (Maramureş *şlivoviţa*, Vinia old plum *țuica,* Maramureş *palinca* and Tomeşti plum *țuica*).

The total dry extract had only two important values in Vinia old plum *țuica* (about 1.1) and Bucium plum *țuica* (about 0.6), the rest of samples practically lacking the extract.

Table 5 - Total esters and pH

Name of samples	Total esters mg ethyl acetate/100 mL ethanol	Volatile acidity	
		g/L acetic ac.	meq/L
Vinia old plum *ţuica*	**443.64**	0.595	9.11
Tomeşti plum *ţuica*	**479.47**	0.967	**15.11**
Bucium plum *ţuica*	*67.43*	0.186	**3.1**
Vlad-extra fine plum *ţuica*	283.31	0.372	6.2
Maramureş *şlivoviţa*	**446.95**	0.669	**11.15**
Maramureş *palinca*	**401.72**	0.632	**11.53**
Sălaj *palinca*, Zalău area	244.91	0.34	5.66
Sălaj *palinca*, Bocşiţa area	277.39	0.442	7.36

Table 6 - Total dry extract

Name of samples	Total dry extract	
	g/100 mL	%
Vinia old plum *ţuica*	**1.03**	**1.07**
Tomeşti plum *ţuica*	0.14	0.14
Bucium plum *ţuica*	0.57	0.59
Vlad-extra fine plum *ţuica*	**0.005**	**0.005**
Maramureş *şlivoviţa*	0.01	0.01
Maramureş *palinca*	0.01	0.01
Sălaj *palinca*, Zalău area	0.06	0.06
Sălaj *palinca*, Bocşiţa area	0.01	0.01

The total polyphenol index (*Table 7*) showed a number of four important values in Vinia old plum *ţuica*, Maramureş *şlivoviţa*, Maramureş *palinca* and Tomeşti plum *ţuica*. Mean values (2.3-3.2) were recorded by Vlad-extra fine plum *ţuica* and the two samples of Sălaj *palinca* and the lowest values were recorded by Bucium plum *ţuica* (Beceanu, 1994).

Table 7 - Total polyphenol index

Name of samples	TPI
Vinia old plum *ţuica*	**6.3175**
Tomeşti plum *ţuica*	**4.6617**
Bucium plum *ţuica*	***1.0054***
Vlad-extra fine plum *ţuica*	2.3459
Maramureş *şlivoviţa*	**5.8444**
Maramureş *palinca*	**5.5451**
Sălaj *palinca*, Zalău area	3.1684
Sălaj *palinca*, Bocşiţa area	3.2267

Table 8 - Determination of colour – brightness

Name of samples	Brightness
Vinia old plum *țuica*	**85.9**
Tomeşti plum *țuica*	95.7
Bucium plum *țuica*	97.6
Vlad-extra fine plum *țuica*	**100.0**
Maramureş *şlivoviță*	99.4
Maramureş *palinca*	99.6
Sălaj plum *palinca*, Zalău area	99.22
Sălaj plum *palinca*, Bocşița area	98.25

Table 9 - Coordinates of complementary colours

Name of samples	Coordinate of complementary colours	
	a **red(+) green(-)**	***b*** **yellow(+) blue(-)**
Vinia old plum *țuica*	**0.94**	**43.58**
Tomeşti plum *țuica*	-1.79	11.38
Bucium plum *țuica*	-0.33	7.46
Vlad-extra fine plum *țuica*	**-4.1**	**0.13**
Maramureş *şlivoviță*	-0.26	2.34
Maramureş *palinca*	-0.13	1.74
Sălaj *palinca*, Zalău area	0.18	2.46
Sălaj *palinca*, Bocşița area	-0.57	6.48

Among the analysed samples, only Vinia old plum *țuica* had a lower value of brightness (86), correlated to a more significant yellow component (44) and the presence of some red hues (0.94) (Sudraud, 1990).

Table 10 - Results obtained for the traditional distillate

Product	Determinations	Value
Traditional distillate of less than a year, produced in a copper boiler with direct fire according to the specific technology	Alcoholic concentration % vol.	38
	Density g/cm^3	0.949
	Total acidity meq/L	17.87
	Volatile acidity meq/L	12.07
	Total esters mg ethyl acetate/100 mL ethanol	211.5

CONCLUSIONS

Bucium plum *ţuica* is a product with a neutral pH and a distinctive dry extract, having the lowest alcoholic concentration (36.8 vol%). The lowest total polyphenol index shows a minimum maturation.

Maramureş *şliboviţa*, Maramureş *palinca* and Tomeşti plum *ţuica* are found, in terms of analytical data, in a similar category of products with the highest total polyphenol index, a high ester content also correlated with a significant volatile acidity. We assess that they evolved towards maturation for a longer time.

Vinia old plum *ţuica* also shows analytical data comparable to the three assortments mentioned as having a longer period of maturation, but it stands out by a more significant extract and a reduced brightness, the highest total polyphenol index and the yellow reddish hues.

Vlad-extra fine plum *ţuica* and the two assortments of Sălaj *palinca* have the highest alcoholic concentration, but a lower total ester content and TPI since they practically lack the total dry extract.

Albeşti traditional plum *ţuica* is a typically raw distillate, characterized by alcoholic concentration and total ester content with mean values, but it has high values in terms of total and volatile acidity.

The enumerated characteristics may constitute a basis for the identification and authentication of the quality of these products, analysed individually or comparatively.

REFERENCES

Beceanu D, **1994** - *Meşteşugul distilării alcoolului în Ţările Române până în perioada interbelică (Craft of alcohol distillation in the Romanian Countries until before war period).* Simpozionul XIV de Istorie şi Retrologie Agrară a României, Bacău

Beceanu D., 1995 - *Distilarea şi băuturile alcoolice distilate, menţionate în vechi documente istorice din Ţările Române (Distillation and distilled alcoholic drinks, mentioned in old historical documents from the Romanian Countries)*. Simpozionul XV de Istorie şi Retrologie Agrară a României, Arad

Beceanu D., 1999 - *Valorificarea legumelor şi fructelor. Aspecte generale (Valorisation of fruits and vegetables. General aspects)*. Edit. "Ion Ionescu de la Brad", Iaşi

Beceanu D., 2000 - *Sortimentul românesc de băuturi alcoolice distilate din fructe (Romanian assortment of distilled alcoholic drinks from fruits)***.** Lucrări ştiinţifice, vol. 43. U.Ş.A.M.V. seria Horticolă. Edit. "Ion Ionescu de la Brad" , Iaşi

Beceanu D. et al., 2000 - *Valorificarea în stare proaspată a fructelor, legumelor şi florilor. Tehnologii specifice, de la recoltare la păstrare şi livrare (Valorisation of fresh fruits, vegertables and flowers. Specific technologies since harvest to preservation and deliverance)*. Edit. "Ion Ionescu de la Brad", Iaşi

Beceanu D., 2002 - *Tehnologia produselor horticole vol. I. Aspecte generale (Technology of horticultural products, vol. I. General aspects)*. Edit. PIM, Iaşi

Beceanu D. et al., 200*0* - *Secolul XX. Performanţe în agricultură (The XX-th century. Performances in*

agriculture). Sub red. Acad. D. Davidescu şi colab. *Cap. 20. Performanțe în valorificarea produselor horticole (Performances in valorising the horticultural products)*. Edit.Ceres, Bucureşti

Beceanu D. et al., 2003 - *Tehnologia produselor horticole. Valorificarea în stare proaspătă şi industrializare (Technology of horticultural products. Valorisation of fresh and processed products)*. Edit. Economică, Bucureşti

Beceanu D., 2008 - *Materii prime vegetale (Vegetal raw materials)*. Edi. Pim, Iaşi

Beceanu D., 2008 - *Prelucrarea şi industrializarea legumelor şi fructelor (Processing and industrialization of vegetables and fruits)*. Edit.Ceres, Bucureşti

Beceanu D., 2009 - *Tehnologia prelucrării legumelor şi fructelor (Technology of fruit and vegetable processing)*. Edit. "Ion Ionescu de la Brad", Iaşi

Domine A. 2008 – *The ultimate guide to spirits and cocktails*. Edit. H. F. Ullmann/Tandem Verlag GmbH

Gasnier V., 2005 – *Drinks*, Edit. SNP Leufung.

Glover B., Walton S., **1998** – *The Ultimate encyclopaedia of wine, spirits and liqueurs*, Edit. Hermes House.

Nicoleanu G. N. and Brezeanu V. S., 1900 – *Etat de l'arboriculture en Roumanie. Compte rendu des travaux depuis 1893 jusqu'en 1900.* Royaume de Roumanie. Exposition Universelle 1900 Paris. Ministère de l'Agriculture du Commerce, de l'Industrie et des Domaines. Service viticole. Imprimerie Dreptatea Bucarest, 1900

Pătrăşcanu NV., 1935 – *Fabricarea rachiurilor de fructe, tescovină şi drojdie (Making fruit brandies)*. Edit. Bucureşti

Pomohaci N., Cioltean I., **1999** - *Țuica o băutură națională (Țuica – a national drink)*. Rev. Agricultorul român, anul I, 6, Bucureşti

Pomohaci N., **1999***, Sortimente de rachiuri naturale (Assortments of natural brandies)*. Rev. Agricultorul român, anul I, 7, Bucureşti

Pomohaci N. et al., 2002 – *Țuica şi rachiurile natural (Țuica and natural brandies)*. Edi.Ceres, Bucureşti

Popa A., 1985 - *Producerea şi învechirea distilatelor de vin (Producing and ageing wine distillates)*. Edit. Scrisul Românesc, Craiova

Puech J. L., Jouret C., Goffinet B., 1985 - *Evolution des composés phrénologiques du bois de chêne au cours du vieillissement de l'armagnac***.** Sciences des aliments, nr. 5

Stănciulescu Gh., 1973 - *Fabricarea băuturilor alcoolice naturale (Making natural alcoholic drinks)*. Edit. Tehnică, Bucureşti

Stănciulescu Gh., Rusnac D., Borteş Gh. 1975 - *Tehnologia distilatelor alcoolice din fructe şi vin (Technology of alcoholic distillates from fruits and wine)***.** Edit.Ceres, Bucureşti

Sudraud P., 1990 - *Observations sur les caractéristiques chromatiques***,** F.V. Nº 830, O.I.V., Paris

Tanner, Brunner, 1982 - *La distillation moderne des fruits***,** Edit. Heller

*** **1998** - *Culegere de standarde române comentate - Alcool etilic şi băuturi alcoolice. Condiții de calitate. Metode de analiză (Collection of commented Romanian standards – Ethylic alcohol and alcoholic drinks. Quality conditions. Analysis methods)*. Institutul Român de Standardizare, COPCICA, Bucureşti

*** **1999 -** *Standarde profesionale. Băuturi alcoolice (Professional standards. Alcoholic drinks)*. MAA – DGPA. Edit.Copcica

http://faostat.fao.org/site/567/default.aspx #ancor.