საქართველოს მეცნიერებათა ეროვნული აკადემიის მოამბე, ტ. 9, №3, 2015
BULLETIN OF THE GEORGIAN NATIONAL ACADEMY OF SCIENCES, vol. 9, no. 3, 2015

Biotechnology

Method of Disposal of High Alcohol Increased Concentration in Young Grape Distillate

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ABSTRACT. The experimental results of treatment of young cognac alcohols with increased concentration of high alcohols by the products of processed oak are presented in the paper. Chips of the processed oak products and the staves of more than 120-year old Ismailly oak were used in the experiment. As a result of the research it was established that transformation and adsorption of refined high alcohols and methanol on the surface of oak wood make 61- 65% and 48.4%, respectively. Organoleptic evaluation of the young distillates characterized by fusel flavor before and after contact with the oak chips and staves is also provided in the paper. *© 2015 Bull. Georg. Natl. Acad. Sci.*

Key words: *stave, chips, distillate, high alcohols, fusel flavor, organoleptic parameters.*

As we know, the specifications of grapes growing area are reflected in the quality of the final product. Evaluation of use of various local oak species in wines and cognac production is a very important task. The oak barrels with capacity of 225-700 l were used during centuries for maturation of wines and distillates. The quality of the prepared beverage is heavily dependent on age, botanical sort, agroecological conditions of growing area as well as chemical composition and manufacturing technology of the oak staves used for barrel [1-2].

In literature sources we meet plenty of scientific works on oak's chemical composition, climatic influence, processing methods, drying regimes of the oak staves and the manufacturing of the barrels, and also transformation of aromatic components of oak staves during maturation of wines and cognacs. Different oak types differ by their chemical composition; main components of oak staves are celluloze – 23...50%, hemicelluloze – 17...30%, lignin – 17...30%, tanning stuffs – 1...10% and resin stuffs – 0.3...0.6% [3-12].

According to the requirements of the Azerbaijan State Standard and the Russian State Standard 51145-98, concentration of aliphatic alcohol in young cognac alcohol should be regulated within the range of 180-600 mg/100cm^3 in terms of iso-amylalcohol. However, at some Azerbaijan enterprises" violation of "Basic Rules of Cognac Production" in the process

Table 1. Physical and chemical parameters of distillates with increased content of higher alcohols after contact with oak chips and staves

Index MC-mass concentration of components	Measure Unit	MC of the analyzed substances in cognac alcohol (State Standard 51145-98)						
		Test: oak chips					Control: vessel with staves	
		Initial	3 months	6 months	14 months	%	Staves 6 months	Staves 14 months
1	2	3	4	5	6	7	8	9
Volume concentration C_2H_5OH	%	68.4	68.4	68.3	67.7		68.1	67.9
pH	-	5.34	5.01	4.17	4.15		4.21	4.17
Aromatic components of the distillate								
High alcohols	mg/100cm^3	1555.01	1275.09	886.35	597.96	38.45	1166.25	995.20
Butanol-1	mg/100cm^3	3.4	2.82	1.93	1.29		2.55	2.17
Butanol-2	mg/100cm^3	9.3	7.62	5.39	3.72		6.97	5.95
n-propanol	mg/100cm^3	211.01	173.02	122.38	82.29	38.99	158.24	135.04
Isobutyl alcohol	mg/100cm^3	450.37	369.30	256.71	171.14	38.00	337.78	288.24
n-Butanol	mg/100cm^3	9.04	7.38	5.13	3.42		6.75	5.76
Isoamylalcohol	mg/100cm^3	980.37	794.04	558.77	372.51	37.99	735.23	627.39
n -Amilovy alcohol	mg/100cm^3	2.04	1.64	1.14	0.76		1.5	1.28
n -Geptanol	mg/100cm^3	0.31	0.25	0.17	0.11		0.25	0.19
Hexanol	mkg/dm^3	17.32	14.20	10.05	6.58		14.72	11.09
n -Octanol	mg/100cm^3	0.20	0.16	0.11	0.06		0.17	0.13
2-phenylethanol	mg/100cm^3	13.68	13.45	13.11	12.89		11.63	8.76
Aldehydes	mg/100cm^3	86.30	86.98	87.93	88.82		87.97	88.88
Middle esters	mg/100cm^3	248.00	247.87	247.63	247.64		247.59	247.51
Ethyl acetate	mg/100cm^3	221.12	221.01	221.00	221.01		221.00	221.04
oenanthylic ether	mg/100cm^3	15.02	15.01	15.01	14.99		14.89	14.73
Ethyl lactate	mg/100cm^3	2.24	2.23	2.21	2.17		2.22	2.19
Diethyl succinate	mg/100cm^3	1.06	1.04	1.03	1.00		1.04	1.03
Ethyl capron	mg/100cm^3	0.24	0.24	0.22	0.24		0.24	0.23
Ethyl myristate	mg/100cm^3	0.02	0.02	0.01	0.01		0.02	0.01
Ethyl lactate	mg/100cm^3	3.62	3.61	3.59	3.57		2.60	3.58
Ethyl caprilat (C8)	mg/100cm^3	0.16	0.15	0.15	0.14		0.15	0.13
Ethyl caprinat (C10)	mg/100cm^3	4.21	4.20	4.17	4.11		4.18	4.15
Ethyl laurate (C12)	mg/100cm^3	3.50	3.49	3.46	3.46		3.47	3.44
Acetic acid	mg/100cm^3	22.00	25.65	27.77	39.01		28.45	39.54
Methanol	g/dm^3	0.91	0.81	0.59	0.47		0.63	0.56
	Aromatic components of oak							
MC p-methyl-y-octalactone (total)	microgram/dm	0.00	0.091	0.16	0.25		0.20	0.23
MC vanillin	microgram/dm	0.00	0.75	1.36	2.12		1.69	2.04
MC eugenol	microgram/dm	0.00	0.14	0.25	0.39		0.34	0.37

Table 2. Organoleptic evaluation of young distillates (with fusel flavor) before and after contact with oak chips and staves

Name of cognac alcohol samples	Cognac alcohol sample and its aging period					
	Young cognac alcohol with flaw	Experiment			Control	
		Oak chips, dose - 8 g / dm^3, aging in the 1500 dal vessel with chips			Stave of 86 2 3 cm/dm, aging in the 1500 dal vessel with chips	
		3 months	6 months	14 months	6 months	14 months
	-	Chips of the middle fraction, ratio 1: 1 = H:T			Oak stave	
Organoleptic characteristics of the ethyl alcohol samples						
Color	Colorless	Light straw with an amber flavour	Straw r with an amber tone	Amber	Light gold	Light gold with slight brown tone
Flavour	Perceptible light color of flowers with dominating fusel flavour, no color of aging	Fusel tones and light flavour of aging: vanilla, coconut, spice	Aging tone and light tone of fusel	Aging tone without fusel tone	Complex, moderately clear color with the flavour of vanilla, cloves, coco-nut, fusel	Aging flavour and light flavour of fusel
Taste	Sharp flavor of young alcohol with fusel flavour	Sharp flavor with slight palatable flavour and obvious flavour of fusel	Balanced, soft,mild, no bitter taste of oak, slight flavour of fusel	Balanced, moderately harmonious, no sharp toe of fusel and bitter taste of oak	Inharmonious, hot with slight flavour of vanilla and obvious flavour of fusel	Balanced, soft, harmonious, with the flavour of vanilla and spice and slight flavour of fusel
Assessment, points	77.8	82.4	86.3	90.2	85.6	89.5

of grape wine distillation in the stills of periodic and continuous action leads to production of the cognac with increased concentration of high alcohols due to which it has an unpleasant fusel-like flavor. When such alcohol is exported, the buyers put a claim against the manufacturer for inferior quality and return the product back.

Traditional methods for reducing the concentration of high alcohols in young cognac alcohol are not always efficient. Even in case of efficiency they cause deterioration of basic qualitative features of the distillate [11-15].

We carried out experiments treating young cognac spirits characterized by increased concentration of high alcohols in the vessel of 1500 dal by the use of specially processed oak products.

Young cognac spirits were produced by distillation of the wine grape variety Rkatsiteli in the stills of continuous action K-5M at Geokchay Cognac Enterprise in 2008 during the season of grapes processing.

The chips (natural and thermally processed chips in the ratio of 1: 1 and in the dose of 8 g/dm^3) were used in the experiment as the products of oak processing and the staves of the same batch of more than 120-year-old English oak from the Ismailly region as the control material.

As a result of study, it was established that transformation and adsorption of refined high alcohols (isoamyl- and isobutyl alcohols, n-propanol) and methanol on the surface of oak wood make 61- 65%

and 48.4%, respectively. Disappearance of fusel flavor in the test alcohols occurs after 14 months of their contact with the active compound of oak chips in the ratio 1:1 (thermally processed and natural) in the dose of 8 g/dm, at the distillate storage temperature over 16" C2 with constant balancing of the air oxygen as no less than 18-20 Mg /dm^3 (Table 1).

The oak staves in the amount of 86 cm/dm or 8 g/l were introduced in the 1500 dal vessel of wine distillate as control material.

Organoleptic and odorimetric evaluation of the wine distillates shows that the strong flavor and taste of high alcohols is reduced after 3 months since its contant with the oak chips, then after 6 months and finally after 14 months (91.2 points). Besides, the cognac spirits acquire rare aroma of aging in oak barrels and do not have any flaw of fusel flavor (Table 2).

In six months of active contact of wine distillate with oak staves the concentration of high alcohols reduced by 25%, on average, methyl alcohol by 38.5%, and in 14 months by 64%. However, organoleptic fusel tone was observed after 14 months of the wine distillate aging in contact with the oak staves indicating insufficient specific surface area of oak staves interacting with high alcohols and methyl alcohol compared to the treatment of distillate with oak chips (90.5 score points).

Thus, carried out research on reduction of concentration of high alcohols in the young wine distillates confirm the hypothesis that it is efficient to use chopped oak wood to remove the flaw of fusel flavor from the young cognac resulting from violation of the "Basic Rules of Cognac Production." The dose of oak is 8 g/l and the reaction time not less than 14 months. Use of the method of 14-month aging of the distillate in the reservoir with oak staves according to Professor G. G. Agabalyants did not allow to achieve the same result of the fusel flavor disposal. Therefore, we recommend the method of treatment of young wine distillates with specially prepared composition of oak chips for disposal of the fusel flavor.

ბიოტექნოლოგია

ახალგაზრდა ყურძნის დისტილატში უმაღლესი სპირტების მომატებული კონცენტრაციის აღმოფხვრის მეთოდი

ტ. პანახოვი

აზერბაიჯანის მეცნიერებისა და მეღვინეობის სამეცნიერო-კვლევითი ინსტიტუტი, ბაქო, აზერბაიჯანი

(წარმოდგენილია აკადემიის წევრის გ. კვესიტაძის მიერ)

წინამდებარე ნაშრომში წარმოდგენილია ახალგაზრდა კონიაკის სპირტების ექსპერიმენტული დამუშავების შედეგები, რომლებსაც გააჩნიათ უმაღლესი სპირტების მომატებული კონცენტრაცია გადამუშავებული მუხის პროდუქტებით. ექსპერიმენტში გამოყენებულ იქნა გადამუშავებული მუხის პროდუქტების ჩიპსები და 120-წლიანზე მეტი ისმაილინური მუხის საკასრო ფიცრები. ჩატარებული კვლევების შედეგად დადგენილ იქნა, რომ რაფინირებული უმაღლესი სპირტებისა და მეთანოლის

ტრანსფორმაცია და ადსორფცია მუხის მერქნის ზედაპირზე შეადგენს 61-65%-ს და 48,4%-ს შესაბამისად. ნაშრომში ასევე წარმოდგენილია ორგანოლეპტური შეფასება ახალგაზრდა დისტილატებისა, რომლებიც ხასიათდება რახის არომატით მუხის ჩიპსებსა და კასრის გვერდებთან შეხებამდე და მათთან კონტაქტის შემდეგ.

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Received September, 2015