

Influence of thermal treatment of wood on the aroma of a sugar cane spirit (cachaça) model-solution

Influência do termotratoamento da madeira no aroma de uma solução-modelo de cachaça

Marta Helena Fillet SPOTO^{1*}, Marcelo Machado LEÃO², José Otávio Otávio BRITO²

Abstract

The aging process of alcoholic beverages is generally conducted in wood barrels made with species from *Quercus* sp. Due to the high cost and the lack of viability of commercial production of these trees in Brazil, there is demand for new alternatives to using other native species and the incorporation of new technologies that enable greater competitiveness of sugar cane spirit aged in Brazilian wood. The drying of wood, the thermal treatment applied to it, and manufacturing techniques are important tools in defining the sensory quality of alcoholic beverages after being placed in contact with the barrels. In the thermal treatment, several compounds are changed by the application of heat to the wood and various studies show the compounds are modified, different aromas are developed, there is change in color, and beverages achieve even more pleasant taste, when compared to non-treated woods. This study evaluated the existence of significant differences between hydro-alcoholic solutions of sugar cane spirits elaborated from different species of thermo-treated and non-treated wood in terms of aroma. An acceptance test was applied to evaluate the solutions preferred by tasters under specific test conditions.

Keywords: *amburana; aroma; sugar cane spirit; balsam; oak; aging; sugar cane spirit; thermal treatment.*

Resumo

As bebidas alcoólicas são, geralmente, envelhecidas em tonéis de madeira fabricados a partir de espécies do gênero *Quercus* sp. Devido ao alto custo de aquisição e necessidade de importação, existe demanda por alternativas de uso de outras espécies nativas e da incorporação de novas tecnologias que aumentem a competitividade da cachaça brasileira. Sabe-se que, com a aplicação de termotratoamento, vários compostos são alterados, desenvolvem-se aromas, altera-se a coloração e as bebidas adquirem gostos mais agradáveis. Este trabalho mostra a diferença significativa entre soluções-modelo hidroalcoólicas de cachaça, envelhecidas em diferentes espécies de madeira, em suas formas termotratoadas e não termotratoadas, avaliadas em relação a seu aroma. O teste de aceitação aplicado verificou as soluções preferidas pelos provadores, nas condições determinadas do teste.

Palavras-chave: *amburana; aroma; cachaça; bálsamo; carvalho; envelhecimento da cachaça; termotratoamento.*

1 Introduction

The quality of a distilled beverage is judged by its color, aroma, and taste. These sensory characteristics depend not only on the raw material used and industrial conditions such as fermentation and distillation, but they are also closely linked to the aging process. The storage of alcoholic beverages in wooden barrels provides sensitive improvements to the product. These changes are caused by various chemical and physical reactions, which distinguish the maturation of distillates aged in wooden barrels from products simply stored in sealed containers, such as those made of steel or glass bottles.

After leaving the distillation column, the beverages have usually a strong and pungent aroma, no color, and high alcoholic graduation. That is when the main high-quality distillates are placed in contact with wood, in which they undergo different reactions that are capable of significantly change its color, aroma, and taste making them more pleasant to taste. Thus, the aging process adds greater value to the final product.

Since the most ancient times, when the aging process started being used in alcoholic beverages, oak originated from some species of the genus *Quercus* sp has been the most frequently used wood. Besides presenting physical characteristics that enable the manufacture of barrels, oak leads to distinctive features in beverages after the aging period. Oak also provides through its thermal treatment, the formation of an important aromatic class, as demonstrated by many specialized studies on this subject (CHATONET, 1995; VIVAS, 1998; MOSEDALE, 1996).

In Brazil, the main alcoholic beverage is sugar cane spirit, which has been incorporating new production technologies to compete with other distillates produced worldwide, such as rum, whiskey, and cognac, among others.

During the manufacturing process of the barrels, one of the most important procedures is the heat treatment of the wood. This practice (the thermal treatment) is not applied in a

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¹ Departamento de Agroindústria, Alimentos e Nutrição, Escola Superior de Agricultura Luiz de Queiroz – ESALQ, Universidade de São Paulo – USP, CEP 13418-900, Piracicaba – SP, Brasil, E-mail: mleao@esalq.usp.br

² Ciências Florestais, Escola Superior de Agricultura Luiz de Queiroz – ESALQ, Universidade de São Paulo – USP, Piracicaba – SP, Brasil

*Corresponding author

The 24 responses obtained were composed of 17 hits and seven errors, or 71% of tasters could distinguish significant differences between treatments (thermo-treated and non-treated woods) for the aroma of amburana sugar cane spirit solutions. For balsam, the responses were composed of nineteen hits and five errors, or 79% of testers could distinguish a significant difference between treatments for the aroma of sugar cane spirit solutions. The responses for the aroma of oak sugar cane spirit solutions were composed of eighteen hits and six errors, or 75% of tasters observed a significant difference between treatments (thermo-treated and non-treated wood).

Thus, for the three species of wood examined, significant sensory differences were observed between thermo-treated and non-treated wood samples for the aroma of sugar cane spirit solutions.

3.2 Preference ordering test

This test aimed to compare several samples on the aroma of sugar cane spirit solutions and to assess the preference of consumers in relation to the three woods (amburana, balsam and oak) in the two treatments (thermo-treated and non-treated wood). The results were evaluated by the Newell and Mac Farlane's table, cited by Dutcosky (1996), where the critical difference between the overall ordering would have to be greater than or equal to 46.

Table 1. Sum of scores given by tasters to the different treatments.

	Amburana	Balsam	Oak	Thermo – treated Amburana	Thermo – treated Balsam	Thermo – treated Oak
Sum of scores	91	82	137	141	136	170

Table 2. Ordering of preference of samples in relation to the aroma of the solution*.

Species	
Thermo-treated oak	a
Thermo-treated amburana	a
Oak	a
Thermo-treated balsam	ab
Amburana	bc
Balsam	c

* Preference ordering test – Newell and Mac Farlane.

The ordering-preference test on the aroma of the solutions showed that thermal treated oak extract was the most preferred, followed by thermo-treated amburana, non-treated oak and thermo-treated balsam without significant differences. The last ones in preference were thermo-treated balsam, non-treated amburana, and finally, non-treated balsam.

4 Conclusions

The difference test showed, for the three species, that it was possible to distinguish, in terms of aroma, thermo-treated samples from non-treated ones in solutions obtained from the same wood.

The ordering test showed preference for thermo-treated oak, thermo-treated amburana, non-treated oak and thermo-treated balsam, but with higher scores for thermo-treated oak.

References

- ASSOCIAÇÃO BRASILEIRA DE NORMAS TÉCNICAS – ABNT. **NBR 13170:** Teste de ordenação em análise sensorial. São Paulo: ABNT, 1994.
- CARDELLO, H. M. A. B.; FARIA, J. B. Análise da aceitação de aguardentes da cana por testes afetivos e mapa de preferência interno. *Ciência e Tecnologia de Alimentos*, v. 20, p. 32-36, 2000. <http://dx.doi.org/10.1590/S0101-20612000000100007>
- CHATONNET, P. Influence des procédés de tonnellerie et des conditions d'élevage sur la composition et la qualité des vins élevés en fût de chêne. Thèse Doctorat. **UFR Institut d'Oenologie, Université de Bordeaux II**, Bordéus. 1995. 268p.
- COCHRAN, W. G.; COX, G. M. **Experimental designs**. New York: John Wiley, 1966. 613 p.
- DUTCOSKY, S. D. **Análise sensorial de alimentos**. Curitiba: Champagnat, 1996. 126 p.
- FRANCIS, I. L.; SEFTON, M. A.; WILLIAMS, P. J. A study by sensory descriptive analysis of the effects of oak origin, seasoning, and heating on the aromas of oak model wine extracts. *American Journal of Enology and Viticulture*, v. 43, n. 1, p. 23-30, 1992.
- MOSEDALE, J. R. Effects of oak on the wood on the maturation of alcoholic beverages with particular reference to whisky. *Forestry – The Journal of the Society of Foresters of Great Britain*, v. 68, n. 3, p. 203-229, 1995.
- MOSEDALE, J. R. Variation of the flavor and extractives of European oak wood from two French forests. *Journal of Science and Food Agriculture*, v. 70, p. 273-287, 1996. [http://dx.doi.org/10.1002/\(SICI\)1097-0010\(199603\)70:3%3C273::AID-JSFA496%3E3.0.CO;2-L](http://dx.doi.org/10.1002/(SICI)1097-0010(199603)70:3%3C273::AID-JSFA496%3E3.0.CO;2-L)
- VIVAS, N. **Manuel de tonnellerie**. Paris: Editions Féret, 1998. 155 p.
- VIVAS, N. Pratiques et recommandations sur la préparation, la mise en service et la conservation de fûts neufs e usagés. *Oenologues*, v. 28, n. 91, p. 24-29, 2001.