

## ANTIOXIDANT CAPACITY EVALUATION OF AGED CACHAÇAS: TIME AND WOOD KIND INFLUENCE

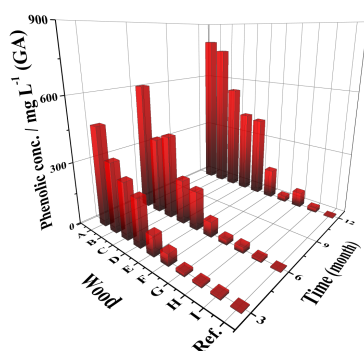
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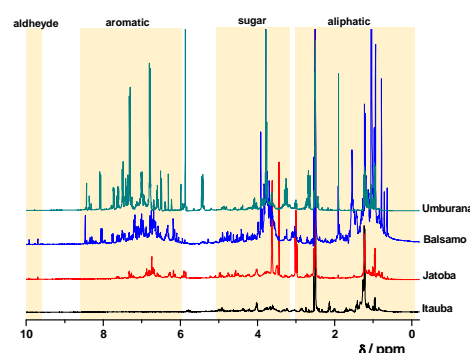
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Cachaça is a typical Brazilian drink produced by sugar cane with an alcohol content between 38-48% (v/v) [1]. Their sensory characteristics such as color, aroma and flavor are acquired in the aging phase. The composition and concentration of the compounds present in the *cachaça* due to the wood kind used, as well as the storage time [2]. In this work, it was evaluated some parameters related to the antioxidant capacity as phenolic total concentration (Folin-Ciocalteu, FC), nitrogen radical scavenging (ABTS<sup>•+</sup>, DPPH<sup>•</sup> and NO<sup>•</sup>) and the Fe (III) (FRAP) reducing capacity to cachaças aged for 3, 6 and 12 months in nine different wood casks. The wood casks used in this study were of: (A) Balsamo (*Myroxylon balsamum*), (B) Jatoba (*Hymenaea spp*), (C) Umbrurana (*Amburana cearensis*), (D) Jequitiba (*Cariniana estrellensis*), (E) Timborana (*Piptadenia sp.*), (F) Jaboti (*Erisma uncinatum*), (G) Carvalho (*Quercus sp.*), (G) Peroba (*Paratecoma peroba*) and (I) Itauba (*Mezilaurus itauba*). For all assays it was used as reference (R) an original cachaça before the aging process. Gallic acid (GA), quercetin (Q) and trolox (TR) were employed as standards for the all analysis methods employed and the results for the assays were expressed in equivalents (eq.) these compounds. The phenolic total concentration, antioxidant capacity based on nitrogen radical scavenging and FRAP assays were compared with the <sup>1</sup>H NRM spectrum profile as shown in Scheme 1.

A)



B)



**Scheme 1.** Results for cachaças samples aged in nine different wood casks: A) phenolic total concentration and B) <sup>1</sup>H NMR (400 MHz) profile spectra in DMSO- *d*<sub>6</sub>.

According Scheme 1A it could be observed that the *cachaças* aged in Umbrurana, Balsamo, Jatoba and Jequitiba had the highest phenolic total concentration. For all *cachaças* evaluated it was observed increase in the total phenolic concentration according to the aging time. Similar behavior was obtained for the antioxidant capacity using the assays of ABTS<sup>•+</sup> (2.3 - 1000 mg L<sup>-1</sup> eq. GA), DPPH<sup>•</sup> (1.5 - 125 mg L<sup>-1</sup> eq. GA) and FRAP (1.3. - 215 eq. GA). Regarding the NO<sup>•</sup> scavenging there was no significant difference between the assessed cachaças, having average inhibition of ~ 70% after 150 min. This way, the results from the ABTS<sup>•+</sup> method to all samples were higher than for DPPH<sup>•</sup>, indicating a higher of hydrophilic antioxidant compounds concentration. The <sup>1</sup>H NMR spectra (Scheme 1B) of the *cachaças* aged in Umbrurana and Balsamo exhibited intense signals between 6.0-8.5 ppm, suggesting the presence of phenolic compounds. For Jatoba and Itauba cachaças, the signal strength for aromatics decrease, which is consistent with the results for FC method and antioxidant capacity. Thus, it is concluded that *cachaças* aged in Balsamo, Jatoba, Umbrurana and Jequitiba casks have a high concentration of phenolic resulting in good antioxidant capacity compared to the methods employed.

### References:

- [1] ALCARDE, A. R.; SOUZA, P. A. de; BELLUCO, A. E. de S. 2010. Aspectos da composição química e aceitação sensorial da aguardente de cana-de-açúcar envelhecida em tonéis de diferentes madeiras. *Ciênc. Tec. Aliment. Campinas* 30: 226-232.
- [2] BORTOLETTO, A. M.; ALCARDE, A.R. 2015. Assessment of chemical quality of Brazilian sugar cane spirits and cachaças. *Food Control. Piracicaba* 54: 1-6.

### Correction of abstract

The word and designation to *cachaça* are described based on the Brazilian decree N<sup>o</sup>. 4851 of 2003 with Normative Instruction N<sup>o</sup>. 13 of 30 June 2005. Furthermore, the Ministry of Agriculture (MAPA) defined *cachaça* as the **typical and exclusive denomination** of alcoholic beverage produced from cane in Brazil. Additionally, are cited below some articles in recent literature that employ the term *cachaça*:

1. H.C. Menezes et al. Determination of polycyclic aromatic hydrocarbons in artisanal *cachaça* by DI-CF-SPME–GC/MS. *Microchemical Journal*, **2015**, 118, 272–277.
2. A.M.R. Machado et al. Determination of ethyl carbamate in *cachaça* produced from copper stills by HPLC. *Food Chemistry*, **2013**, 138, 1233–1238.
3. A.M. Bortoletto & A.R. Alcarde. Assessment of chemical quality of Brazilian sugar cane spirits and *cachaças*. *Food Control*, **2015**, 54, 1-6.
4. L.M. Zacaroni et al. Natural clay and commercial activated charcoal: Properties and application for the removal of copper from *cachaça*. *Food Control*, **2015**, 47, 536-544.
5. P.P. Souza et al. Artificially-aged *cachaça* samples characterised by direct infusion electrospray ionisation mass spectrometry. *Food Chemistry*, **2014**, 143, 77-81.

Alternatively, some authors prefer Brazilian sugarcane spirits to replace the designation *cachaça*. However, we prefer that the term *cachaça* was maintained. Thus, the only change made on this abstract corrected version will be written *cachaça* in italic form. Finally, references were corrected.

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