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Antioxidant profile of Portuguese and Spanish craft beers

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Abstract

Background: The antioxidant potential of craft beer (CB) may be due to high quality of the raw materials (water, malt, hop and yeast) and traditional techniques [1-4]. The scarcity of studies evaluating the antioxidant potential of CB highlights the relevance of this study. **Objective:** *In vitro* evaluation of the antioxidant activity of aqueous extracts of Portuguese and Spanish CB. **Methods:** Experimental study using six CB with different styles: Milk Stout (EL-MS), India Pale Ale (EL-IPA, ALM-IPA), Imperial Stout (EME-IS), Oatmeal Stout (ALM-OS), Pilsner (EL-P), Munich Dunkell (B-MD) and two industrial beers, Pilsner (S-P) and Munish Dunkell (S-MD). The pH, acidity content (AC) and total phenolic compounds (TPC) were determined. The antioxidant capacity was assessed using 2,2'-azino-bis(3-ethylbenzothiazoline-6-sulfonic acid) (ABTS) and the hydrogen peroxide (H_2O_2) assays, expressed in concentration for 50% activity inhibition (IC_{50}). One-way ANOVA and Student's t-test were used for statistical analysis in GraphPad® Prism 8.0 software, with a significance level of 0.05. **Results:** The pH of the beers varied between 3.89±0.00-4.78±0.05 and AC between 0.13±0.01-0.44±0.01%. ALM-IPA had the highest TPC value (8.96±0.64mg gallic acid equivalents/g). IPA style presented the lower IC_{50} values in H_2O_2 (ALM-IPA with an IC_{50}=23.54±1.53µg/mL, p<0.05) and ABTS (EL-IPA with an IC_{50}=55.21±4.68µg/mL, p<0.05) assays. The industrial beers have lower TPC values compared to CB (same style, p<0.05), and lower capacity to neutralize the H_2O_2 and ABTS radicals. For Omisore *et al*. (2005), samples with IC_{50}>50µg/mL are classified as being moderately active, while samples with IC_{50}<50µg/mL have high antioxidant capacity. Also, the results for IPA style are in line with Breda *et al*. (2022), in which light-colored beers had better antioxidant profiles. However, according to Silva *et al*. (2022) the best antioxidant profiles were associated with dark beers. **Conclusions:** The samples showed antioxidant potential, but further tests should be carried out considering the complex underlying antioxidant mechanisms.

Keywords: craft beer; antioxidant activity; phenolic compounds

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