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Potential skin benefits of incorporating *Prunus avium* Lapins extracts into a commercially available Portuguese India Pale Ale craft beer

Maria João Pereira [1,*], Diana Santos [2], Cláudia Pinho [2] and Ana Isabel Oliveira [2]

[1] Escola Superior de Saúde, Instituto Politécnico do Porto, Rua Dr. António Bernardino de Almeida 400, 4200-072 Porto, Portugal
[2] REQUIMTE/LAQV, Escola Superior de Saúde, Instituto Politécnico do Porto, Rua Dr. António Bernardino de Almeida 400, 4200-072 Porto, Portugal

* Correspondence: psj@ess.ipp.pt

Abstract

Background: A commercially available Portuguese India Pale Ale craft beer (ALM-IPA) has shown potential skin benefits in a previous study [1]. However, the incorporation of cherry extracts into bottled beers lacks scientific evidence. **Objective:** To evaluate, *in vitro*, the benefits of incorporating aqueous (ACE) and ethanolic (ECE) cherry extracts into ALM-IPA beer, in terms of antioxidant and photoprotective activity and the viability of human keratinocytes (HaCaT cells). **Methods:** Experimental study, with the incorporation of ACE (infusion, 1:10) and ECE (70%) (1 mg/mL) into ALM-IPA bottles. Total phenolic content (TPC) was determined. The antioxidant potential was assessed using the 2,2'-azino-bis(3-ethylbenzothiazoline-6-sulfonic acid) (ABTS), hydrogen peroxide (H_20_2) and iron-reducing antioxidant power (FRAP) assays. The photoprotective potential was estimated by determining the sun protection factor (SPF) and the ultraviolet absorption capacity (UV-AC). The viability of HaCaT cells was assessed using the 3-(4,5-Dimethyl-2-thiazolyl)-2,5-diphenyl-2H-tetrazolium bromide (MTT) assay. Data were analysed using the one-way ANOVA test and significant differences were considered for $p < 0.05$. **Results:** Regarding antioxidant activity, and comparing both extracts, ALM-IPA+ACE presented the lowest value of IC_{50} for ABTS assay (86.16 ± 5.33 µg/mL) and the highest FRAP value (27.58 ± 0.42 µmol of trolox equivalents/g), which is related with the highest TPC observed (15.10 ± 0.16 mg of gallic acid/g). ALM-IPA+ECE presented the lower IC_{50} (43.27 ± 2.14 µg/mL) compared to ALM-IPA+ACE (65.08 ± 1.69 µg/mL) for H_20_2 assay. However, ALM-IPA beer showed higher antioxidant activity (IC_{50} = 55.21 ± 4.68 µg/mL for ABTS; IC_{50} = 23.54 ± 1.53 µg/mL for H_20_2; FRAP = 53.74 ± 1.27 µmol of trolox equivalents/g). Regarding photoprotective potential, both extracts presented photoprotective potential (SPF > 6) [2]. Analyzing the viability of HaCaT cells after incubation with both extracts, ALM-IPA+ACE and ALM-IPA+ECE presented cytotoxicity, for the 24 h and 48 h incubation period, only for concentrations higher than 100 µg/mL (cell viability > 80%) [3]. In the 24 h incubation period, ALM-IPA cell viability was higher than ALM-IPA+ACE and ALM-IPA+ECE, and generally, ALM-IPA+ECE was superior to ALM-IPA+ACE. **Conclusions:** More studies are needed regarding the incorporation of plant extracts into commercially available beers, particularly in other stages of brewing or different styles of beer.

Keywords: craft beer; *Prunus avium* Lapins; keratinocytes

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