

[P2.1.20]

Effect of almond hull flour addition on the physico-chemical and nutritional characteristics of bread and its consumer acceptability

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The almond industry generates a huge amount of bio-waste mainly constituted by hulls, shells, and skin that represents 70.0 – 85.0% of the whole almond fruit. Because of the interesting physico-chemical properties of the almond hull, several studies have suggested alternative applications for this by-product such as the recovery of valuable bio-based compounds and their use as natural food preservation additives. Then, the aim of this work was to analyse the effect of Almond Hull Flour (AHF) addition, Almond hulls with two ripening stages (green and mature), on the physico-chemical characteristics and the consumer acceptability of the bread compared with Control Bread made by using only refined flour (BCtr) and Wheat Bran Bread made by using bran flour (WBB). Bread formulations were developed by replacing the refined wheat flour with the AHF and wheat bran at two concentrations (4 and 8% (w/w)). The results showed that studied samples of bread are comparable in terms of moisture content and water activity. However, the bread containing AHF showed slightly lower specific volume, darker crumb colour and lower hardness than BCtr and WBB samples. Among all concentrations tested, the breads prepared with 8% of AHF were that with the highest score for overall acceptability and total phenolic content (TPC). Moreover, the addition at 8% (w/w) of AHF, improve the antioxidant capacity assessed by DPPH Free Radical Scavenging Activity (RSA). The evaluation of the bioaccessibility of the bioactive compounds was carried for breads prepared with 8% (w/w) AHF and WBB for comparative purposes. After the in vitro digestion, higher values of RSA and TPC were observed in bread prepared with the green AHF. In conclusion, this study suggests that AHF can be used as a substitute of wheat flour up to 8% (w/w) in bread leading to improve human health benefits with satisfied bread's quality.

Keywords: almond hull flour, physico-chemical, consumer acceptability, bread