

Optimization of ultrasound extraction of anthocyanins from grape pomace using acidified water as solvent

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Grape pomace is an affordable source of anthocyanins, being ultrasound a non-thermal technology that can assist the extraction of these phenolics. The extraction efficiency depends on process parameters, food matrix, and the extraction solvent. This study aimed to optimize the ultrasound extraction of anthocyanins from grape pomace using acidified water as a solvent. The equipment parameters potency density (8.3 W/mL and 16.7 W/mL), time (1 and 5 min), and pulse (0 and 2 s) were evaluated using a faced centered composite design 23 with 3 center points. Control samples (no ultrasound) were prepared. A 16.7 W/mL ultrasound processor (Eco-sonics®, Brazil) with a 4 mm diameter probe tip was used for sonication. The tip was submerged to a 15 mm depth in the sample. The suspension was prepared with 1.5 g of ground grape pomace (dried at 60 °C for 5 h) and 30 mL of acidified water (pH = 1.5), placed in a jacked glass reactor (internal dimensions: diameter = 45 mm; height = 110 mm) coupled to a thermostatic water bath at 25 °C. Total monomeric anthocyanins (pH differential method) and single anthocyanins by UPLC-QDA (Single ion recording method) were evaluated. Results show that extracts carried out with potency = 16.7 W, time = 5 min, with (2 s) and without (0 s) pulse (no significative difference, $p < 0.05$) presented the highest anthocyanin content, resulting in an extract with up to 48% more monomeric anthocyanin than control. Through the semiquantitative analyses by UPLC-QDA, 14 anthocyanins were identified, comparing their molecular weight and retention time with the literature. Malvidin-monoglucoside and Malvidin-diglucoside were the compounds that presented the highest areas, representing circa 50% of the areas detected. The highest increases observed were 38% for Malvidin-monoglucoside (potency density = 16.7 W/mL, time = 5 min, pulse = 0 s) and 22% Malvidin-diglucoside (potency = 16.7 W/mL, time = 5 min, pulse = 2 s). Higher potency and longer extraction times led to the greatest increase in malvidine-glucosides and monomeric anthocyanins. The results show that acidified water is a promissory solvent to extract anthocyanins using ultrasound, adding value to the grape pomace.