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Sustainable valorisation of a by-product: Recovering antioxidants from out-of-caliber kiwifruits

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PURPOSE OF THE ABSTRACT

Industrial production of fruit leads to large quantities of residues discarded every year. For example, fruits that are too small or misshapen are usually discarded, and composting is their main use on an industrial scale, which is a poor way to valorise these by-products, considering the valuable compounds present in them [1,2]. This problem occurs in particular in kiwifruits production. Valorisation of discarded kiwifruits is proposed by extracting bioactive compounds using sustainable solvents, namely deep eutectic solvents (DES). DES have recently attracted considerable attention due to the fact that they are more eco-friendly, non-toxic and exhibit low volatility compared to conventional organic solvents[3]. A screening of fifteen DES, and several hydrogen bonding donor solvents, such as ethylene glycol or glycerol, was carried out. Extraction efficiency was measured in terms of antioxidant activity using DPPH and FRAP tests. These tests are used worldwide since they are simple and fast [4,5]. The influence of DES structure, presence of ethanol or water and of pH of a DES/water mixture on the antioxidant properties of a resulting extract was studied. The results show that DES based on carboxylic acids exhibit enhanced antioxidant activity compared to conventional solvents and alcohol-based DES. Glycerol or ethylene glycol used without choline chloride are also efficient at the extraction of antioxidant compounds from kiwi peels. Finally, a chemical analysis of extracts using high performance thin layer chromatography (HPTLC) was carried out. With this latter technique, the extracts can be applied without further preparation as plates are not reused. After the separation of families of compounds on the chromatographic plate, identification of chemical families was carried out using derivatisation reagents [6]. This revealed that most active compounds extracted are similar in all extracts and are polyphenolic compounds, presumably tannins.

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FIGURES

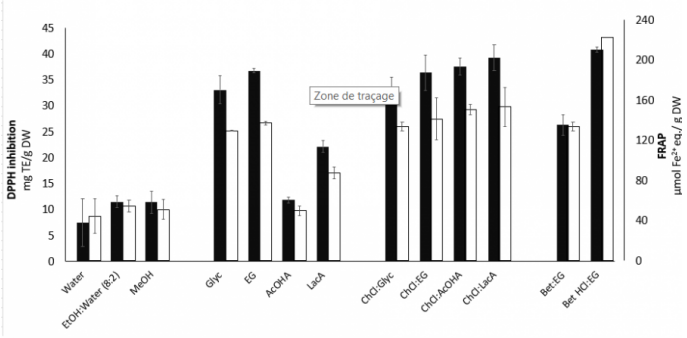

FIGURE 1

Antioxidant activities measured using DPPH test (black) and FRAP test (white) of the kiwi peels extract according to the solvent used. All the solvents except water and methanol contain 20% w/w of water.

EtOH: Ethanol; MeOH: Methanol; ChCl: cholinium chloride; Glyc: Glycerol; EG: Ethylene glycol; AcOHA: Acetic acid; LacA: Lactic acid; Bet: Betaine; Bet HCl: Betaine hydrochloride.

FIGURE 2

KEYWORDS

Kiwifruit by-product | deep eutectic solvent | antioxidant activity | HPTLC analysis

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