High recovery of bioactives from pomegranate waste with high pressure- and conventional extraction methods

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Pomegranate waste from juice production contains the peel and seed of the fruit and available in high quantities in Eastern and South part of Europe and the Middle East, Africa and America. The seed depending on varieties contains high value oil in 10-20% (w/w) with high content of polyunsaturated fatty acids, carotene and tocopherols. The peel represents 40-50% pf the total fruit weight is rich in phenolic compounds and shows strong antioxidant and antimicrobial effects [1-4].

The main objective of this research was to recover bioactive compounds from Turkish pomegranate seed and peel with optimized extraction methods. Supercritical carbon dioxide extraction with and without ethanol co-solvent was applied in a pilot plant apparatus to recover oil and peel extracts between 30-45 MPa extraction pressure and 40-80°C extraction temperature using two separators. Ultrasonic assisted extraction and traditional solvent extraction methods were also studied with optimization of solvent, extraction temperature and solvent to feed ratio. The extraction yields from the seed were between 12.9 – 25.1 % (g / 100 g dry seed) depending on the applied solvents and method. From the peel, extracts were obtained between 0.4 – 58.6 % (g/100 dry peel) yield which were also highly depended on the applied methods and solvents used.

The fatty acid composition of the seed oil was measured by GC. The content of total polyphenols was measured with Folin-Ciocalteu reagent and pyrogallol standard using a spectrophotometric method, while main phenolic components were quantified by HPLC. The antioxidant stability of the oil was evaluated using the Rancimat method, while the antioxidant activity of the seed and peel extracts was also analysed by DPPH method. The peel extracts showed very strong antioxidant activity in the presence of DPPH, the measured values similar to those of synthetic antioxidants (BHT and BHA). Further experiments were carried out to evaluate the antimicrobial activities of the seed and peel extracts in the presences of food-borne fungi and microbes using microbial standard tests (as agar disk-diffusion method, the agar dilution plate-counts method and microculture tetrazolium reduction assay). The extracts showed different activities in the presences of different strains of Gram-negative and Gram-positive bacteria and fungi.

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