

Exploring the Valuable Compounds and Antioxidant Activity in the Peel of New Zealand Grown Buttercup Squash (*Cucurbita maxima*)

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Abstract

The untapped potential of New Zealand buttercup squash or buttercup pumpkins encourages innovative ways of repurposing and valorising food waste to contribute towards efforts in creating a circular economy. This cultivar of the *Cucurbita maxima* was chosen due to its mass production in New Zealand where 65,789 tonnes were produced in 2021/22 (HEA, 2022). The pumpkin industry across the globe generates significant waste from byproducts such as the peel which is often discarded despite being a valuable source of nutrition and bioactive compounds for human health and well-being. These compounds include phenolic acids, flavonoids, and carotenoids among others are proven to possess beneficial properties such as antioxidant, anti-inflammatory, antifungal, antibacterial, antiviral, antitumour, antidiabetic, neuro-protective, and cardio-protective activity (Badr et al., 2010; Hussain et al., 2021; Salami et al., 2020). The unique environment of New Zealand with its high UV radiation exposure provides opportunities to discover unexplored variations in qualitative and quantitative information regarding bioactive compounds. This provides motivation to identify and quantify such beneficial compounds to give insight into their potential values and applications. While there has been some investigation of the applications of these compounds as new ingredients in the food and agricultural sectors, their promising uses in the cosmetic, pharmaceutical, and dietary supplement industries remain largely unexplored. The study evaluated both fresh and dried pumpkin peel of buttercup squash, utilising ultrasound assisted extraction. The extractions from the processed peels were carried out using water or 70% ethanol with a sample:solvent ratio of 1:10 and ~1:3 (w/v). The greatest yield was achieved using dried pumpkin peel, with a ratio of 1:10 (w/v) and 70% ethanol as the solvent. Qualitative phytochemical screening of the samples revealed the presence of different classes of plant metabolites, including phenols, flavonoids and tannins. HPLC and various other quantitative analytical methods revealed the presence of lutein, beta-carotene, zeaxanthin, vitamin E and vitamin A. GCMS analysis identified the presence of compounds shown to have biological activity, including limonene, α -pinene, β -dihydroagrofuran, thujopsen, lactic acid, linalyl anthranilate, benzyl benzoate, among

others. The Folin-Ciocalteu assay revealed a total phenolic content of 113.1 ± 5 mg GAE / 100 g dry weight for a 25% solution of the extract. The antioxidant activity was measured through in-vitro 2,2-diphenyl-1-picrylhydrazyl (DPPH) assay where the dried ethanolic extracts had the highest radical scavenging activity of $68.3 \pm 1\%$.

Keywords: New Zealand *Cucurbita maxima*, pumpkin peel, waste valorisation, antioxidant activity, phenolics

References

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