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Valorization of peel waste from *Passiflora edulis* sims red and yellow varieties through bioactivity assessment

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Fruit peels are often discarded during fruit processing and treated as agricultural waste. Using fruit peels helps reduce waste and promotes circular economy practices by creating value-added products. This study investigated the bioactivity of methanolic extracts from the ripe peels of *Passiflora edulis* Sims, red and yellow varieties, cultivated in Sri Lanka. The crude extracts were evaluated for antioxidant activity using the *2,2-diphenyl-1-picrylhydrazyl* (DPPH) radical scavenging assay and ferric reducing power (FRAP) assay, as well as for their α-amylase inhibitory activity, cytotoxicity, and phytotoxicity properties. In the DPPH assay, red passion fruit peel showed higher radical scavenging activity (IC_{50}=394.70 ± 11.20 mg L^{-1}) than yellow passion fruit peel (IC_{50}= 643.35 ± 3.45 mg L^{-1}). However, both values were significantly lower than the positive control, ascorbic acid (IC_{50}= 7.90 ± 0.10 mg L^{-1}). Red passion fruit peel demonstrated a reducing power of 0.44 ± 0.01 mmol Fe^{2+} g^{-1}, higher than yellow passion fruit peel (0.40 ± 0.03 mmol $Fe^{2+}g^{-1}$) as measured by the FRAP assay. Still, Trolox showed a value of 1.26 ± 0.01 mmol Fe^{2+} g^{-1} as the positive control. Additionally, the peel extract of yellow passion fruit demonstrated α-amylase inhibitory activity, with a percentage inhibition of 12.95 ± 3.35% at a concentration of 1000 mg L^{-1}, in comparison to the standard inhibitor acarbose, which exhibited 59.82 ± 4.10% inhibition. In the brine shrimp lethality assay, only the red passion fruit peel showed an LC_{50} value of 136.72 ± 7.25 mg L^{-1} against $K_2Cr_2O_7$ as the positive control (7.90 ± 0.10 mg L^{-1}). The root inhibition at 1000 mg L^{-1} was 31.43 ± 0.00% for red peel and 33.33 ± 0.00% for yellow peel, while shoot growth was promoted in both cases. These findings suggest that both passion fruit peels display moderate bioactivity, and further research could explore potential applications in nutraceutical, pharmaceutical, and agricultural industries.

Keywords: *Antioxidant, Enzyme inhibition, Passiflora edulis, Peel*

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