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In vitro bioactivity evaluation of leaf extracts of Sri Lankan plants *Osbeckia octandra* and *Crotalaria pallida Aiton*

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The rising demand for natural alternatives to synthetic herbicides and therapeutic agents has prompted research into plant-derived bioactive compounds. This study aimed to evaluate the biological activities of methanolic leaf extracts of *Osbeckia octandra* and *Crotalaria pallida Aiton*. Shade-dried, powdered leaf material was subjected to ultrasonic-assisted extraction using methanol, and crude extracts were concentrated using rotary evaporation. Antioxidant activity was assessed using the 2,2-diphenyl-1-picrylhydrazyl (DPPH) radical scavenging assay and Ferric Reducing Antioxidant Power (FRAP) assay. Phytotoxic and cytotoxic potentials were evaluated using the lettuce (*Lactuca sativa*) seed germination assay and brine shrimp (*Artemia salina*) lethality bioassay, respectively. Enzymatic inhibition assays targeting α-amylase, α-glucosidase, and pancreatic lipase were performed only for *O. octandra* at a concentration of 1000 mg L^{-1}. *O. octandra* showed strong DPPH radical scavenging activity (IC_{50} = 9.39 ± 0.09 mg L^{-1}) compared to *C. pallida* (IC_{50} = 483.80 ± 10.10 mg L^{-1}) and ascorbic acid (IC_{50} = 7.90 ± 0.10 mg L^{-1}). The FRAP values were recorded as 1.75 ± 0.13 mmol Fe^{2+}/g for *O. octandra*, 0.49 ± 0.02 mmol Fe^{2+}/g for *C. pallida*, and 1.26 ± 0.01 mmol Fe^{2+}/g for Trolox. Phytotoxicity assay showed weak shoot and root inhibition in *O. octandra*, while *C. pallida* had moderate activity (Minimum inhibition concentration (MIC) between 250 – 500 mg L^{-1}; positive control: abscisic acid 10 mg L^{-1}). *C. pallida* also exhibited notable cytotoxicity (LC_{50} = 20.03 ± 2.05 mg L^{-1}) compared with *O. octandra* and $K_2Cr_2O_7$ as positive control (LC_{50} = 7.90 ± 0.10 mg L^{-1}). *O. octandra* showed strong α-glucosidase (99.92 ± 0.13%) inhibition compared to acarbose (88.97 ± 0.22%) and α-amylase inhibition (65.32 ± 3.08%) compared to acarbose (57.51 ± 4.33%) as the positive control. Lipase inhibition of *O. octandra* was lower (16.51 ± 5.27%) than orlistat (68.00 ± 14.53%) as the positive control. These findings suggest *O. octandra* may serve therapeutic roles, while *C. pallida* shows herbicidal potential, and further investigation could explore potential for development into natural herbicides and therapeutic agents.

Keywords: *Antioxidant activity, cytotoxicity, enzyme inhibition, phytotoxicity*