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Antioxidant, antidiabetic and cytotoxic activities of methanolic extracts of *Zingiber officinale* and *Zingiber zerumbet*

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Plants belonging to the Zingiberaceae family have long been used in traditional medicine practices and as spices. As such, the current study aimed to determine the bioactivities of methanolic extracts of *Zingiber officinale* (common ginger) and *Zingiber zerumbet* (wild ginger) rhizomes and to assess their potential as pharmaceutical and agricultural sources in related developments. Fresh rhizomes were collected in Kandy district, Sri Lanka. They were air-dried and ground to powder. The powdered samples were extracted in methanol by sonication for 30 minutes. This process was carried out twice and then the filtrates were combined and evaporated to dryness on a rotary evaporator. The extracts were screened for their antioxidant activity by the 2,2-diphenyl-1-picrylhydrazyl (DPPH) radical scavenging method, enzyme inhibitory activity against α -amylase, α -glucosidase, and lipase, cytotoxicity by the brine shrimp lethality assay, and phytotoxicity by the lettuce seed germination bioassay. The results showed the $IC_{50} = 29.80 \pm 2.06 \text{ mg L}^{-1}$ value of *Z. officinale* is significantly higher than the positive control ascorbic acid with $IC_{50} = 3.47 \pm 0.45 \text{ mg L}^{-1}$. *Z. zerumbet* exhibited weak activity against DPPH radical scavenging assay since not detecting 50% of inhibition within the tested concentration range. For enzyme inhibition, *Z. zerumbet* showed percentage α -glucosidase inhibition of 100% for 1000 mg L^{-1} , more effective than *Z. officinale* which showed percentage inhibitions of 60% at 1000 mg L^{-1} . However, their IC_{50} values were higher compared to the positive control: acarbose with $IC_{50} = 8.87 \pm 1.21 \text{ mg L}^{-1}$. Both extracts exhibited remarkable results for brine shrimp lethality, with LC_{50} values of $15.34 \pm 2.06 \text{ mg L}^{-1}$ for *Z. zerumbet* and $48.06 \pm 3.34 \text{ mg L}^{-1}$ for *Z. officinale*, respectively, against the positive control, atropine, $LC_{50} = 88.60 \pm 8.11 \text{ mg L}^{-1}$. No positive activity results were observed for the α -amylase, lipase and phytotoxicity bioactivity studies. The findings indicate that *Z. officinale* displayed potent antioxidant capacity, while *Z. zerumbet* exhibited good α -glucosidase inhibitory activity. Both extracts demonstrated notable cytotoxic effects, with *Z. zerumbet* showing enhanced efficacy in this regard. These results suggest *Z. zerumbet* as a potential candidate for antidiabetic and anticancer therapies, while *Z. officinale* may be better suited for antioxidant-based applications.

Keywords: Antioxidant activity, cytotoxicity, α -glucosidase, *Zingiber officinale*, *Zingiber zerumbet*