



## Development of Rhizomes of *Nymphaea* spp. as Functional Foods to be used as Health Beneficiary Products

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### Abstract

*Nymphaea nouchali* and *Nymphaea pubescens* are widely distributed aquatic plants in Sri Lanka. Their rhizomes were underutilized despite having medicinal value and are not readily accessible due to ecological limitations. This study focuses on the transformation of rhizomes into functional foods that are readily accessible to consume throughout the year while maintaining quality. Methanolic and aqueous extracts were prepared from the dried powder of rhizomes. Qualitative phytochemical analysis of the extracts of both species showed the presence of important phytochemicals. Quantification of phytochemicals in methanolic extract showed that total flavonoid (TFC), total phenolic (TPC), and total tannins (TTC) were in the ranges of  $(0.50 \pm 0.02 - 1.00 \pm 0.02)$  mgQE/g,  $(5.00 \pm 0.01 - 10.00 \pm 0.25)$  mgGAE/g, and  $(10.00 \pm 0.01 - 20.00 \pm 0.10)$  mgTAE/g respectively for both species. Proximate analysis showed rhizomes of both species consist of moisture (45-60%), carbohydrates (25-30%), ash (8-12%), protein (3-8%), crude fiber (0.50-1.20%), and fat (1.50-2%).  $IC_{50}$  values were calculated for methanolic extracts of *N.nouchali* and *N.pubescens* as  $77.42 \pm 0.19$  ppm and  $73.31 \pm 0.17$  ppm respectively in the DPPH assay. *In-vitro* evaluation of glucose uptake by yeast cells showed a significant glucose uptake compared to the standard drug. Seven formulations of soup cubes and ten formulations of cereal powder were developed by incorporating the dried powder of both species. Normal cytotoxicity assay (Brine Shrimp Lethality assay) was evaluated for all soup cubes and cereal powder formulations. The two soup cubes and cereal formulations were found safer according to this assay. Quantification of phytochemicals, (TPC = 3.00-7.00 mgGAE/g, TFC = 0.50–2.00 mgQE/g, TTC = 4.00–5.00 mgTAE/g) proximate analysis (moisture = 3-7 %, protein = 4-10%, fat = 4-6%, fiber = 0.5-2%, ash = 3-10%) and antioxidant capacity ( $IC_{50}$  = 30.00 ppm – 40.00 ppm) for soup cubes and cereal formulations showed acceptable results. In conclusion, this study confirmed that both rhizomes are a rich source of important secondary metabolites and potent antioxidants. The developed functional foods are acceptable for consumption and provide good health benefits.

Keywords: *Extract, Functional Foods, Nymphaea, Phytochemicals, Rhizomes.*

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