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Nutritional profile and Antioxidant activity of *Alpinia officinarum* found in Bishnupur district, Manipur, India

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ABSTRACT

Alpinia officinarum commonly known as lesser galanga, found in the Bishnupur district of Manipur, exhibits significant nutritional and phytochemical properties that support its traditional usage as both a food and medicinal plant. Nutritional analysis indicates a moderate carbohydrate composition with low fat and protein content in its rhizomes. Phytochemical screening reveals a rich presence of bioactive compound including phenol and secondary metabolites which contribute to the plant's antioxidant.

Figure : 01 References : 11 Table : 01

KEY WORDS : *Alpinia officinarum* Hance,DPPH, Nutritional profile, Phytochemical composition, Total phenolic content.

Introduction

Lesser galanga *(Alpinia officinarum*) is a valuable medicinal plant from the Zingiberaceae family[5]. It is found in Bishnupur district, Manipur, a region known for its diverse flora and rich ethnobotanical resources. Traditionally, the rhizomes of this plant are valued for their aromatic properties and extensively used in local medicinal practices to treat digestive disorders, infections, and inflammation. The occurrence of *Alpinia officinarum* in the plains of Bishnupur underscores its ethnobotanical significance and highlights the need for further scientific exploration of its phytochemical properties and therapeutic potential in this geographic context[4,7]. This study aims to document and analyse the presence and benefits of lesser galanga in the plain regions of Bishnupur district, Manipur.

Material and Methods

Study area and sample preparation: Matured rhizomes were collected from the Kwasiphai village, Bishnupur district, Manipur. The rhizomes were washed properly and chopped into pieces (1cm). Then, they were dried at 45-degree Celsius at air dry oven for 48hrs. The dried plant samples were ground using a crusher and sieve to obtain powders which were kept for further analysis**.**

Proximate composition analysis: The Proximate composition , moisture, fat, ash, content, crude fiber and protein contents of plant samples were determined using standard analytical methods[1]. Moisture content was determined by drying the sample in an oven at 105 ± 2 °C until constant weight was achieved. This involved weighing the sample before and after drying, and calculating the loss in weight as moisture percentage. Ash Content was evaluated by incinerating the dried sample for 20 hours at 550 °C in a muffle furnace. The residue left after incineration was weighed and expressed as percentage ash content[1]. Nitrogen content was analyzed using the micro-Kjeldahl method. The sample was digested with concentrated acid, neutralized, and distilled, and the ammonia was titrated. The protein content was then calculated from nitrogen content by multiplying by the factor 6.25 (*i.e.,* Protein = N × 6.25). Lipid content was determined by extracting the sample with a solvent (usually petroleum ether or hexane) using the Soxhlet extraction method. The solvent was evaporated, and the residue left was weighed as the lipid content.Total Carbohydrate[6] was usually determined by difference, subtracting the sum of moisture, ash, protein, and fat from 100%. The referenced procedure[6] was used for calculation in this analysis.

Extraction of natural antioxidants: Polyphenols derived from plant materials were obtained by Soxhlet

extraction. It was performed using 10 g of powdered sample with methanol as the solvent for approximately 6 hours[8]. The resulting extract was concentrated by rotary evaporation and stored for subsequent analysis of phytochemical content and antioxidant activity.

Evaluation of TPC and Antioxidant activity contents: Determination of total phenolic contents: The total phenol content of plant samples was determined[3]. In a test tube of 5 ml volume, 20 µl of a 2 mg/ml extract solution was added, followed by the Folin-Ciocalteu reagent (0.2 ml) and distilled water (2 ml). After 3 min incubation of the solution mixture at the room temperature, 1 ml 20% sodium carbonate solution was added and the mixture re-incubated for 20 min under the same conditions. The absorbance of the resulting blue-colored solution was measured at 765nm using spectrophotometer. The total phenolic content of the extract was calculated from the gallic acid standard curve and expressed as milligrams gallic acid equivalent (GAE) per gram of extract[2].

Determination of the antioxidant activity by the DPPH free radical scavenging activity: The ability of plant extract to scavenge the DPPH free radical was determined according to the method[2]. A total of 4 ml of 0.002% alcoholic solution of DPPH was added to 0.5ml of different concentrations (µl/ml) of extract samples and standard solution separately, to have final concentrations of products of 25-200µg/ml[3,9]. The samples were kept at room temperature in the dark for 30 min. The absorbance of the resulting solution was measured at 512 nm using a spectrophotometer. The absorbance of the samples, control, and blank was measured in comparison with distilled water. The antioxidant activity (AA) was calculated as follows

TABLE-1 : Proximate Composition of plant powdered

Parameters	Result (%)
Moisture	4.43
Lipid	1.38
Ash content	3.16
Crude fibre	14
Protein	2.43
Carbohydrate	74.3

AA% = (Abs control – Abs sample)/Abs control × 100

Besides, the efficient concentration 50 (EC50) was determined according to the antioxidant activity.

Results and Discussion

Proximate composition analysis: The proximate analysis revealed that the plant sample contained **4.43% moisture**, indicating good storage stability. The **ash content (3.16%)** suggests moderate mineral presence, while the **lipid content was low (1.38%)**, consistent with non-oil plant materials. The sample showed **highrude fibre (14%)** and **high carbohydrate content (74.3%)**, making it a potential source of dietary fiber and energy. Protein content was relatively low (**2.43%**), similar to many medicinal plants. Overall, the composition indicates that the sample is nutritionally valuable, particularly for its fiber and carbohydrate content.

Total phenolic content: The total phenolic content of the extract, determined from the plant sample was **560.79 µg/mL gallic acid equivalent (GAE), which is greater than those reported by earlier findings[10,11]**. This high phenolic concentration indicates the presence of abundant bioactive compounds, which likely contribute to the strong antioxidant activity of the plant extract.

Antioxidant activity (DPPH Assay): The antioxidant potential of the extract was further supported by the absorbance trends observed in the R1 and R2 replicates (Fig. 2). Both replicates showed consistent absorbance patterns across concentrations (20–100 µg/mL), confirming the reliability of the assay. R1 displayed a slight increase up to 60 µg/mL, followed by a minor decline, while R2 showed a gradual rise, reaching its maximum at 100 µg/ml. These patterns align with the high DPPH inhibition values obtained, which ranged from **93.63% to 95.51%**, and with the very low **EC… € values (0.94–6.80 µg/ml)**. Together with the high phenolic content (**560.79 µg/ml GAE**), the results indicate that the extract possesses highly potent radical-scavenging constituents. This strong antioxidant activity, supported by consistent replicates, highlights the plant's potential as a valuable natural source of bioactive compounds for nutraceutical and functional food applications.

The findings of this study demonstrate that the plant sample possesses notable nutritional and bioactive characteristics that support its potential as a functional and therapeutic resource. The proximate composition revealed a **low moisture content (4.43%)**, which enhances storage stability and reduces the risk of microbial spoilage. The **moderate ash content (3.16%)** suggests the presence of essential minerals, while the **low lipid level (1.38%)** is typical of non-oil-bearing medicinal plants. The **high crude fiber (14%)** and

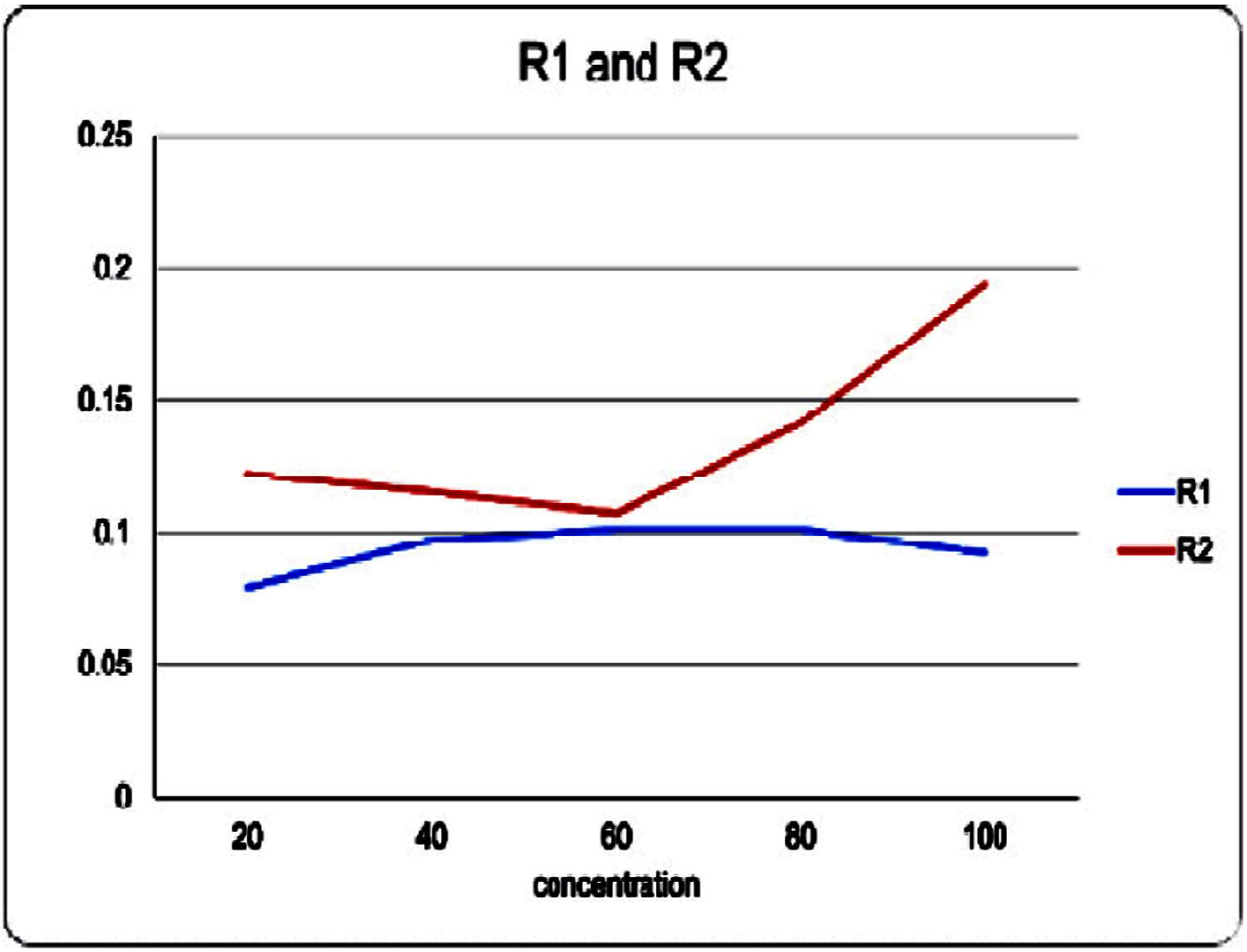

Fig. 1 : Variation in DPPH scavenging activity of plant extract at different concentrations compared to that of ascorbic acid

elevated carbohydrate content (74.3%) indicate that the plant may serve as a valuable dietary component, particularly in supporting digestive health and providing sustainable energy. Although the **protein content (2.43%)** is comparatively low, it is consistent with values reported for many traditional medicinal species where therapeutic rather than nutritional properties are predominant.

A key finding of this study is the **high total phenolic content (560.79 µg/mL GAE)**, which exceeds values reported in earlier studies of similar plant materials. Phenolic compounds are well recognized for their strong antioxidant, anti-inflammatory, and disease-preventive properties. The elevated phenolic concentration observed here strongly suggests that the plant is rich in bioactive secondary metabolites that contribute significantly to its medicinal potential.

The antioxidant activity assessed through the DPPH scavenging assay further reinforces this conclusion. The extract exhibited **remarkably high radical-scavenging efficiency**, with inhibition values consistently above 93% across all tested concentrations. The **very low EC… € values (0.94–6.80 µg/mL)** indicate outstanding antioxidant strength, revealing that only a small amount of extract is required to achieve substantial free radical neutralization. The consistency observed in the R1 and R2 replicates confirms the reliability of the assay and validates the robustness of the antioxidant response. The gradual absorbance increases in R2 and the characteristic peak in R1 reflect stable and reproducible behaviour of the extract across concentration ranges.

Overall, the combined nutritional, phenolic, and antioxidant profiles suggest that the plant is an excellent source of natural antioxidants. Its **high phenolic levels and potent free radical-scavenging activity** highlight its potential application in **nutraceuticals, functional foods, herbal formulations, and natural preservative systems**. These findings position the plant as a promising for further phytochemical exploration and

potential commercialization in health-promoting products.

Conclusion

The present study highlights the nutritional and bioactive potential of the investigated plant sample. The proximate composition revealed low moisture content and high levels of carbohydrate and crude fiber, indicating good storage stability and nutritional value. The extract also exhibited a remarkably high total phenolic content (560.79 µg/mL GAE), suggesting the presence of abundant bioactive compounds. This was further supported by the strong DPPH radical scavenging activity, with consistently high inhibition percentages and very low EC… € values, confirming the extract's exceptional antioxidant potency.

Overall, the combined results demonstrate that the plant is a rich source of natural antioxidants with potential applications in **nutraceuticals, functional foods, and herbal formulations**. Its strong antioxidant capacity, supported by reproducible experimental data, indicates that it may serve as a valuable for further phytochemical characterization and therapeutic evaluation. Continued research may help unlock its full potential for use in health-promoting and antioxidant-based products.

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