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ANTIOXIDANT ACTIVITY OF ALANGIUM SALVIIFOLIUM (L.F.) FRUITS - A WILD EDIBLE PLANT OF MELGHAT FOREST.

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Abstract:

Melghat forest has a rich diversity of wild edible fruit plants. **Alangium salviifolium (L.f.)** is one among them. The fruits of this plant have been consumed by the tribal people of this area. Therefore, the present investigation was undertaken to study the antioxidant properties of **A. salviifolium (L.f.)** fruits. The five different solvent extracts were screened for antioxidant activities by free radical scavenging activity (DPPH). The antioxidant activity of the different extracts ranged from 19.31 to 74.43 by DPPH and the IC50 was 1.291. This study suggests that **A. salviifolium (L.f.)** fruits exhibit great potential for antioxidant activity and may be useful for their nutritional and medicinal functions.

Key words: Antioxidant activity, Alangium salviifolium, DPPH.

Introduction

Wild edible fruits, rich in nutritional and medicinal properties, have been a staple for indigenous communities across diverse regions for centuries. These fruits not only fulfil the nutritional needs of rural populations but also hold significant economic potential, as they are often harvested from natural habitats and sold in rural markets, contributing to the income of local communities. In addition to being common food resources in rural areas, the consumption of wild fruits has demonstrated various health benefits, offering protection against chronic diseases such as cardiovascular diseases, diabetes, obesity, and certain types of cancer (Fernández-López et al., 2010).

Certain edible wild plants have been shown to possess comparable or even superior nutritive values compared to cultivated fruits (Mahapatra et al., 2012). This has sparked a growing interest among researchers in recent years to assess various wild edible plants for their nutritional features, including dietary fibers, vitamins, minerals, and bioactive compounds essential for maintaining human health (Aberoumand and Deokule, 2009).

The Melghat forest stands out for its abundant diversity of wild edible fruit plants, with Alangium salviifolium (L.f.) being a noteworthy example. Local tribal communities inhabiting the Melghat region have been consuming the fruits of A. salviifolium for centuries. Given the longstanding traditional usage of these fruits by the local population, our study places a specific focus on investigating the antioxidant potential of A. salviifolium (L.f.) fruits.

The A. salvifolium (L. f.) Wang., a deciduous shrub belonging to the Alangiaceae family, boasts a rich history of traditional medicinal usage. A. salvifolium is renowned for its efficacy in treating and preventing various diseases, including jaundice, epilepsy, scabies, gonorrhea, hepatitis, diabetes, syphilis, and asthma. With this in mind, we have evaluated the antioxidant activity of A. salvifolium fruits collected from the Melghat region of the Amravati district, Maharashtra, using five different extracts and determined the IC_{50} value.

Material and Methods

A frequent field trips was conducted to collect A. salvifolium fruits from the Melghat forest region in the Amravati district of Maharashtra. Plant identification was performed through reference to various floras, books, relevant articles, and consultation with experts in the field. The plant species, along with its fruits, were photographed, and fruits were transported to the research laboratory for further study.

Sample Preparation

The collected fresh fruits were thoroughly washed with distilled water. Subsequently, the washed fruits were soaked with blotting paper and allowed to air dry. The air-dried fruits were then sliced into thin pieces and shade dried in room temperature (Plate 1). The small dried fruit pieces were ground into a powder, and the powdered material was finally sieved and packed into an air-tight plastic container.

Cold Extraction

For cold extraction, five different solvents were utilized, namely water, ethyl acetate, petroleum ether, methanol, and ethanol. Five grams of fruit powder were added to a beaker containing 200 ml of each solvent, maintained at room temperature for 30 minutes. The contents were shaken at 24-hour intervals for the next seven days. The extracts were filtered using Whatman filter paper, and the resulting extract was air-dried at room temperature on a watch glass with the assistance of ice cubes.

Plate 1. Fresh and shade dried fruit samples of Alangium salvifolium

Determination of Antioxidant Activity

The free-radical scavenging activity was determined using the DPPH (2, 2-diphenyl-1-picrylhydrazyl) assay, as described by Shimada et al. (1992). The reaction mixture comprised 10 µl of the test sample, a positive control with 1 mg concentration of ascorbic acid, and 190 µl of a solvent solution of 0.1 mM DPPH radical. The mixture was vigorously shaken and then incubated at 37°C for 5 minutes. The antioxidant activity of the extracts, corresponding to the scavenging of DPPH radical, was measured at 517 nm using a UV–VIS spectrophotometer. The free radical scavenging activity was calculated using the following equation;

$$(\%)\ \text{Free radical scavenging effect} = \frac{[\text{Absorbance of control (Ac)} - \text{Absorbance of sample(As)}]}{\text{Absorbance of control (Ac)}} \times 100$$

Statistical Analysis

The statistical analyses were performed using the statistical package SPSS (Statistical Package for Social Science, SPSS Inc., Chicago, IL). The 50% inhibitory concentration (IC_{50}) was calculated according to Concentration-Effect regression line.

Results and Discussion

Table 1. Free radical scavenging activity of Alangium salvifolium extract as measured by DPPH assay.

Extraction solvent (2 mg/ml)	Free Radical Scavenging Activity (%)
Ethyl Acetate	55.16 ± 1.27
Ethanol	51.11 ± 1.32
Methanol	74.43 ± 3.21
Petroleum Ether	19.31 ± 2.12
Water	35.06 ± 3.22

Table 2. DPPH free radical scavenging activity and IC_{50} of Alangium salvifolium methanolic extract.

S. No.	Conc. (in mg/ml)	% free radical scavenging activity	Y equation	R^2 value	IC_{50} (in mg)
1	0.4	16.90 ± 1.54	35.717x + 3.8733	0.994	1.291
2	0.8	33.60 ± 1.57			
3	1.2	46.33 ± 2.05			
4	1.6	63.40 ± 2.87			
5	2.0	73.43 ± 2.31			

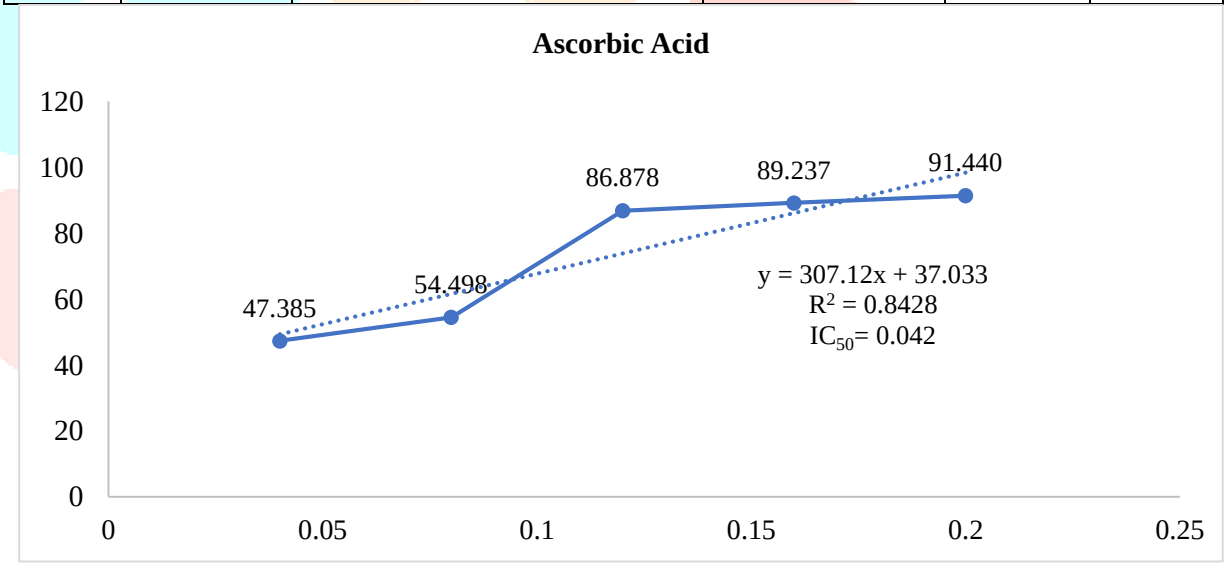

Figure – 1. Inhibition percentage for Ascorbic acid

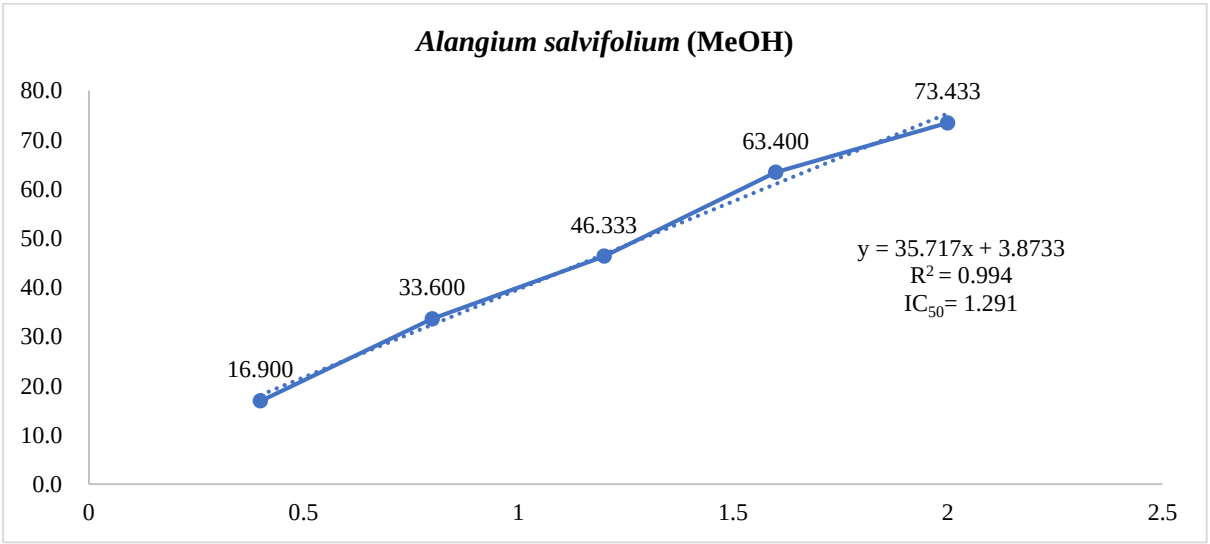

Figure – 2. IC50 values for methanol extract

The efficacy of A. salvifolium fruit extract in five different solvents, namely ethyl acetate, ethanol, methanol, petroleum ether, and water, to scavenge DPPH radicals is presented in Table 1. The results indicate that the percentage of free radical scavenging activity varied between 19.31 ± 2.12 and 74.43 ± 3.21 across different solvents. The highest and lowest percentage of free radical scavenging activity was observed in methanol and petroleum ether solvents, respectively. A percentage of free radical scavenging activity of 35.06 ± 3.22 was noted in the fruit extract with water as the solvent, highlighting methanol as the superior solvent among those tested. Subsequently, five different concentrations of methanolic extract (0.4, 0.8, 1.2, 1.6, and 2.0 mg/ml) were employed to evaluate the reducing power of A. salvifolium fruit samples.

Table 2 presents the results, indicating that these extracts significantly inhibited the activities of DPPH radicals in a dose-dependent manner. The percentage inhibition of DPPH free radical scavenging increased with an increase in concentration, demonstrating a dose-dependent effect. Notably, a substantial inhibition of DPPH radicals (73.43%) was observed for the 2.0 mg/ml concentration of A. salvifolium fruit extract.

The scavenging activities of the methanolic extract of A. salvifolium on DPPH radicals ranged from 16.90% to 73.43%. At a similar concentration, the standard ascorbic acid exhibited 47.38%, 54.49%, 86.87%, 89.23%, and 91.44% inhibition (Figure 1). These results align with findings by Saklani et al. (2011) in Pyracantha crenulata methanolic extract and Pal et al. (2013) in Berberis asiatica and Pyracantha crenulata methanolic extract.

The IC_{50} values, calculated and tabulated in Table 2, were employed for the comparison of the free radical scavenging activities of different samples. The IC_{50} value represents the concentration of the samples required to scavenge 50% of the free radicals present in the system. With a calculated IC_{50} of 1.291, A. salvifolium extracts demonstrated significant scavenging activity. In comparison, the ascorbic acid reference displayed excellent free radical scavenging activities with an IC_{50} value of 0.042 (Figure 2).

Reactive oxygen species and free radicals in the body are generated through exogenous (radiation, atmospheric pollutants, toxic chemicals, etc.) and endogenous (various cytokines) sources (Antonieta et al., 2010). Excessive free radicals are known to result in oxidative stress, leading to various degenerative diseases (Devasagayam et al., 2004). In this context, antioxidants play a crucial role in preventing the formation of ROS, scavenging radicals, and repairing the enzymes involved in cellular development. The extracts exhibited diverse trends of antioxidant activity when assessed using different solvents, with A. salvifolium methanolic extracts showing potent antioxidant activity through the DPPH free radical scavenging assay method.

Conclusion

The current study establishes a scientific foundation for the utilization of Alangium salvifolium fruit extracts in traditional healthcare systems. Specifically, methanolic extracts of exhibited robust antioxidant activity, suggesting potential applications in both medicinal and food industries.

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References

[1] Aberoumand, A., & Deokule, S. S. 2009. Studies on nutritional values of some wild edible plants from Iran and India. Pakistan Journal of Nutrition, 8(1), 26-31.

[2] Antonieta R., Hermosin-Gutierrez, I., Mardones, C., Vergara, C., Herlitz, E., Vega, M., von Baer, D. 2010. Polyphenols and antioxidant activity of calafate (Berberis microphylla) fruits and other native berries from Southern Chile. Journal of Agricultural and Food Chemistry, 58(10), 6081-6089.

[3] Choudhury, R., Choudhury, M. D., De, B., & Paul, S. B. 2010. Importance of certain tribal edible plants of Tripura.

[4] Danesi, F. 2009. Biological effects of bioactive components and extracts derived from edible plants commonly used in human nutrition.

[5] Devasagayam, T. P. A., Tilak, J. C., Boloor, K. K., Sane, K. S., Ghaskadbi, S. S., & Lele, R. D. 2004. Free radicals and antioxidants in human health: current status and future prospects. Japi, 52(794804), 4.

[6] Fernández-López, J. A., Almela, L., Obón, J. M., & Castellar, R. 2010. Determination of antioxidant constituents in cactus pear fruits. Plant Foods for Human Nutrition, 65, 253-259.

[7] Pal, R. S., Kumar, R. A., Agrawal, P. K., & Bhatt, J. C. 2013. Antioxidant capacity and related phytochemicals analysis of methanolic extract of two wild edible fruits from north western Indian Himalaya. Int J Pharm Bio Sci, 4(2), 113-123.

[8] Saklani, S., Chandra, S., & Mishra, A. P. 2011. Evaluation of antioxidant activity, quantitative estimation of phenols, anthocynins and flavonoids of wild edible fruits of Garhwal Himalaya. Journal of Pharmacy Research, 4(11), 4083-4086.

[9] Shimada, K., Fujikawa, K., Yahara, K., & Nakamura, T. 1992. Antioxidative properties of xanthan on the autoxidation of soybean oil in cyclodextrin emulsion. Journal of agricultural and food chemistry, 40(6), 945-948.