Chapter 3

Food and medicinal values of *Antidesma ghaesembilla* Gaertn. (Phyllanthaceae)

Rajeev Kumar Singh[1] and Sanjeet Kumar[2]*

[1]Botanical Survey of India, Arid Zone Regional Centre, AIIMS Road, Jodhpur, Rajasthan, India

[2]Biodiversity and Conservation Laboratory, Ambika Prasad Research Foundation, Cuttack, Odisha, India

*E-mail: sanjeetaprf@gmail.com; ORCID: https://orcid.org/0000-0001-9538-397X

Licensed under a Creative Commons Attribution 4.0 International License

Abstract: Wild edible fruits are valuable sources of nutraceuticals, contributing significantly to human health and nutrition while addressing food security challenges. In this context, the present study investigates the food and medicinal potential of *Antidesma ghaesembilla* Gaertn. through an integrative approach involving field surveys and laboratory analyses. Ethnobotanical fieldwork confirmed the edibility of the fruits and their traditional use in local communities. Phytochemical screening revealed a rich composition of primary and secondary metabolites, suggesting notable nutritional and therapeutic potential. Cytotoxicity assays demonstrated promising anticancer activity, and thin-layer chromatography (TLC) profiling indicated a diverse spectrum of bioactive constituents. These findings underscore the importance of *A. ghaesembilla* as a wild edible resource with significant health benefits, emphasizing the need for its sustainable utilization and conservation.

Keywords: Anti-cancer agents, Food problems, Global health issues, Phytochemicals

Introduction

Across the world, food insecurity, limited access to effective medicines, and climate change are among the most pressing challenges of our time (Rossati, 2017). Addressing these interconnected issues may require a shift in focus toward forests and indigenous or tribal communities, where nature still offers a wealth of underutilized resources (Addas, 2023). Forest ecosystems and their dwellers possess invaluable traditional knowledge and biodiversity that, if harnessed sustainably, could provide solutions to global warming, nutritional deficiencies, and healthcare needs. Despite the growing crisis of food scarcity worldwide (Guine, 2024), modern food systems remain heavily dependent on a narrow range of crops, primarily about twelve staple food plants, along with a limited variety of vegetables and fruits (Colgrave et al., 2021). In contrast, forests harbor numerous plant species with significant food, medicinal, and nutraceutical potential that remain largely untapped or poorly understood.



Figure 1: Fruits and leaves of *Antidesma ghaesembilla*

Recognizing and integrating these wild resources into mainstream systems could play a vital role in promoting food diversity, improving public health, and mitigating climate impacts. In this context, documenting wild edible fruits with

both nutritional and medicinal value is of critical importance, not only for human health but also for forest conservation and the well-being of the wildlife that depend on these ecosystems. Many wild fruits that are edible for humans also serve as vital food sources for birds and animals, reinforcing the ecological interconnectedness of forest systems. With this perspective, the authors conducted ethnobotanical surveys in two Indian states (Odisha and Jharkhand) and identified a commonly occurring wild fruit-bearing plant, *Antidesma ghaesembilla* (Figure 1). This species is known locally for its edibility and traditional uses. Therefore, the present study aimed to evaluate its food and medicinal potential through qualitative phytochemical analysis for primary and secondary metabolites, cytotoxicity assessment using *Artemia salina*, and thin-layer chromatography (TLC) profiling. The findings underscore the relevance of wild edible fruits in addressing contemporary global challenges related to food security, public health, and environmental sustainability.



Figure 2: Collection of fruits for experimental works

Methodology

During various floristic explorations in the Indian states of Odisha and Jharkhand, information on the food value of wild plants was collected from local tribal communities using standard ethnobotanical methods (Jain, 1987; Jain and Mudgal, 1999; Jena et al., 2025a). Fruits of *Antidesma ghaesembilla* were specifically collected from the Cuttack region of Odisha (Figure 2). The detection of primary metabolites was carried out using aqueous extracts, following the procedures outlined by Jena *et al.* (2025b). Secondary metabolite profiling was conducted using three solvent extracts (n-hexane, ethanol and aqueous; Figure 3) based on their polarity index (Chandrashekar et al., 2025). For toxicity and TLC, maceration method of extraction was adopted to get desired extracts (Chandrashekar et al., 2025; Figure 3). *Artemia salina* was used to test the cytotoxicity and 3 mobile phases were used to carry out the TLC (Chandrashekar et al., 2025).



Figure 3: Filtrate extracts of *A. ghaesembilla* fruits for experimental analysis

Results and discussion

The survey conducted in selected regions of Odisha and Jharkhand revealed that the ripe fruits of *Antidesma ghaesembilla* are commonly consumed by tribal and rural populations as a part of their traditional diet (Table 1; Figure 4). Based on their local food usage, further analysis was performed to assess the plant's nutritional and medicinal potential. Phytochemical screening of the fruit extracts confirmed the presence of primary metabolites, including carbohydrates and amino acids.



Figure 4: Authors collected fruits with tribal children for consumption

Additionally, secondary metabolites such as tannins, saponins, phenolic compounds, and reducing sugars were also detected (Table 2; Figure 5), with a notably high concentration of phenolic compounds observed. Given the abundance of phenolic compounds, often associated with antioxidant and anticancer properties, a cytotoxicity assay using *Artemia salina* was conducted.

Table 1: Food values of *Antidesma ghaesembilla*

State	Location	Food values
Odisha	Mayurbhanj	Ripen fruits are edible.
	Cuttack	Ripen fruits are edible.
	Khordha	Ripen fruits are edible.
	Keonjhar	Ripen fruits are edible.
	Sundargarh	Ripen fruits are edible.
Jharkhand	Latehar	Ripen fruits are edible.
	Jamtara	Ripen fruits are edible.

Table 2: Qualitative phytochemical analysis of *Antidesma ghaesembilla* fruits using different extracts

Bioactive compounds	n-hexane	Ethanol	Aqueous
Tannin	Absent	Present	Present
Saponin	Present	Present	Present
Flavonoids	Absent	Absent	Absent
Terpenoids	Absent	Absent	Absent
Phenolic compounds	Present	Present	Present
Reducing sugars	Absent	Present	Present
Steroids	Absent	Absent	Absent
Alkaloids	Absent	Absent	Absent
Carbonyl compounds	Absent	Absent	Absent

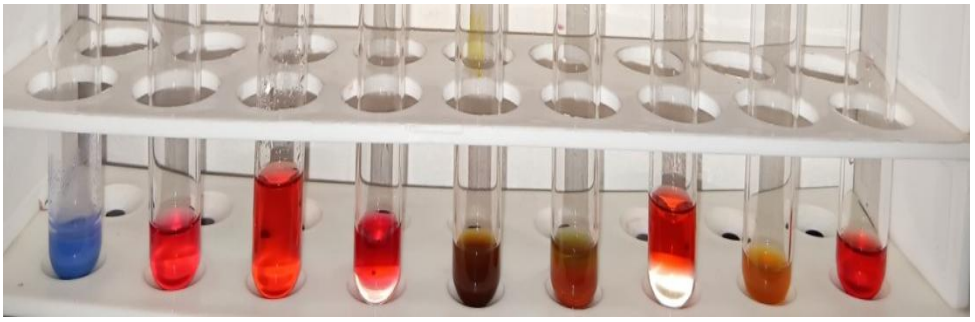


Figure 5: Detection of secondary metabolites of *A. ghaesembilla* fruits using aqueous extract

Remarkably, all three selected extracts (aqueous, ethanol, and n-hexane) exhibited 100% mortality at the tested concentrations (Table 3; Figure 6).

Table 3: Cytotoxicity analysis of *Antidesma ghaesembilla* fruits using Brine shrimp nauplii

Extracts	Concentration (in mg/ml)	Initial number of Nauplii	Number of Deaths of Nauplii (after hours)		Death rates (%)
			1	2	
n-hexane	15.62	10	5	10	100
	31.25	10	1	10	100
	62.5	10	3	10	100
	125	10	10	10	100
	250	10	10	10	100
	3.5% Saline	10	0	0	0
	Vincristine sulphate	10	10	10	100
Ethanol	15.62	10	10	10	100
	31.25	10	10	10	100
	62.5	10	10	10	100
	125	10	10	10	100
	250	10	10	10	100
	3.5% Saline	10	0	0	0
	Vincristine sulphate	10	10	10	100
Aqueous	15.62	10	10	10	100
	31.25	10	10	10	100
	62.5	10	10	10	100
	125	10	10	10	100
	250	10	10	10	100
	3.5% Saline	10	10	10	100
	Vincristine sulphate	10	10	10	100

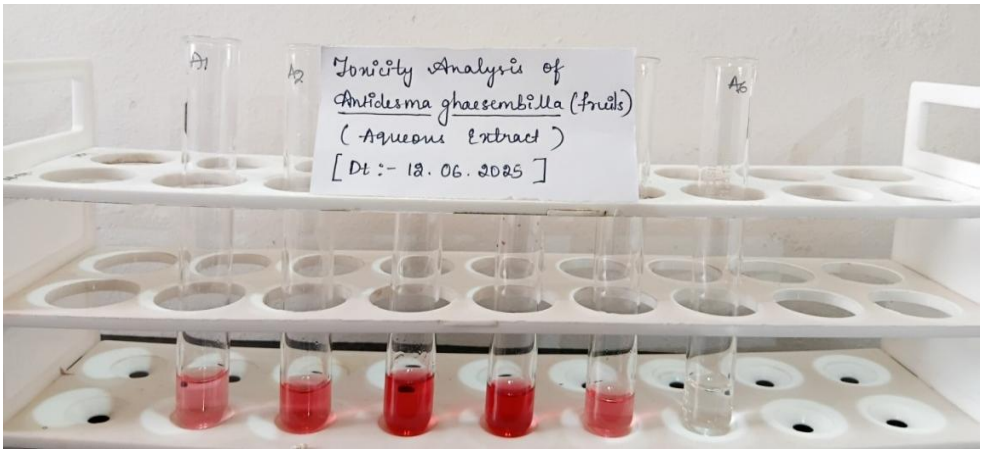


Figure 6: Toxicity analysis using Brine shrimp nauplii of aqueous extract of *A. ghaesembilla* fruits

The TLC analysis showed that 8 spots were detected in three selected mobile phases of hydroethanolic extracts of fruits (Table 4). It showed fruits have different active constituents which maybe be act as anticancer agent.

Table 4: TLC analysis of *Antidesma ghaesembilla* fruits using different mobile phases

	Mobile Phases	Rf value of Spots		
		S1	S2	S3
Hydroethanolic	Methanol: Chloroform (1:1)	0.67	0.71	0.81
	Ethyl acetate: Chloroform (1:9)	0.8	0.97	-
	Ethyl acetate: Water: Acetic acid (8:1:1)	0.95	0.97	0.98

Previous studies have highlighted the antioxidant potential of *Antidesma ghaesembilla*. Anantachoke et al. (2016) documented the presence of antioxidant

enzymes in the plant, indicating its role in combating oxidative stress. Similarly, Tiranakwit et al. (2023) reported significant antioxidant activity of *A. ghaesembilla* within the framework of traditional Thai medicine. Despite these findings, a comprehensive literature survey indicates that ethnopharmacological research on this species remains limited. There is a noticeable gap in detailed studies on its phytochemical diversity, therapeutic mechanisms, and broader nutraceutical applications. This underlines the need for further scientific investigation into the food and medicinal values of *A. ghaesembilla*, especially within the context of traditional knowledge and modern health challenges.

Conclusion

The present study underscores the significance of Antidesma ghaesembilla as a wild edible fruit plant with notable food and medicinal potential. Phytochemical analysis confirmed the presence of various bioactive compounds, including primary and secondary metabolites. The cytotoxicity assay demonstrated strong biological activity, suggesting the fruit's potential as a preventive or therapeutic anticancer agent. Furthermore, TLC profiling revealed a diverse range of phytoconstituents, reinforcing its value as a nutraceutical resource. These findings highlight the critical importance of documenting, conserving, and sustainably utilizing wild edible plants. Such underutilized species not only support local food and healthcare systems but also offer promising solutions to broader global health and environmental challenges.

Acknowledgements: The authors express their sincere gratitude to the local communities of the study areas for generously sharing their traditional knowledge regarding the food values of *Antidesma ghaesembilla*. The authors also extend their thanks to the forest officials of Odisha and Jharkhand for their support and assistance during fieldwork activities.

References

Addas A. (2023). Impact of forestry on environment and human health: an evidence-based investigation. Frontiers in Public Health. 11:1260519. doi: 10.3389/fpubh.2023.1260519.

Anantachoke N, Lomarat P, Praserttirachai W, Khammanit R and Mangmool S. (2016). Thai Fruits Exhibit Antioxidant Activity and Induction of Antioxidant Enzymes in HEK-293 Cells. Evidence-based complementary and alternative medicine. 2016:6083136. doi: 10.1155/2016/6083136.

Chandrashekar HP, Das SR, Jaiswal A, Basole SG, Bhat SS, Jena N and Kumar S. (2025). Food, Ethnomedicinal and Pharmacological Evaluation of *Streblus asper* Lour. (Fruits): A Minor Nutraceutical of India. Annals of Agri-Bio Research. 30(1):98-102.

Colgrave ML, Dominik S, Tobin AB, Stockmann R, Simon C, Howitt CA, Belobrajdic DP, Paull C and Vanhercke T. (2021). Perspectives on Future Protein Production. Journal of Agricultural and Food Chemistry. 69(50):15076-15083.

Guiné RPF. (2024). The Challenges and Strategies of Food Security under Global Change. Foods. 13(13):2083. doi: 10.3390/foods13132083.

Jain SK and Mudgal V. (1999). A hand book of Ethnobotany. Bishen Singh Mahendra Pal Singh, Dehradun, India.

Jain SK. (1987). Manual of Ethnobotany. Scientific Publishers, Jodhpur, India.

Jena N, Tripathi G and Kumar S. (2025b). Plants and Secondary Metabolites, Volume 5. Ambika Prasad Research Foundation, Odisha, India.

Jena N, Vimala, Singh B, Patra A, Sharma BP, Hossain E and Kumar S. (2025a). Methods for ethnobotanical data collection, phytochemistry, antioxidant, anthelmintic, and antimicrobial activities for pharmacological evaluation of medicinal plants. Journal of Biodiversity and Conservation. 9(2): 87-107.

Rossati A. (2017). Global Warming and Its Health Impact. International Journal of Occupational and Environmental Medicine. 8(1):07-20.

Tiranakwit T, Puangpun W, Tamprasit K, Wichai N, Siriamornpun S, Srisongkram T and Weerapreeyakul N. (2023). Phytochemical Screening on Phenolic, Flavonoid Contents, and Antioxidant Activities of Six Indigenous Plants Used in Traditional Thai

Medicine. International Journal of Molecular Sciences. 24(17):13425. doi: 10.3390/ijms241713425.