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New Distributional Evidence of *Laggera crispata* from South-Central Rajasthan, India

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Abstract: ***The genus Laggera (Asteraceae) comprises aromatic herbs primarily distributed in hot and humid regions of Asia and Africa. Among its species, Laggera crispata (Vahl) Hepper & J. R. I. Wood holds significant taxonomic, ecological, and pharmacological importance. This study presents a detailed taxonomic investigation of Laggera crispata, focusing on its morphological traits, habitat preferences, and ecological adaptations. The species was first documented in South-Central Rajasthan (Lakhola, near Gangapur), a semi-arid region with diverse vegetation. Field studies (October–December) assessed its distribution and morphological traits, with identification verified through standard taxonomic methodologies. Morphological analysis revealed distinct adaptations, including a fibrous root system, oblong-lanceolate serrated leaves, and corymbose panicle inflorescence, facilitating pollination and seed dispersal. The study highlights the species' resilience to semi-arid conditions and its ethnomedicinal uses, warranting further pharmacological research. Future studies should explore its molecular phylogenetics, physiological responses, and bioactive compounds. This research enhances taxonomic clarity, biodiversity conservation, and sustainable medicinal applications while emphasizing the need for conservation strategies to protect its habitat under increasing environmental pressures.***

Keywords: Asteraceae, *Laggera crispate*, aromatic herbs, Biodiversity, Distribution, and morphological traits

1. Introduction

The genus *Laggera* (Asteraceae) comprises an assemblage of flowering flora that are primarily distributed in regions with tropical and mild-warm conditions of Asia and Africa. Among these species, ***Laggera crispata*** (Vahl) Hepper & J. R. I. Wood is a well-known aromatic herb with significant ethnobotanical and pharmacological importance. It was firstly collected from South-Central Rajasthan from Lakhola region near Gangapur (Figure -3). The species was collected at geographic coordinates latitude 25.2037° N and longitude 74.6474° E. Lakhola area is characterized by its semi-arid climate and diverse vegetation, making it a vital ecological zone for the study of native and invasive flora. Anderberg *et al*., (2005) *Laggera* Sch. Bip. ex Benth. & Hook. f. is a genus of annual or perennial herbaceous plants in the Asteraceae family. Li (2006), Several morphological traits were documented in populations of two *Laggera* species, particularly in the stem wing characteristics of *L. crispata* populations. This morphological variation could result in taxonomic confusion, particularly in identifying the correct species and defining species boundaries explain that plant phenology examines the timing of recurring biological events, Including the visible attributes of new leaves, leaf shedding, flowering, and fruit production given by Nakar & Jadeja (2015). Koyama *et al., (*2016) It includes approximately 17 species, found across tropical Africa, Arabia, and Asia. Taxonomic novelties in the Asteraceae–Inuleae with the documentation of a newly identified genus, Galgera separate from Laggera sudy conducted by Anderberg *et al.* (2022) Nkosi *et al.,* (2024) studied the variation in phenology and morphological traits of seed-propagated *Laggera alata* and *Laggera crispata* forms.

2. Material and Methods

The investigation was performed in Lakhola, located in the south-central region of Rajasthan, India. This region experiences a semi-arid climate with seasonal fluctuations in temperature and rainfall. The area's vegetation primarily consists of arid-adapted species, featuring scattered grasslands and typical shrubbery. Field surveys were conducted in Lakhola and nearby areas between October and December to document the allocation of *Laggera crispata*. Plant Specimens were determined through the assistance of local knowledge and sampled from different locations within the area. The coordinates of each site were recorded using GPS to ensure accurate location tracking. The morphological characteristics of *Laggera crispata*, such as leaf shape and size, stem structure, and floral features, were carefully examined and documented. Specimens for the herbarium were mounted following methodology established by Jain & Rao (1977). Detailed identification of The analysis of the plant was performed following established references materials, including the *Flora of India* (BSI, 1996). The collected specimens were subsequently submitted to the Herbarium Department of the Botany Department at Sangam University, Bhilwara.

3. Results

Laggera crispate. (Vahl) Hepper & wood in Kew Bull.38: 33. (1983). *Conyza crispata* vahl, symb. Bot.1: 71. (1790). *Laggera pterodanta* (DC). Sch-Bip. ex oliver in Trans. Linn. Soc.29: 24. (1873). Hook. f., Fl. Brit. Ind.3: 271.1881. *Blumea pterodanta* Dc. in wight, conbrit. Bot. Ind.16.1834.

Taxonomical Treatments:

Description: *Laggera crispata* (table- 1 figure 1 and 2) is a herbaceous and annual plant approximately 32cm in hight The plant exhibits a well-defined morphology with distinct vegetative and reproductive structures, indicative of its adaptive features and growth patterns. The root system is slender and fibrous, measuring between 0.1 cm to 0.3 cm in width, with an average of 0.2 cm, and extending 7.4 cm to 8 cm in length, averaging 7.6 cm. This suggests a moderately deep root penetration, likely supporting efficient nutrient and water uptake from the soil.

The stem is relatively elongated and sturdy, with a width ranging from 0.3 cm to 0.4 cm (average 0.3 cm) and a length varying from 27 cm to 32 cm (average 29.25 cm). The cylindrical structure provides mechanical support, allowing the plant to maintain an upright posture while facilitating the transport of water, minerals, and photosynthates between different plant organs.

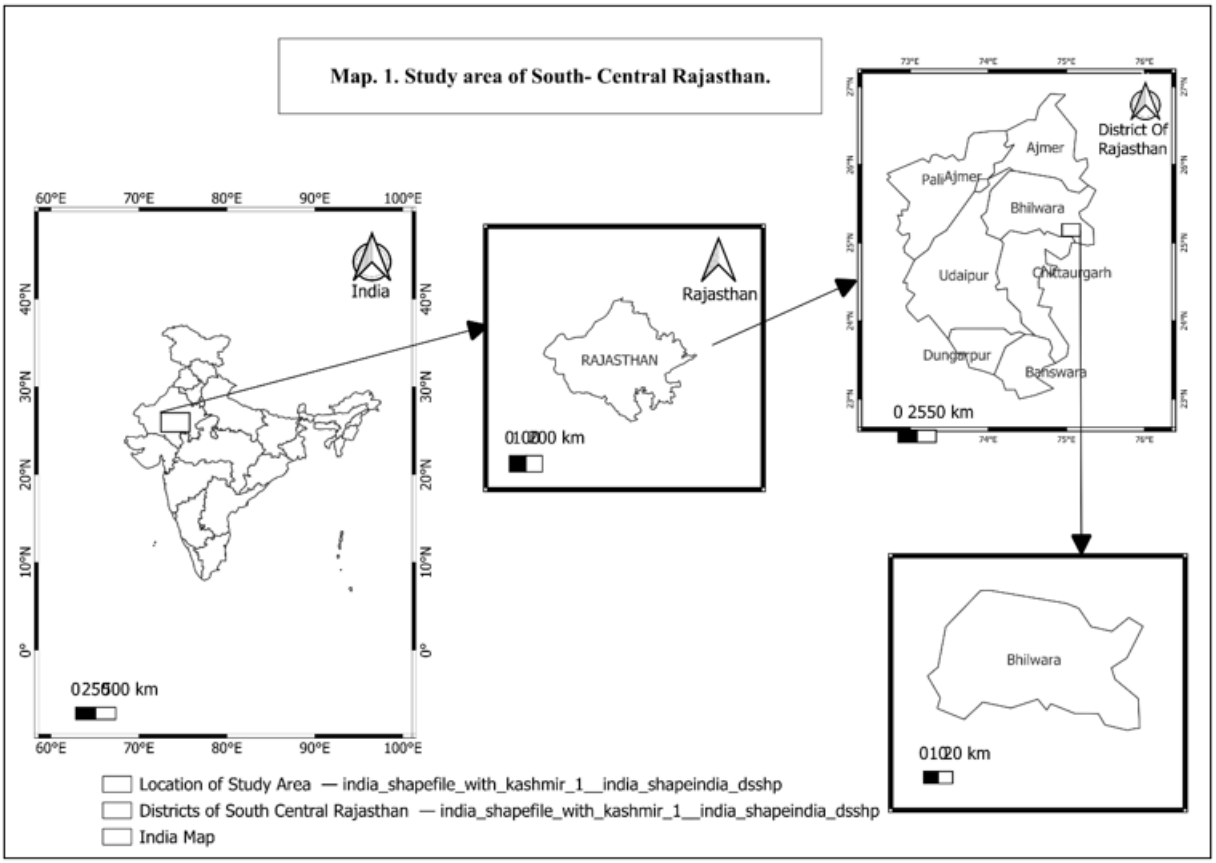
The leaves are oblong-lanceolate in shape, possessing serrated or deeply lobed margins, which may enhance photosynthetic efficiency by increasing the surface area for light absorption. The foliage exhibits a pale green color, indicative of its chlorophyll content and potential adaptability to different light conditions. The leaf width measures 0.3 cm to 0.4 cm (average 0.3 cm), while the length varies from 3 cm to 4 cm (average 2.95 cm). The petiole is relatively narrow, measuring 0.1 cm to 0.2 cm in width (average 0.1 cm) and 1.3 cm to 1.6 cm in length (average 1.4 cm), playing a crucial role in leaf positioning for optimal light capture.

The flower is borne in a terminal position, emerging at the apex of the stem or branches, a characteristic commonly associated with determinate growth in inflorescence development. It is relatively small, with a width ranging from 0.4 cm to 0.6 cm (average 0.5 cm) and a length of 0.8 cm to 1.1 cm (average 0.9 cm). The corolla displays a purplish-pink hue, which may play a role in attracting pollinators such as bees and butterflies.

The inflorescence is a broad, branched corymbose panicle, suggesting a complex floral arrangement that maximizes reproductive efficiency. The peduncle, the stalk supporting the inflorescence, measures 0.4 cm to 0.6 cm in width (average 0.6 cm) and 0.4 cm to 0.7 cm in length (average 0.5 cm), providing structural support to the floral arrangement. The corolla measures between 5 mm and 8 mm in width (average 6.5 mm) and 3 mm to 5 mm in length (average 4 mm). The calyx, an essential protective structure for the developing floral bud, has a width of 0.3 mm to 0.6 mm (average 0.3 mm) and a length of 30 mm to 38 mm (average 34 mm), suggesting an elongated shape that may contribute to flower protection and pollination efficiency. The bract, a reduced leaf-like structure often associated with reproductive organs, measures 1 mm to 2 mm in width (average 1.5 mm) and 3 mm to 6 mm in length (average 4.5 mm). The achenes, the dry, indehiscent fruits that house the seeds, exhibit a width of 0.3 mm to 0.5 mm (average 0.4 mm) and a length of 1.5 mm to 2 mm (average 1.75 mm), indicating a potential wind or animal-mediated dispersal mechanism. Overall, this plant's morphological characteristics suggest an efficient adaptation for survival, reproduction, and environmental interaction, making it a significant subject for botanical and ecological studies.

Table 1: Taxonomical Parameters of *Laggera crispate*

S. No	Name of The Plant Part	Width	Average Width	Length	Average Length
1	Root	0.1cm -0.3cm	0.2cm	7.4-8cm	7.6cm
2	Stem	0.4cm -0.3cm	0.3cm	27-32cm	29.25cm
3	Leaf	0.3cm -0.4cm	0.3cm	3cm -4cm	2.95cm
4	Shape of leaf	Oblong lanceolate, serrated or deeply lobed margins.	-	-	-
5	Colour of leaf	Pale green	-	-	-
6	Petiole	0.1cm-0.2cm	0.1cm	1.3cm-1.6cm	1.4cm
7	Position of Flower	Terminal position	-	-	-
8	Measurement of Flower	0.4-0.6 cm	0.5 cm	0.8-0.11 cm	0.9 cm
9	Colour	Purplish-pink,	-	-	-
10	Inflorescence	Corymbose panicle, broad, branched,	-	-	-
11	Peduncle	0.4cm-0.6cm	0.6cm	0.4cm-0.7cm	0.5cm
12	Corolla	5 mm-8mm	6.5mm	3–5 mm	4 mm
13	Calyx	0.3-0.6 mm	0.3 mm	30-38 mm	34 mm
14	Bract	1–2 mm	1.5 mm	3–6 mm	4.5 mm
15	Achenes	0.3–0.5 mm	0.4 mm	1.5–2 mm	1.75 mm



4. Discussion

The present study provides a detailed morphological analysis of the plant, highlighting the structural adaptations of its vegetative and reproductive organs, which contribute to its ecological adaptability, growth efficiency, and reproductive success. The slender and fibrous root system, with a length ranging from 7.4 cm to 8 cm, suggests an adaptation to Various soil compositions, especially those with moderate moisture retention, ensuring stability and efficient water and nutrient absorption. The stem, measuring between 27 cm and 32 cm in length, provides structural support for foliage and reproductive structures while its moderate thickness (0.3 cm to 0.4 cm) ensures flexibility, allowing it to withstand environmental stresses. Additionally, the stem facilitates the transportation of nutrients and water between plant organs. The leaf morphology, characterized by an oblong-lanceolate shape with serrated or deeply lobed margins, enhances photosynthesis by increasing the Leaf surface for photon absorption and gas exchange. The pale green leaf color may reflect a specific chlorophyll composition, potentially indicating adaptation to varying light intensities, while the narrow petiole optimizes leaf orientation for efficient metabolic processes. The terminal position of the flower suggests a reproductive strategy that enhances pollination efficiency, as its exposure increases accessibility to pollinators such as bees and butterflies. The purplish-pink corolla likely plays a role in pollinator attraction, and the relatively small flower size (0.4 cm to 0.6 cm in width and 0.8 cm to 1.1 cm in length) may indicate adaptation to pollination by small insects or wind-mediated fertilization. The broad and branched corymbose panicle inflorescence structure maximizes reproductive success by allowing multiple flowers to bloom simultaneously, increasing cross-pollination opportunities. The peduncle (0.4 cm to 0.6 cm in width and 0.4 cm to 0.7 cm in length) ensures structural support for the developing flowers and fruits, reducing the risk of mechanical failure. The corolla and calyx measurements indicate a moderate floral size, influencing pollination strategies, while the elongated calyx (30 mm to 38 mm in length) serves a protective role for the floral bud and contributes to pollen retention. The bract, though small (1 mm to 2 mm in width and 3 mm to 6 mm in length), supports and protects the reproductive organs during development. The achenes, measuring 0.3 mm to 0.5 mm in width and 1.5 mm to 2 mm in length, indicate an effective seed dispersal mechanism, possibly through wind (anemochory) or animal-assisted methods (epizoochory or endozoochory), depending on their structural modifications. The presence of dry, indehiscent fruits suggests a strategy focused on maximizing seed survival and establishment in varied habitats. Overall, the observed morphological traits highlight a well-adapted plant species with efficient vegetative growth, reproductive strategies, and dispersal mechanisms. These findings contribute to a broader understanding of plant morphology and its ecological implications, offering insights relevant to taxonomic classification, conservation efforts, and potential applications in medicinal or agricultural fields. Further studies on physiological traits, genetic variability, and environmental interactions might shed further light on the plant's adaptability and ecological role.

5. Conclusion

This study provides a comprehensive taxonomic and morphological analysis of *Laggera crispata*, highlighting its structural adaptations, ecological significance, and potential applications. The species, first recorded in the Lakhola region

of South-Central Rajasthan, exhibits distinct vegetative and reproductive traits that enable its survival in semi-arid environments. The fibrous root system enhances water and nutrient absorption, the sturdy stem ensures mechanical support, and the oblong-lanceolate leaves contribute to efficient photosynthesis. The terminal inflorescence, purplish-pink corolla, and broad corymbose panicle facilitate pollinator attraction and reproductive success, while the small-sized achenes suggest effective seed dispersal mechanisms, contributing to its wide distribution.

Advantages and Correlation

This taxonomic study provides significant advantages for ecological conservation, plant taxonomy, and ethnobotanical applications. By documenting the morphological diversity of *Laggera crispata*, the study contributes to a clearer classification and differentiation within the *Laggera* genus, reducing taxonomic ambiguities. The observed correlation between morphological traits and environmental factors suggests that *Laggera crispata* has developed adaptive mechanisms to thrive in semi-arid conditions. This understanding can aid in habitat conservation strategies and sustainable utilization in medicinal and agricultural fields.

6. Future Aspects

Further research should focus on the genetic variability of *Laggera crispata* to resolve taxonomic discrepancies and examine its genetic relationships among Asteraceae members. Additionally, physiological studies examining drought resistance, secondary metabolites, and ecological investigation its evolutionary connections within the Asteraceae family its adaptive strategies. Given its reported ethnobotanical significance, pharmacological investigations could uncover potential medicinal properties, paving the way for its application in traditional and modern medicine. Conservation strategies should also be developed to protect its natural habitats and promote sustainable utilization.

This study lays the foundation for future taxonomic, ecological, and pharmacological research on *Laggera crispata*, contributing to the broader understanding of plant biodiversity, adaptation mechanisms, and its role in environmental sustainability.

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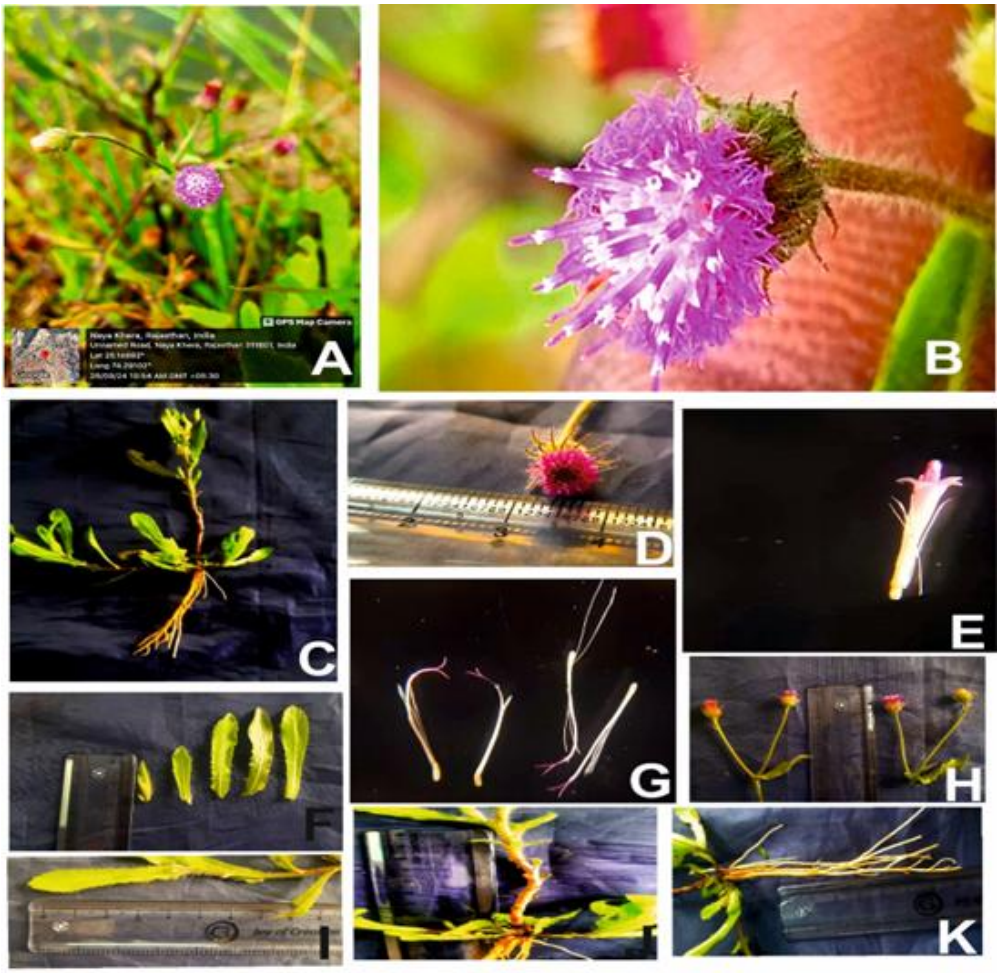

Fig.1. Taxonomical features of Laggera crispata collected from South Central region of Rajasthan
A. Natural Habitat **B.** Close view of Flower **C.** Whole plant Nature **D.** Measurement of flower
E. Ray flower of Laggera crispata **F.** Different size of Leaves **G.** Different flower part
H. Measurement of flowering twig **I.** Measurement of leaves **J.** Measurement of stem
K. Measurement of Root.

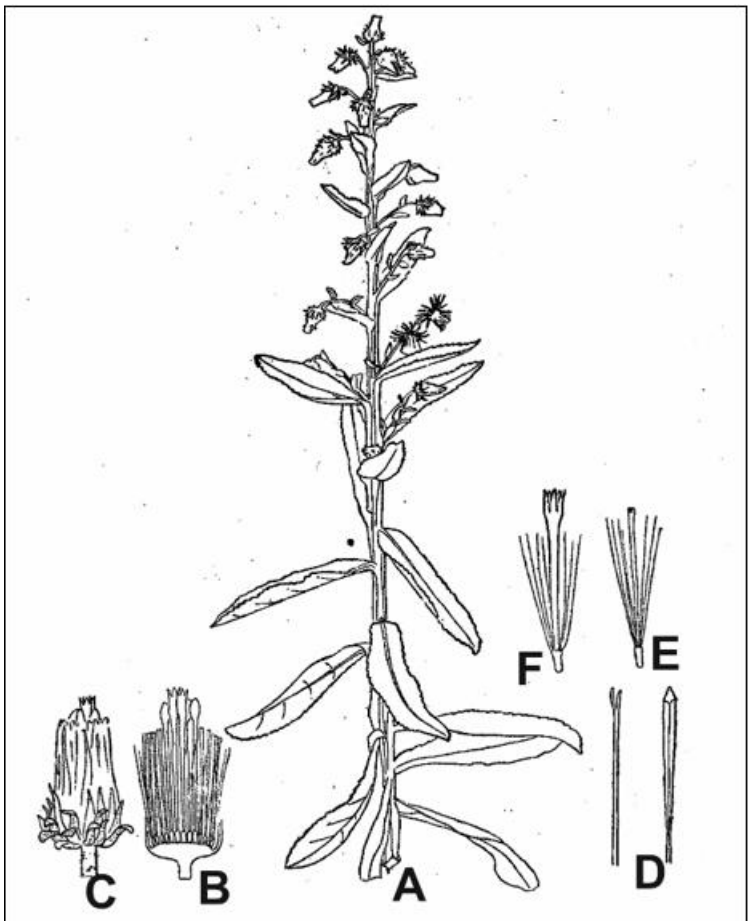

Fig. 2. Liner illustration of *Laggera crispata* **A.** Whole plant **B.** Proximal Surface of flower **C.** Distal Surface of flower **D.** Ray Flower **E.**Proximal Surface of ray flower **F.** Distal surface of ray flower