

Morphological Characteristics and Taxonomic Study of *Arnebia hispidissima* (Lehm.) A. DC.

Arya Shukla,^{ID} Vaishali Bhartiya,^{ID} Swapnil Anand,^{ID} and Deepak Kumar Gond*^{ID}

Plant Taxonomy Laboratory, CMP Degree College (A Constituent PG College of University of Allahabad), Mahatma Gandhi Marg, George Town, Prayagraj-211002, Uttar Pradesh, India

Citation: Arya Shukla, Vaishali Bhartiya, Swapnil Anand, and Deepak Kumar Gond (2026). Morphological Characteristics and Taxonomic Study of *Arnebia hispidissima* (Lehm.) A. DC. *Acta Botanica Plantae*. <https://doi.org/10.51470/ABP.2026.05.01.55>

Corresponding Author: **Deepak Kumar Gond** | E-Mail: (botanydeepakgond@gmail.com)

Received 20 December 2025 | Revised 15 January 2026 | Accepted 11 February 2026 | Available Online 10 March 2026

Copyright: This is an open access article distributed under the terms of the Creative Commons Attribution License (CC BY 4.0), which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

ABSTRACT

Arnebia hispidissima is a well-known medicinal plant widely distributed across East Asia. However, comprehensive taxonomic information on this species remains limited, largely because it occurs across diverse habitats. Morphologically, the species is characterized by a dense hispid indumentum, yellow tubular flowers, a distinctive taproot system, and heterostylous flowers.

Keywords: *Arnebia hispidissima*, descriptions, heterostyly, morphology.

Introduction

The genus *Arnebia* Forsk. includes approximately 25 species that are widely distributed across East Asia and tropical Africa [6]. *A. hispidissima* has a broad distribution range extending from Northern Africa, including Egypt, to the northern parts of India [8]. In India, the genus comprises five species, which occur mainly in the western Himalayas and the Upper Gangetic Plains [1]. Different parts of the plant possess significant medicinal value. The roots are traditionally used to treat boils, cardiac ailments, headaches, and fevers, while the flowering parts are used to treat tongue and throat disorders, as well as fevers and heart-related conditions [10]. *A. hispidissima* also exhibits antibacterial [5] and antitumor activities attributed to bioactive compounds such as naphthoquinones, triterpenoids, and pyrrolizidine alkaloids. The roots contain two important isomeric red pigments, alkannin and shikonin [9]. Alkannin is known for its anti-inflammatory, antimicrobial, and antioxidant activities [2, 3]. Additionally, it is widely used as a natural colorant in the food, cosmetic, and textile industries [7]. The roots also yield a mixture of naphthoquinones with antibiotic and anticancer properties, while the flavonoid glycoside vitexin has been isolated from the fresh flowers [4]. It is distinguished by the presence of white tubercles on the plant surface, a flat torus, an actinomorphic campanulate corolla with imbricately folded lobes, a globose inflorescence, and a four-lobed ovary.

Study Area

Allahabad district, currently known as Prayagraj, is located in southern Uttar Pradesh at 25° 28'N and 81° 50'E, and stands at the confluence of the Ganga and Yamuna rivers. The district experiences an average annual temperature of 26.1°C (79.0°F), with mean monthly temperatures ranging between 18-29°C (64-84°F). The climatic condition of the district is characterized by the rainy or monsoon, winter, and summer seasons [12].

Methodology

A comprehensive review of the literature, particularly the *Flora of Uttar Pradesh* [11], along with a thorough examination of the collected specimens, revealed that they belong to the genus *Arnebia* Forsk. A detailed taxonomic description, current citation, phenology, ecology, photographs, geographical distribution, and voucher specimen numbers for the taxon have been provided to facilitate field identification. Extensive field surveys were undertaken for specimen collection. Plant materials were collected in the field and temporarily stored in polybags for subsequent identification and taxonomic analysis in the laboratory, with reference to standard regional floras. The specimens were then processed following conventional herbarium techniques, including pressing, drying, preservation, and mounting on herbarium sheets, and were finally deposited in the Herbarium of CMP Degree College.

Description

Arnebia hispidissima (Lehm.) A. DC., Prodr. 10:94. 1846; FBI.4:176; FUGP. 2: 97; Fl. Alld. 2: 72; Kazmi, J. Arnold Arbor. 52: 489. 1971.-*Lithospermum hispidissimum* Sieber ex Lehm., Icon. Nov. Strip. 1: 23. 1821.

Plant an annual herb, prostrate, maulicauline, densely bristly, up to 20 cm long. Root deep, fusiform, purple. Leaves lanceolate, acute or subacute, up to 4 cm long, densely covered with bulbous-based, white hairs. Flowers heterostylous, in terminal, simple or forked scorpioid cymes; bracts foliaceous. Calyx lobed, free, unequal, enlarging. Corolla yellow, hypocrateriform, limb slightly zygomorphic; throat glabrous. Filaments are much shorter than the anthers and are attached below the corolla throat. Nutlets conic, brown.

Flowering & Fruiting: October-March.

Ecology: Commonly grows in sandy soil.

Distribution: INDIA: Himachal Pradesh, Jammu & Kashmir, Punjab, Rajasthan; Uttar Pradesh, Uttarakhand; AFRICA, ARABIA, IRAN, PAKISTAN.

Voucher specimen: India, Uttar Pradesh, Allahabad, Jhusi, 25.438846° N, 81.93276° E, 19 March 2026, Arya Shukla:145, 146, Department of Botany, CMP Degree College, Prayagraj.

Results

This study provides detailed taxonomic information on *A. hispidissima*, including both morphotaxonomic characteristics and field-based observations. Diagnostic features such as root coloration, leaf arrangement, the presence of hispid indumentum, and sepal and petal coloration are used for species identification. Furthermore, the species is confirmed to be distinctly heterostylous, with floral morphology adapted to facilitate cross-pollination.

Acknowledgement

The authors are thankful to the principal and Head of the Department of Botany, CMP Degree College, University of Allahabad, for providing laboratory facilities.

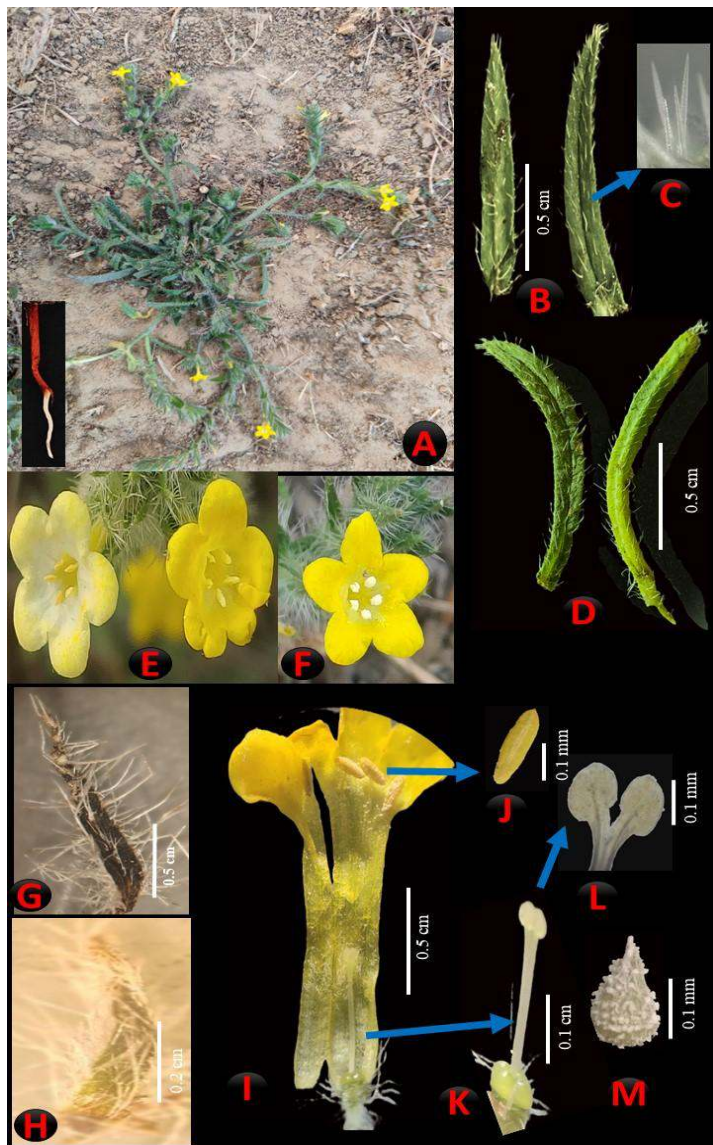


Figure 1: *Arnebia hispidissima* (Lehm.) A. DC. A. Short-Type Style Plant; B. Dorsal and ventral view of lower leaf; C. Closed view of hispid hair; D. Dorsal and ventral view of stem leaf; E-F. Closed view of flower; G. Closed view of bract; H. Closed view of sepal; I. L. S. of flower; J. Anther; K. Ovary with stigma; L. Closed view of stigma; M. Seed.

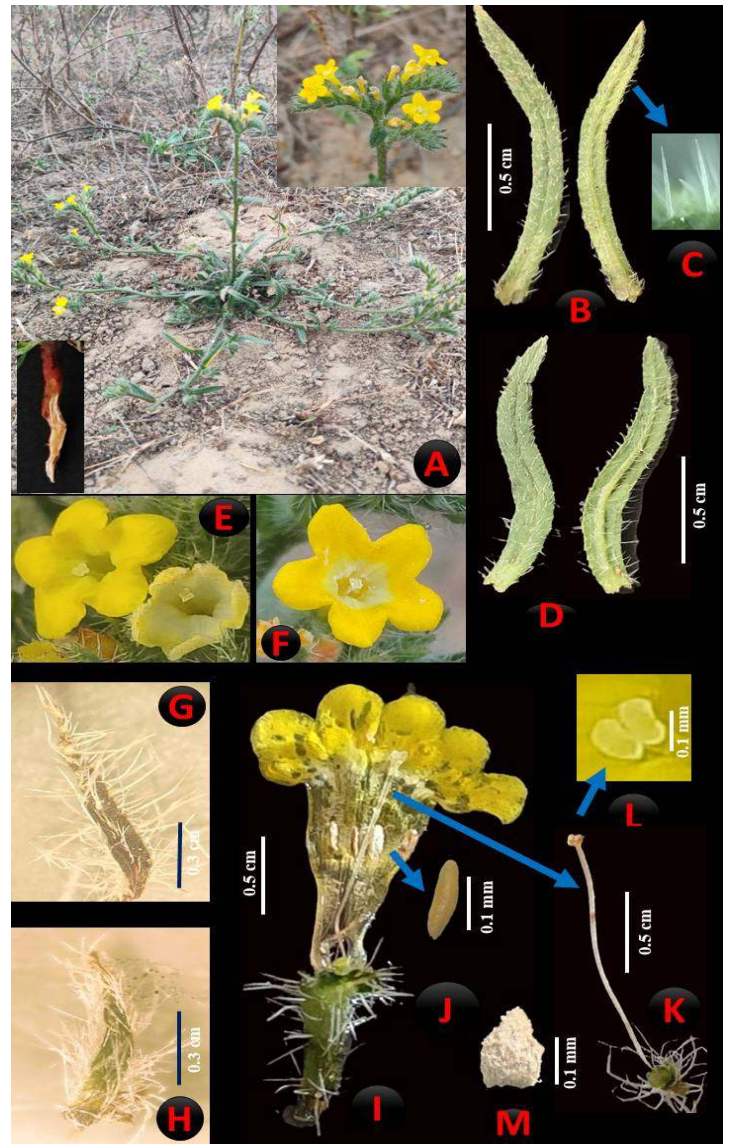


Figure 1. *Arnebia hispidissima* (Lehm.) A. DC. A. Long Type Style Plant; B. Dorsal and ventral view of lower leaf; C. Closed view of hispid hair; D. Dorsal and ventral view of stem leaf; E-F. Closed view of flower; G. Closed view of bract; H. Closed view of sepal; I. L. S. of flower; J. Anther; K. Ovary with stigma; L. Closed view of stigma; M. Seed.

References

1. Aswal, B.S. & Mehrotra, B.N. (1994). Flora of Lahul-Spiti-A Cold Desert in North- West Himalaya. Bishen Singh Mahendra Pal Singh, Dehradun.
2. Damianakos, H., Kretschmer, N., Sykłowska-Baranek, K., Pietrosiuk, A., Bauer, R., & Chinou, I. (2012). Antimicrobial and cytotoxic isohexenylnaphthazarins from *Arnebia euchroma* (Royle) Jonst.(Boraginaceae) callus and cell suspension culture. *Molecules*, 17(12), 14310-14322.
3. Ganie, S. A., Jan, A., Muzaffar, S., Zargar, B. A., Hamid, R., & Zargar, M. A. (2012). Radical scavenging and antibacterial activity of *Arnebia benthamii* methanol extract. *Asian Pacific Journal of Tropical Medicine*, 5(10), 766-772.
4. Hamdard, M. E., Badar, Y., Khan, M. S., & Shamsi, M. A. (1988). Revised phytochemical study of *Arnebia hispidissima*. *Pakistan Journal of Pharmaceutical Sciences*, 1(1), 19-20.
5. Jain, S. C., Jain, R., & Singh, B. (2003). Antimicrobial principles from *Arnebia hispidissima*. *Pharmaceutical biology*, 41(4), 231-233.
6. Mabberley, D.J. (2008). Mabberley's Plant Book: A Portable Dictionary of Plants, their classification and uses. Cambridge University Press. Cambridge, U.K.P.

7. Pal, M., & Chaudhury, A. (2010). High frequency direct plant regeneration, micropropagation, and shikonin induction in *Arnebia hispidissima*. *Journal of Crop Science and Biotechnology*, 13(1), 13-19.
8. Phondani, P. C., Bhatt, A., Elsarrag, E., & Horr, Y. A. (2016). Ethnobotanical magnitude towards sustainable utilization of wild foliage in Arabian Desert. *Journal of Traditional and Complementary Medicine* 6(3), 209-218.
9. Sharma, R. A., Singh, B., Singh, D., & Chandrawat, P. (2009). Ethnomedicinal, pharmacological properties, and chemistry of some medicinal plants of Boraginaceae in India. *Journal of Medicinal Plants Research*, 3(13), 1153-1175.
10. Shukla, Y.N., Srivastava, A., Singh, S.C., Singh, & Kumar, S.(2001). New naphthoquinones from *Arnebia hispidissima* roots. *Planta Med.*, 67, 575-577.
11. Sinha, G. P., & Shukla, A. N. (2020). Flora of Uttar Pradesh vol. II. *Botanical Survey of India*.
12. Singh, S.K., Mustak, S., Srivastava, P.K., Szabó, S.&Islam, T. (2015). Predicting spatial and decadal LULC changes through cellular automata Markov chain models using Earth observation datasets and geospatial information. *Environmental Processes*, 2, pp.61-78.