

# *Anoda cristata* (L.) Schlechter: New Addition in the Flora of Nashik District, Maharashtra, India

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## ABSTRACT

**Background:** *Anoda* genus of around 24 species distributed all over the world. *Anoda cristata* (L.) Schlechter is commonly called spurred anoda. This study led to exploring the angiospermic taxon *A. cristata* (L.) Schlechter belongs to the plant family Malvaceae in the northern Western Ghats, Maharashtra, India. Earlier, it was known exclusively from the Pune district in Maharashtra and was one of the state records.

**Methods:** This research article deals with refreshed terminology, references, brief descriptions, distribution with coordinates, phenology, and notes for a better understanding. For better understanding, we used Taxonomy, Morphology and Herbarium consultation of studied species.

**Results:** The basic literature assessment of effectively justifiable sensible composing considered extra taxa that had not been remembered for the Flora of Nashik district. Claims are made that these are novel records for the Flora of Nashik district, situated in the state of Maharashtra, India.

**Conclusion:** This exploration demonstrated the morphological characters comparability and uniqueness among the concentrated genera added *A. cristata* (L.) Schlechter is a new record of the flora of Nashik district, Maharashtra, India.

**Key-words:** *Anoda cristata* (L.) Schlechter, Flora of Nashik district, Malvaceae, Morphological characters, New addition

## INTRODUCTION

The *Anoda* genus was first published in Diss. 1: 38 (1785) [1,2]. *Anoda cristata* belongs to the plant family Malvaceae. *Anoda* genus of about 24 species distributed all over the world [3-5]. The genus *Anoda* is mainly Mexican, but it very well might be found in southern Argentina, US Bolivia, and Chile. *Anoda cristata* native to

North America [6]. *A. cristata* was introduced into some regions of Asia, Australia, and Africa [7,8]. *A. cristata* species of plant in the Jemez Mountains New Mexico (USA) [9]. This annual species is native to the southwestern United States, Central and South America [8]. The *Anoda* genus was first published in Diss. 1: 38 (1785) [2]. *A. cristata* belongs to the plant family Malvaceae [4,10].

Prior it was known only from the Pune region and it shapes another record for the state, subsequently the current assortment reports new locality for the species [10]. This research article documented taxonomic exploration of *A. cristata* exotic species new additions to the flora of the Nashik district. It is a weed of rural fields, developing most frequently along the edges of *Glycine*

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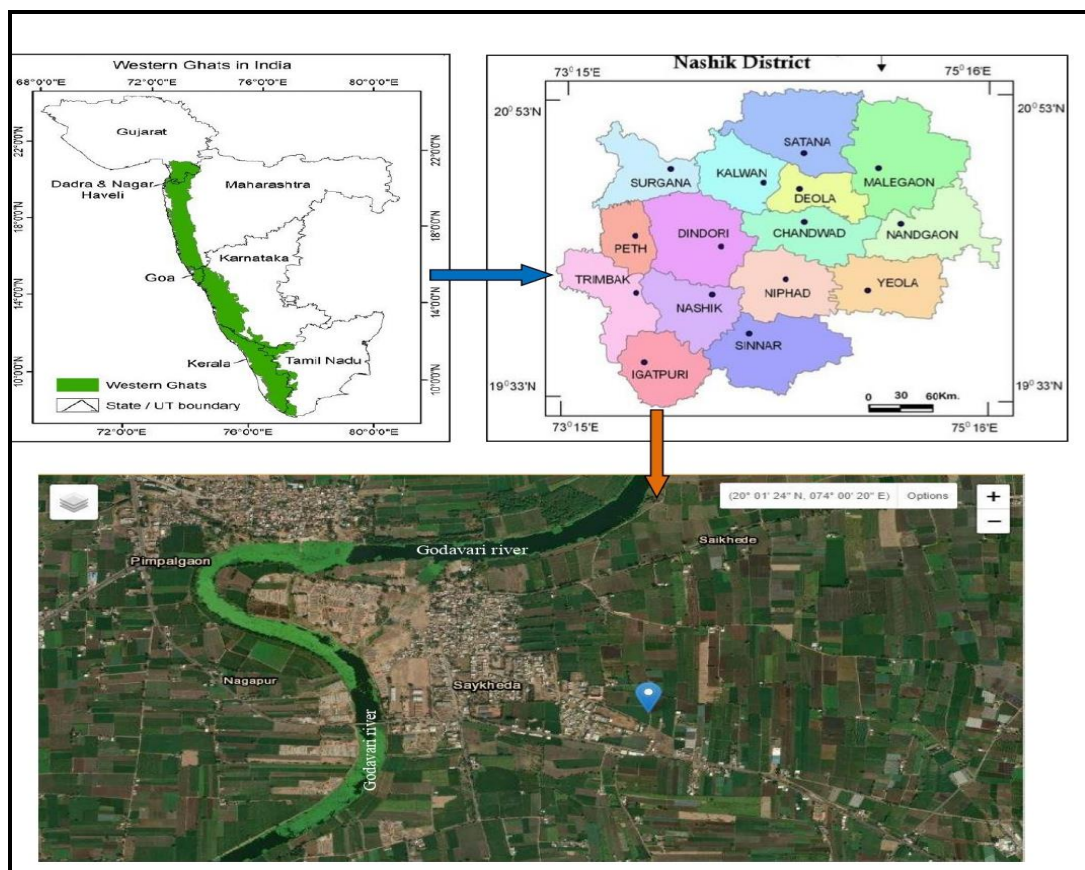
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*max* (L.) Merr. (soybean) fields <sup>[11,12]</sup>. Floristic research keeps updating records and fills distribution gaps for angiosperm plant species within the northern Western Ghats of the Nashik district. In some regions of Mexico *A. cristata* (alaches) is cultivated as a crop weed <sup>[12]</sup>. Flowers of *A. cristata* have been utilized to deliver a beverage to treat stomach illnesses, fevers, and coughs <sup>[13]</sup>. This research aimed to add *A. cristata* as a new record to the Flora of Nashik district.

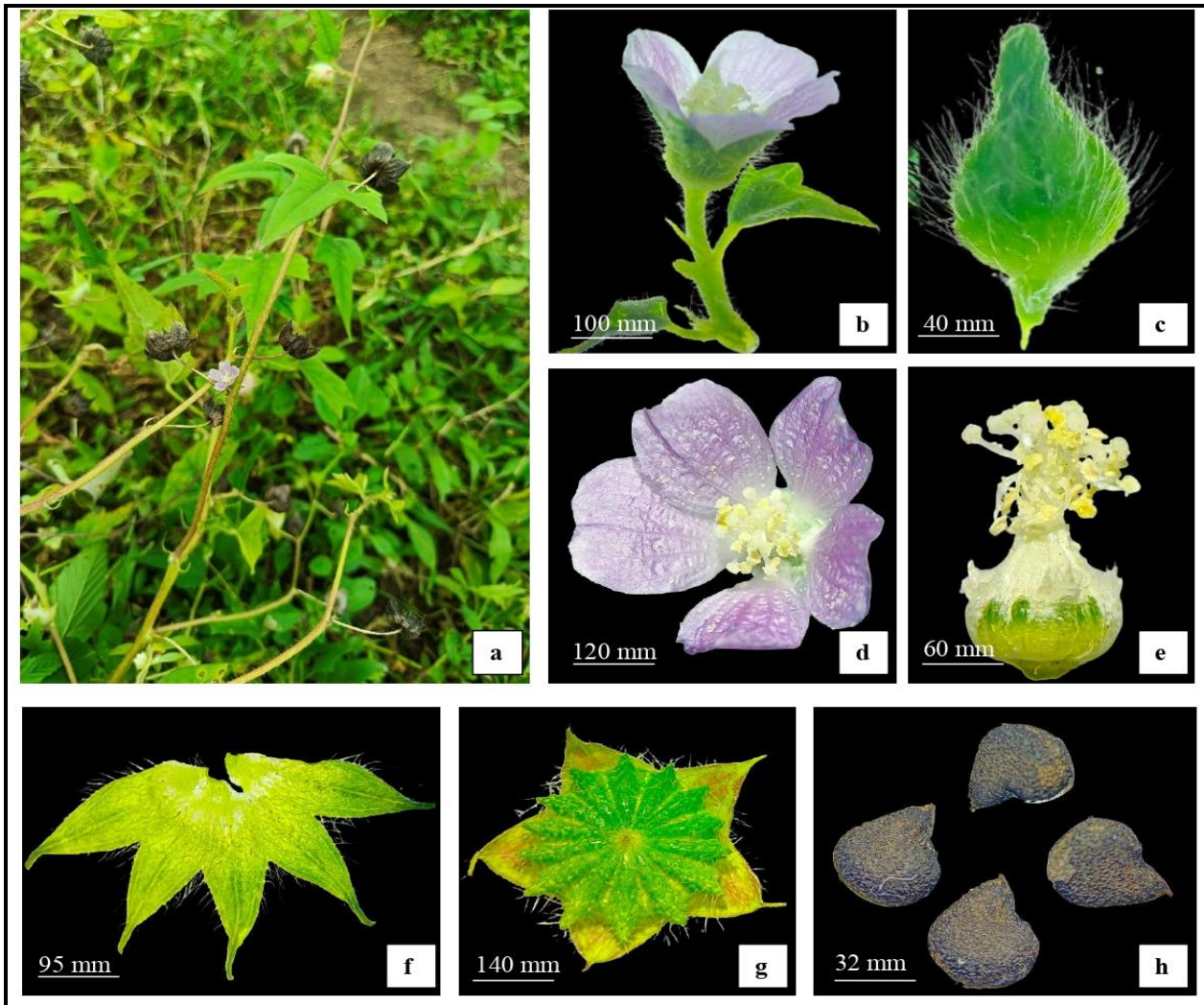
## MATERIALS AND METHODS

**Study area-** The *A. cristata* species was a new locality recorded during floral exploration in the Saikheda village, Niphad tehsil of Nashik district (Maharashtra), India (N20.011655, E74.015829 GPS location recorded) 564.84 m. elevation from sea level (Fig. 1). The studied site was explored during the years 2022-2024. The studied living plant specimen recorded its livingness during the monsoon seasons of the year. *A. cristata* specimen identification by using Flora of the Presidency of Bombay and Flora of Maharashtra <sup>[6]</sup>.

**Taxonomy & Morphology-** *A. cristata* (L.) Schltld. Linnaea11(2): 210 1837 *Sida cristata* L. Sp. Pl. 2: 685. 1753. *A. cristata* (L.) Schlechter Erect or decumbent, annual or perennial herbs, the stems usually hispid, the hairs spreading or retrorse. Leaves variable, ovate, hastate, or palmately lobed, crenate to subentire, acute, sparsely pubescent above and beneath, the hairs principally simple and appressed, often with a purple blotch along the midrib, sometimes also on the margins, the petioles hispid. Flowers solitary in the leaf axils with long peduncles; calyces 5-10 mm long in flower, accrescent to 12-20 mm long in fruit, hispid; petals lavender or purple, rarely white or white with purple veins, 8-26 (-30) mm long; androecia included, the columns pubescent. Fruits in the form of a flattened disk, 8-11 mm in diameter (excluding the spines), densely hispid; mericarps (8-)10-19, indehiscent, with radiating spines, 1.5-4 mm long on the dorsal angle, the lateral walls evanescent; seeds glabrous, 3 mm long, usually naked or sometimes with an endocarp surrounding the seed (or sometimes with only a coarse reticulum persisting) <sup>[6,7,14]</sup> (Fig. 2).



**Fig. 1:** Map showing *Anoda cristata* (L.) Schlechter collected from Saikheda village, Nashik



**Fig. 2:** *Anoda cristata* (L.) Schlechter: a- habit | b- flowering twig | c- flower bud | d- flower | e- androecium and gynoecium | f- calyx | g- Fruit | h- seeds. © B. S. Kale

**Herbarium consultation-** Specimens in herbaria accession no. K001259146, K001259094, K000543640, K000543641, K000528397 etc. were studied to obtain information about geographic localities, patterns of morphological variation, taxonomical data, and ethnobotanical data. Species published in species plantrum [7,4].

## RESULTS

*A. cristata* of the Malvaceae family plant species studied between 2022 and 2024 uncover captivating plant taxa that are dispersed around the world. Using Flora of the Presidency of Bombay, Flora of British India, Flora of Maharashtra, Flora of Nashik district, and deposited Herbarium Catalogue specimen, the plant was precisely identified [14,15]. The basic literature assessment of effectively justifiable sensible composing considered extra taxa that had not been remembered for the Flora

of Nashik district. Claims are made that these are novel records for the Flora of Nashik district, situated in the state of Maharashtra, India. A review of the literature indicates that this species was recorded exclusively in the Pune district only of Maharashtra state [10]. Earlier there was no distribution record of Flora of Nashik district. This is the second timely report of the examined plant taxonomy from the state of Maharashtra and the first identification of the species in the Flora of Nashik district. To simplify identification, a comprehensive description is given in Fig. 2. The identification of *A.cristata* was accomplished by the consultation of several deposited Herbarium Catalogue specimens, namely No. K001259146, K001259094, K000543640, K000543641, K000528397, from the Botanical Survey of India and Royal Botanical Garden KEW. The botanical database was collected from the Western Ghats region of India [7].

**Family:** Malvaceae

**Synonym:** *Sida cristata* L. *Anoda lavatrioides* Medik. *A. triangularis* (Willd.) DC. and *Sida cristata* L. [6].

**Description-** Erect or decumbent, annual or perennial herbs, the stems usually hispid, the hairs spreading or retrorse. Leaves variable, ovate, hastate, or palmately lobed, crenate to subentire, acute, sparsely pubescent above and beneath, the hairs principally simple and appressed, often with a purple blotch along the midrib, sometimes also on the margins, the petioles hispid. Flowers solitary in the leaf axils with long peduncles; calyces 5-10 mm long in flower, accrescent to 12-20 mm long in fruit, hispid; petals lavender or purple, rarely white or white with purple veins, 8-26(-30) mm long; androecia included, the columns pubescent. Fruits in the form of a flattened disk, 8-11 mm in diameter (excluding the spines), densely hispid; mericarps (8-)10-19, indehiscent, with radiating spines, 1.5-4 mm long on the dorsal angle, the lateral walls evanescent; seeds glabrous, 3 mm long, usually naked or sometimes with an endocarp surrounding the seed (or sometimes with only a coarse reticulum persisting) [1,7,10] (Fig. 2).

**Common names:** Violettasica, Amerspurred anoda, and crested anoda.

**Flowering and fruiting:** Jul.–Oct.

**Distribution:** North and South America Africa, Asia, and Australia.

**Distribution in Maharashtra:** Primarily reported in Pune district of the Maharashtra state.

**Ecology:** The studied plant taxa are grown along some crop species majorly *Glycine max* (L.) Merr. (Soybean).

## DISCUSSION

*A. cristata* is commonly called spurred anoda, Violettasica, Amerspurred anoda, and crested anoda [5]. The *A. cristata* is native to the American continent [6]. It was introduced as a weed in some regions of Asia, Australia, and Africa [7,8,16]. *A. cristata* recently recorded vascular plant taxa that were collected from Egypt [11]. *A. cristata* additions to the flora of West Virginia [17]. *A. cristata* additional species for the Jemez Mountains, New Mexico, U.S.A. [9]. After taxonomic investigation of the wild types of Malvaceae and examination with the writing managing the vegetation of Egypt, there were new wild species considered as additions to Malvaceae

*A. cristata* (L.) Schltld. [18]. The studied species was reported for Flora of Egypt [11]. *A. cristata* is a typical weed utilized as Ethnobotany for food and medication in Mexico [13]. *A. cristata* was introduced into some regions of Asia, Australia, the southwestern United States, Central and South America [7-9].

For identification classification and description, we consulted different kinds of literature such as floras, research notes, and Herbarium [12,15]. In Maharashtra, there was no distributional record before the year 2013 [14,15]. Earlier, it was known exclusively from the Pune district in Maharashtra and was one of the first state records [10]. After that, there were no more distribution records of the *A. cristata*. Our research team investigated the Nashik district, particularly the northern Western Ghats biodiversity area. We gathered studied species, inspected them utilizing logical techniques, and inferred that this is another appropriation record for the Flora of Nashik district. Floristic research keeps updating records and fills distribution gaps for angiosperm plant species within the northern Western Ghats of the Nashik district. The *A. cristata* species was a new locality recorded during floral exploration in the Saikheda village, Niphad tehsil of Nashik district (Maharashtra), India.

## CONCLUSIONS

Earlier, it was known exclusively from the Pune district in Maharashtra and was one of the state records. After that, there were no more distribution records of the studied species. Our research team explored the Nashik district, especially the northern Western Ghats biodiversity region. We collected studied specimens, examined them using scientific methods, and concluded that this is a new distribution record for the Flora of Nashik district. The continuous taxonomic study on considering morphological characters uncovered that *A. cristata* (L.) Schlechter is one more new record to the vegetation of flora of Nashik district, Maharashtra, India, and scattered as a weed in *Glycine max* (L.) Merr. (Soybean).

## CONTRIBUTION OF AUTHORS

**Research concept-** Balasaheb Shantilal Kale

**Research design-** Balasaheb Shantilal Kale

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**Data collection-** Balasaheb Shantilal Kale

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## REFERENCES

- [1] Marquise Gates BS. The family Malvaceae (Sensus stricto) in Texas. 2022; 1.
- [2] KEW RBG. *Anoda* Cav. Royal Botanical Garden, KEW, 2024.
- [3] Kubitzki K, Bayer C. The Families and Genera of Vascular Plants. V. Flowering Plants - Dicotyledons - Malvales, Capparales, and Non- Betalain Caryophyllales.; 2003.
- [4] Garad KU, Gore RD, Gaikwad SP. Noteworthy flowering plants of Solapur district of Maharashtra , India. Phytodiversity, 2015; 2(1):13-21.
- [5] WFO. The World Flora Online- *Anoda* Cav. Published on the Internet. Published 2024. <http://www.worldfloraonline.org/taxon/wfo-4000002245>. Accessed.
- [6] GO BOTANY NPT. *Anoda cristata*— crested anoda. Discover thousands of New England plants Home.
- [7] KEW RBG. *Anoda cristata* (L.) Schldl. RBG, KEW.
- [8] Weakley AS. Flora of the Southern and Mid- Atlantic States.; 2012. [http://www.herbarium.unc.edu/FloraArchives/WeakleyFlora\\_2015-05-29.pdf](http://www.herbarium.unc.edu/FloraArchives/WeakleyFlora_2015-05-29.pdf).
- [9] Keller CF, Martin CT, Foxx TS, Greiner NR. Additional species for the Jemez mountains, new Mexico, U.S.A. J Bot Res Inst Texas, 2017; 11(2): 513-22.
- [10] Rahangdale SS, Rahangdale SR. *Anoda cristata* (L.) Schldl. (Malvaceae): a new record for Maharashtra. Indian For., 2013; 139(9): 853-54.
- [11] Shams E, Hosni H, Hosny A, Rabei S, Elgamal I. Contribution to the Flora of Egypt: A critical inventory of newly recorded vascular taxa of Egypt. Sci J Damietta Fac Sci., 2023; 13(3): 111-49. doi: 10.21608/sjdfs.2023.247544.1141.
- [12] Lira R, Casas A, Blancas J. Ethnobotany of Mexico.; 2016. [https://link.springer.com/chapter/10.1007/978-1-4614-6669-7\\_7%0Ahttp://link.springer.com/10.1007/978-1-4614-6669-7\\_7%0Ahttp://link.springer.com/10.1007/978-1-4614-6669-7](https://link.springer.com/chapter/10.1007/978-1-4614-6669-7_7%0Ahttp://link.springer.com/10.1007/978-1-4614-6669-7_7%0Ahttp://link.springer.com/10.1007/978-1-4614-6669-7).
- [13] Rendón B, Robert B, Núñez-Farfán J. Ethnobotany of *Anoda cristata* (L.) Schl. (Malvaceae) in Central Mexico: Uses, management and population differentiation in the community of Santiago Mamalhuazuca, Ozumba, State of Mexico. Econ Bot., 2001; 55(4): 545-54. doi: 10.1007/BF02871717.
- [14] Singh NP, Lakshminarasimhan P, Karthikeyan S, Prasanna P V. Flora of Maharashtra State, Dicotyledons. Flora India Ser., 2000; 1(1): 1-871.
- [15] Singh NP, Lakshminarasimhan P, Karthikeyan S, Prasanna P V. Flora of Maharashtra State: Dicotyledones. Flora India Ser 2. 2001; 2(1): 1-1096. Available at: <https://books.google.co.in/books?id=76G3mgEACAAJ>.
- [16] Thomas WE, Maxwell RH. Distribution records of southern Indiana vascular plants III. Proc Indiana Acad Sci., 2009; 118(1): 31-38.
- [17] Brant AE, SIDA. Additions to the flora of west Virginia. J Adel Bot Gard., 1997; 12(2): 425-28.
- [18] MOHAMED AMA. A floristic study of Malvaceae in Egypt. Published online 2022.

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