Copyright copy

Andrographis saxalitis a woody new species from Eastern Ghats of Andhra Pradesh, India

*Raja Kullayiswamy K[1] and Sarojini Devi N[2]

1,2 - Centre of Excellence and climate change lab, Dharmavana Nature Ark, Cherlapalli-500 051

*rajakswamy@DharmavanaNatureArk.org

Abstract:

Andrographis saxatilis has been described from rocky plateaus of Owk dam area, Andhra Pradesh. It resembles *A. beddomei* but it differs in many morphological characters.

Key words:

Andrographis, woody stem, rocky crevices, Eastern Ghats, Andhra Pradesh

Introduction:

Andrographis Wall ex Nees is a tropical Asian genus (Mabberley, 2008) by 58 taxa and 44 species (POWO, 2023), and 29 taxa in India (Karthikeyan et al., 2009, Gnanasekaran et al., 2016), especially Peninsular India, of which 23 are endemic (Gnanasekaran & Murthy, 2012; Gnanasekaran et al., 2015). *Andrographis* is well known by *A. paniculata* which is one of the most popular in Ayurvedha medicine by its properties of anticancer, antimicrobial, antifungal, antihelmenthic etc. (Okhuarobo et al 2014). *Andrographi serpilifolia* (Venkata et al 2021), *A. liniata* (Bhat and Hoskatte 2023) are also resembles *A. paniculata* in medicinal properties. *Andrographis* species are mostly herbaceous and annuals but some are perennial by stout stem or/and root (*Andrographis beddomei* and present new species). Very less study has been done on this genus, so knowing more about this group of species in evolution point of view is very significant.

While doing filed survey under Peninsular India project, Authors have collected an interesting species of *Andrographis* herb between red lime stone with stout stem in scrub forest near Owk dam area. On critical studies it was clearly showed differences with known species of the genus. So, it is described here with colour photographs, comparative characters with allied species for easy identification.

Material and methods:

Collected specimens were treated with 70% Ethanol, and made herbarium specimens following standered methods (Santapau 1958, Jain and Rao 1977). Flowers and anthers were fixed in

Copyright copy

70% Ethanol for future reference. Morphological and microscopic characters were studied under Olympus SZ61 with Magnus (Magcam DC 5) camera attached.

Taxonomic treatment:

Andrographis saxatilis Raja Kullayisw. & Sarojin. sp. nov. Fig. 1 & 2.

Diagnosis: *Andrographis saxatilis* is resembles *A. beddomei* by its stout root, obovate leaves, glandular calyx, pubescent corolla and seed colour and shape, but it can be distinguished from later one by its growing patern, smaller leaves, larger raceme than leaves, cylindrical stem, glaucous green stem and leaves, smaller pedicel, nonglandular hairs on fruit and some more which are tabulated in table 1.

Type: India, Andhra Pradesh, Nandhyala dist., Owk mandal, Owk dam area, rocky plateaus 15.227718N, 78.082321E, at 282 m MSL, dt. 3 Jan 2023, *RKS* DNA001 (holotype BSID; isotypes MH, SKU, HDNA).

Description:

Perrenial woody herb, up to 40 cm, stem stout, bark grey, fissured vertically. Branches many basally angular, hispid hairy, terete towards apices, pubescent, glaucous green, corcky, 2 – 3 mm in diameter. Leaves opposite decussately arranged, obovate, elliptic-oblanceolate, spathulate, 8 – 25 × 5 – 11 mm, pubescent, glaucous green, slight coriaceous, leaf base tapering into petiole, margin entire, apex rounded, mid vein prominent below, lateral veins 3 pairs, inconspicuous; petiole to 5 mm long, pubescent. Inflorescence a raceme, axillary, to 5.5 cm long raceme axis, pubescent, terete, unbranched, 3 – 8 flowered (empty bracts 4 – 5 towards base of raceme). Bracts spathulate at base of raceme, 4 × 2 mm, pubescent which structurally resembles apical leaves; fertile bracts linear-lanceolate from the middle of raceme with well-developed flowers, 1.5 mm long, pubescent; bracteoles as similar as bracts. Flowers 1.3 – 1.4 cm long, calyx green, pubescent and corolla white. Pedicel 2 mm long, pubescent. Calyx tube 1 – 1.5 mm long; sepals ovate linear-lanceolate, acuminate at apex, glabrous within, pubescent, tipped gland hairy without. Corolla tube 5 mm long, sparsely pubescent and glandular hairy outside and densely villous inside, nonglandular hairy; lower lobe boat shaped, 6 × 2 mm, curved back; upper 3 lobes ligulate, maroon red dotted, 9 × 8 mm, connate half of its length; lobes ovate, rounded apex, hirsute at junction of middle lobe. Stamens 2, adnate to base of ventricose portion of corolla tube, filaments 12 – 13 mm long, white, sparsely villous; anthers linear to oblong, maroon red, 1 – 1.6 × 1 mm, woolly at base. Ovary ovoid-oblongoid, 1.5 – 2 × 1 mm, bristled hairy, receptacle swollen, white, 1.5 mm across. Style 13 – 14

mm, antrorsely bristled hairy; stigma linear, curved, maroon red. Capsules linear-oblong to very narrowly ellipsoid, acute at ends, 15 – 17 × 3 – 4 mm, sparsely villous, 4 – 8-seeded. Seeds yellowish, sub-qudrate, 2.5 – 3 × 1.5 mm, oblique at base, obtuse at apex, hard, scrobiculate, verrucose.

Habitat: Rocky crevasses of scrub forest at an altitude 270 – 290 m.

Distribution: Known only from Owk rocky plateaus, near Owk reservoir, about 8 sq. km area.

Conservation status:

Population size of this species is 458 individuals per 8 sq. km radios. It is not been found in complete study rocky plateaus which spreads around 279 sq. km. The species has been categorised under data deficiency (DD) as there was insufficient information about its occurrence and distribution in India. It is evaluated here as 'Vulnerable' [VU Bab(iii)+2ab(iii)] using the IUCN Red List Categories and Criteria version 15.1 (IUCN 2022). Main threats observed were grazing and forest fire. Fire damages areal parts like branches along with flowers and fruits mostly when these plants associate with *Heteropogon* and other grass. We also observed that seed setting is very less, it might be lack of pollinator or sexual incompatibility. About 500 fruits were collected in three periodical field visits, among them 8 fruits were with fully developed seeds (8 seeds per capsule), about 10 fruits with 1 – 2 developed seeds and rest were abortive. Potted plant at DNA nursery has empty fruits without seed development, it is because lack of cross pollination.

Table 1: Comparative table of closely related species:

Character	***Andrographis saxatilis* sp. nov.**	***A. beddomei***	***A. paniculata***
Habit	Rocky crevices	Hard gravelly soil	Gravelly and loose soil
Root	Woody, stout	Tuberous woody. stout	Normal tap root
Stem	Woody and stout	Herbaceous	Herbaceous
Branches	Erect, rarely decumbent, basally 4-angular at base only	Decumbent to prostate, 4-angular from base to tip	Erect, 4-angular from base to tip
Leaves	Obovate, elliptic-oblong, rounded apex	Obovate to narrowly oblanceolate, elliptic, rounded apex	Elleptic-oblong, acuminate apex

Copyright copy

Inflorescence	Axillary, larger than the leaves, unbranched	Axillary and terminal, shorter than the leaves, unbranched	Axillary and terminal, larger than the leaves, branches
Flowers	3 – 8 flowers, glandular hairy on sepals, outside of corolla tube	2 – 3 flowers, glandular hairy on sepals, out and inner side of corolla tube	8 – 15 flowers, glandular hairy on sepals, outside of corolla tube
Pedicels	1 – 2 mm long	4 – 15 mm long	8 – 17 mm long
Fruit	Non glandular hairy	Glandular hairy	Glandular hairy

Acknowledgements:

Authors are grateful to DNA for facilities and making periodical field visits for gathering more data on the species distribution and population size, and thanks to the jungle team of DNA for supporting.

Legends:

Figure 1. Andrographis saxatilis sp. nov. A. habita, B. habit in full sun, C. habit under rock shade, D. stout stem, E. twig, F. flower side view, G. flower front view, H. mature fruit, I. seed arrangement in a fruit, J – N: under microscope: J. fresh fruit, K. a complete flower, L. calyx with ovary, M. seeds, N. style and stigma.

Figure 1

Copyright copy

References:

Bhat, M. & Hoskatte, N. M. (2023). Cytotoxic Activity of Andrographis lineata Wall. ex Nees: An In Vitro study. Indian Journal of Pharmaceutical Sciences. 85(1): 261–266. DOI: 10.36468/pharmaceutical-sciences.1090.

Gnanasekaran, G., Karuppusamy, S. & Murthy, G. V. S. (2016). *Andrographis megamalayana* (Andrographinae: Acanthaceae), a new species from the southern Western Ghats, India. Phytotaxa. 244 (1): 089–095. http://dx.doi.org/10.11646/phytotaxa.244.1.7.

Gnanasekaran, G., Raja kullayiswamy, K. & Murthy, G. V. S. (2015). *Andrographis nallamalayana*, a heterotypic synonym of a little-known endemic species *A. beddomei* (Acanthaceae). Rheedea. 25(1): 47–53.

Gnanasekaran, G. & Murthy, G. V. S. (2012). Lectotypifications in *Andrographis*. Rheedea. 22(2): 77–79.

IUCN Standards and Petitions Committee. (2022). Guidelines for Using the IUCN Red List Categories and Criteria. Version 15.1. Prepared by the Standards and Petitions Committee. Downloadable from https://www.iucnredlist.org/documents/RedListGuidelines.pdf.

Jain, S. K. & Rao, R. R. (1977). A hand book of field and herbarium methods. Scholarly publication, New Delhi.

Karthikeyan, S., Sanjappa, M. & Moorthy, S. (2009). Flowering Plants of India – Dicotyledons. Volume I. Acanthaceae–Avicenniaceae. Botanical Survey of India, Kolkata. pp. 1–4.

Mabberley, D. J. (2008). Mabberley's Plant-Book: A portable dictionary of plants, their classification and uses. Third Edition. Cambridge University Press, Cambridge.

Okhuarobo, A., Joyce, E. F., Erharuyi, O., Imieje, V., Falodun, A. & Langer, P. (2014). Harnessing the medicinal properties of *Andrographis paniculata* for diseases and beyond: a review of its phytochemistry and pharmacology. Asian Pacific Journal of Tropical Disease 4(3): 213–222. https://doi.org/10.1016/S2222-1808(14)60509-0.

POWO (2023). Plants of the World Online. Facilitated by the Royal Botanic Gardens, Kew. Published on the Internet; http://www.plantsoftheworldonline.org/. Retrieved 18 March 2023.

Santapau, H. (1958). Botanical collectioris manual. – Botanical Survey of India, Calcutta.

Copyright copy

Venkata S. K., Susmila Aparna, G., Peddana, K., Rajesekhar, A., Apparao, Ch. & Sai Gopal, D. V. R. (2021). Bio-inspired multifunctional zinc oxide nanoparticles by leaf extract of *Andrographis serpilifolia* and their enhanced antioxidant, antimicrobial, and antidiabetic activity—a 3-in-1 system. Particulate Science and Technology. 40 (4): 185–499.