

# THE STATUS OF *NARDIA ASSAMICA* (MITT.) AMAK.\*

RAM UDAR AND ADARSH KUMAR

Department of Botany, University of Lucknow, Lucknow

## ABSTRACT

The confused taxonomy with respect to *Nardia assamica* (Mitt.) Amak. and *N. sieboldii* (S. Lac.) St. has been considered and both taxa have been assigned independent status. *N. assamica* is being described with some new details and variations including stem anatomy, leaf, oil-bodies, underleaf, male and female bracts and bracteoles. *N. assamica* is endemic to India and, in the present state of our knowledge, is confined to Meghalaya.

## INTRODUCTION

*Nardia* Gray, a rare and most specialised genus of the Jungermanniaceae, is represented in India only by two species: *N. assamica* (Mitt.) Amak. (AMAKAWA, 1963; INOUE, 1971; VÁNA, 1972a) and *N. flagelliformis* Inoue (INOUE, 1971). However, CHOPRA (1938) reported *Alicularia scalaris* (Schrad.) Corda [now *Nardia scalaris* (Schrad.) Gray] from Darjeeling (on specimens stated by him to be located in Panjab University Herbarium, Lahore) which seems to be a doubtful report because repeated efforts at collection in this area have not yielded this taxon. It is not possible to clearly establish its occurrence in India in view of the fact that the specimens on which this report is based are not available for study.

MITTEN (1861) instituted *Jungermannia assamica* Mitt. on the basis of collections made by William Griffith and provided only a very short description from which the diagnostic features of the plant cannot be obtained. Later STEPHANI (1901) erroneously merged this species under *Jungermannia polyrhiza* Hook. but the description and illustration of the latter species given by him (see also Icones on page no. 2242) do not agree with the circumscription of the former species. For over six decades *J. assamica* apparently did not receive any attention. AMAKAWA (1963), who investigated the Type Specimens, gave some details of the plant, maintaining the original status of *Nardia assamica*, and referred it to be endemic to the Himalayas. He, however, remarked that the Type Specimens were in poor condition and so the description given by him does not reveal the complete details. Subsequently, GROLLE (1966) described this species on the basis of the specimens collected by J. POELT from Nepal, but VÁNA (1972a) observed that these plants were not *N. assamica* but a new species which he named *N. poeltii* VÁNA. VÁNA (1972a) investigated the Type Specimens of *N. assamica* obtained from NY and BM but did not give full details. In this study he treated *N. sieboldii* as a synonym under *N. assamica* thus assigning it a range of distribution in China (VÁNA, 1972), Korea and Japan (AMAKAWA, 1959). He emphasised the similarity in the perianth structure between the two in arriving at this conclusion. It would thus appear that *N. assamica* has never been investigated for its complete details and reference to only more

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or less deteriorated Type Specimens has resulted in its confused understanding. However, from an examination of authentic specimens of *N. sieboldii*, received from AMAKAWA, it can be stated that this species is sufficiently distinct from *N. assamica*. Thus, *N. assamica* is endemic to India—a conclusion now based on a study of this species from recent collections made from the type locality *sensu lato*. It is interesting that this species is most common in various localities of Meghalaya.

The genus *Nardia* is characterized by prostrate to ascending plants usually forming mats or patches and mostly with intercalary branching. The leaves are succubous, entire to bilobed (sometimes with retuse apex), orbicular to reniform or ovate, concave and subtransversely to obliquely inserted. The underleaves are distinct, lanceolate to sublinear to triangular. The oil-bodies are 1-4(6) per cell (sometimes wanting in few cells). The plants are dioecious or paroecious, the male inflorescence being terminal or intercalary. The male bracts are more or less similar to the vegetative leaves, ventricose and with (1) 2-3 antheridia with biseriate stalk per bract. The female inflorescence is terminal with bracts and bracteoles more or less similar to vegetative leaves but often shallowly bilobed. The perianth is short, exerted or hidden within bracts and bracteoles and situated at the tip of a prominent, fleshy, stem perigynium. The calyptra is formed (except at the tip) from the elaboration of shoot apex. The capsule wall is bistratose. The elaters are with (1)-2(-3) spirals. Asexual reproduction is absent : (see AMAKAWA, 1959 and SCHUSTER, 1969).

#### TAXONOMIC DESCRIPTION

***Nardia assamica*** (Mitt.) Amak., J. Hattori bot. Lab. **26** : 23, 1963. (Text-figs. 1-26).  
=*Jungermannia assamica* Mitt., Jour. Proc. Linn. Soc. London. **5** : 91, 1861. *Nardia sieboldii* (S. Lac.) St. in Udar et Singh, J. Indian Bot. Soc. Suppl. **58** : 31, 1979.

Plants up to 5-15 (-20) mm long, yellowish brown, in mats. Stem prostrate, flexuous, spherical or elliptical in cross section, 162-297  $\mu\text{m}$  in diam. ; cortex 1-2(-3) cells thick, cells small, thick-walled, 7-16 (24)  $\times$  14-22  $\mu\text{m}$ , medullary cells thin-walled, comparatively larger, 11-27  $\times$  14-27  $\mu\text{m}$ ; branches few, intercalary (arising from ventral half of leaf axil). Leaves contiguous, succubous, obliquely inserted with wide base, concave, dorsally decurrent, reniform, dorsally appressed, broader than long, (176) 308-528  $\mu\text{m}$  long, (330) 484-748  $\mu\text{m}$  broad, apex entire (retuse or emarginate near female inflorescence); marginal cells 11-27  $\times$  11-24  $\mu\text{m}$ , walls slightly thick with prominent trigones; middle and basal cells 19-50  $\times$  16-42  $\mu\text{m}$ , walls thin with small or without trigones; cuticle smooth to verrucose. Oil-bodies 1-2 in each cell of the leaf, occasionally lacking in few cells; oval, elliptical to spindle shaped when single, 14-24 (30)  $\times$  8-14  $\mu\text{m}$ ; spherical when two, 8-14  $\mu\text{m}$  in diam. in most of the middle and basal cells of leaf; granules small and faint. Underleaves triangular, 160-300  $\mu\text{m}$  long, 110-260  $\mu\text{m}$  broad in maximum width, spreading away from the stem, connate either with one side or with both the sides of leaves, apex obtuse to subacute; margin lobed and recurved; marginal cells 11-22  $\times$  7-22  $\mu\text{m}$ ; middle cells 15-33  $\times$  18-23  $\mu\text{m}$ ; cell walls thin; trigones present, acute to slightly bulging; cuticle smooth to verrucose; mucilage papillae usually on each marginal lobe. Rhizoids numerous, long, colourless, usually restricted to the base of underleaves. Dioecious. Male inflorescence intercalary, rarely terminal; bracts up to (5) 12-18 or more pairs, contiguous, ventricose, 300-380  $\mu\text{m}$  long, 360-460  $\mu\text{m}$  broad, enclosing (1)-2 antheridia in the axil; antheridial body globose, ca 140  $\mu\text{m}$  in diam. with 40-60  $\mu\text{m}$  long, biseriate stalk; bracteole ovate to tri-

angular. Female inflorescence terminal. Female bracts larger than leaves, reniform, broader than long, 484-792  $\mu\text{m}$  long, 728-1188  $\mu\text{m}$  broad, concave, margin retuse or emarginate at apex, undulate, not decurrent; bracteole large, 550-730  $\mu\text{m}$  long, 435-585  $\mu\text{m}$  broad. Perianth 0.9-1.1 mm long, 0.5-0.7 mm wide, oblong, fusiform, exerted 1/2 of its length, 3-4 plicate, gradually narrowed towards mouth; mouth contracted and crenulate; mouth cells 30-46  $\times$  14-19  $\mu\text{m}$ ; middle cells 32-81  $\times$  14-27  $\mu\text{m}$ , thick-walled with small trigones; perigynium conspicuous, erect, never bulbous, usually as high as perianth. Foot short, anchor-shaped. Seta 130-156  $\mu\text{m}$  in diam. when young, 6-7 cells across, with ca 17 cell rows at periphery. Capsule globose, ca 406  $\mu\text{m}$  in diam.

*Specimens examined*—LWU 1031/75 *Nardia assamica* (Mitt.) Amak. Loc. : Shillong Peak, Meghalaya, alt. ca 2000 m. Date : Oct. 13, 1975. Coll. : D. K. Singh. Det. : R. Udar and A. Kumar; LWU 3904/79, 3908/79, 3920 A/79, 3920 B/79, Loc. : Elephant Fall, Shillong, alt. ca 1800 m. Date : Nov. 10, 1979; LWU 4051/79. Loc. : Jowai, Meghalaya, alt. 1800 m. Date : Nov. 11, 1979. Coll. : A. Kumar and U. S. Awasthi. Det. : R. Udar and A. Kumar.

*Ecology*—The plants of *N. assamica* grow in mats on moist and shady portions of rock surface either in association with *Jackiella javanica* Schiffn., *Jungermannia* sp., *Pogonatum* sp. or in pure population.

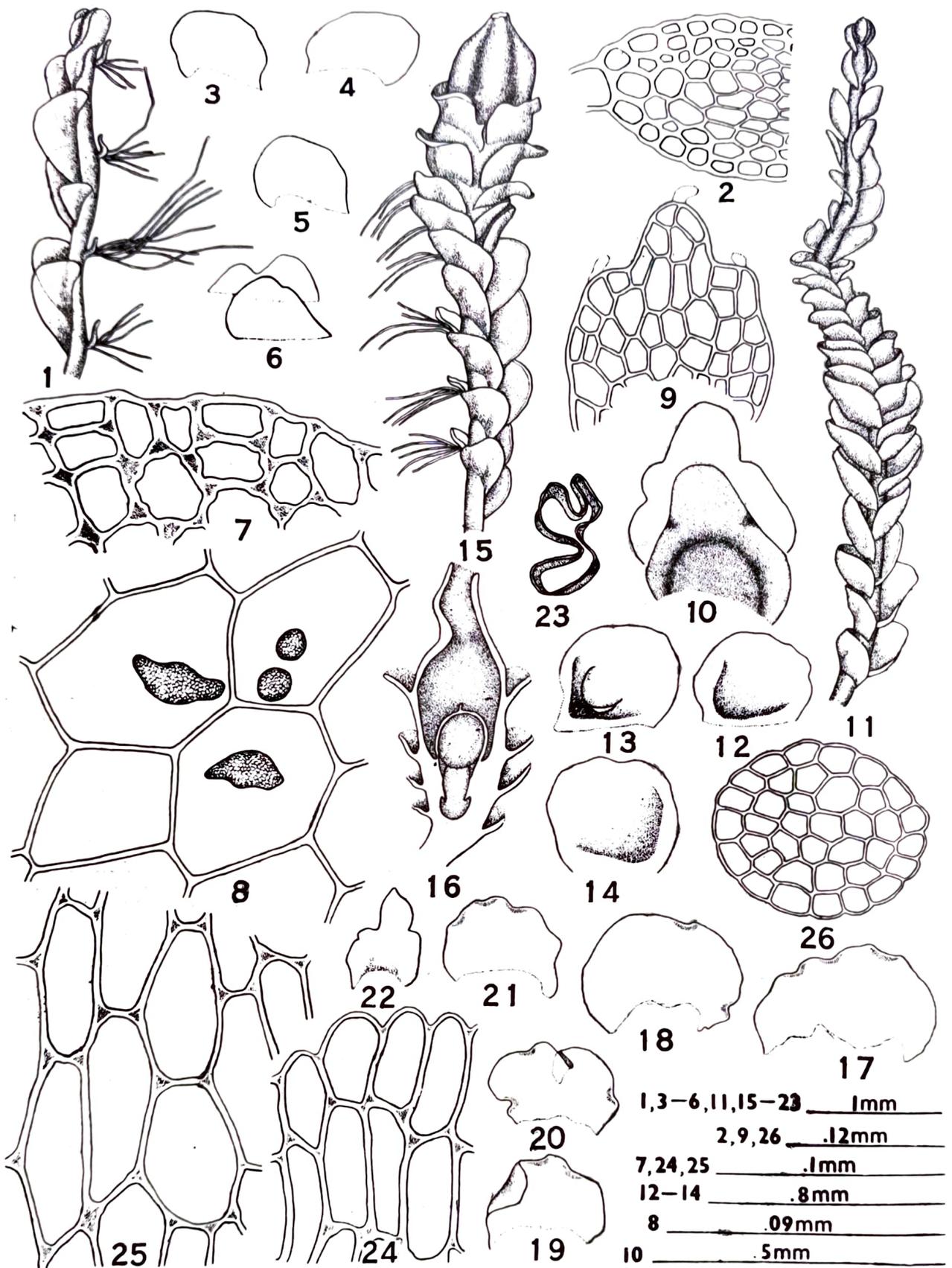
*Range*—Endemic to India; Meghalaya.

*Other specimens examined*—Herbarium Bryologicum T. Amakawa 2284 *Nardia sieboldii* (S. Lac.) Steph. Loc. : Japan, alt. 1300 m. Date : Aug. 21, 1952. Coll. : T. Kodama; 10259. Loc. : Japan, alt. 600 m. Date : Sept. 24, 1954. Coll. : T. Kodama; 7979. Loc. : Japan, alt. 200 m. Date : Jan. 16, 1955. Coll. : T. Kodama; 1807. Loc. : Japan, alt. 250 m. Date : Nov. 23, 1955. Coll. : T. Amakawa; 568. Loc. : Japan, alt. 50 m. Date : Dec. 19, 1955. Coll. : S. Kanno.

## DISCUSSION

*N. assamica* approaches *N. sieboldii*, a species well developed in Japan and Korea, in shape of perianth. However, both differ in several other features. The plants of former species are prostrate and flexuous with 1-2(-3) layers of thick-walled cells in cortex (Text-fig. 2); the leaves are broader than long, reniform (Text-figs. 3-6) and antically decurrent (Text-figs. 1, 15); the oil-bodies are large and single in the leaf cells but two small spherical oil-bodies may also be seen in most of the middle and basal cells of the leaf (Text-fig. 8); the male inflorescence is intercalary with ovate to triangular bracteoles and the female inflorescence has reniform bracts (Text-figs. 17-21). The plants of *N. sieboldii* (as described by AMAKAWA, 1959), in contrast, are suberect and rigid usually with thin-walled cells in the cortex; the leaves are longer than broad, ovate and not decurrent antically; the oil-bodies are single and small in the cells of the leaf; the male inflorescence is terminal with oblong and lingulate bracteoles and the female inflorescence has ovate bracts.

*N. assamica* exhibits a great deal of variations in development of trigones and cuticular ornamentation. The trigones may be present or absent in the leaf cells of the same plant (Text-figs. 7, 8). Sometimes they are prominent with bulging margins (Text-fig. 7). Besides, the cuticle is also either smooth or verrucose. It is possibly environmentally influenced. However, the thick-walled marginal cells of the leaf (particularly in upper and middle region of the plant) constitute a significant feature of this species (Text-fig. 7). The male inflorescence, which is rather characteristic for



Text-figs. 1-26. *Nardia assamica* (Mitt.) Amak. 1. Apical part of a vegetative plant, 2. T. S. main stem, 3-6. Leaves, 7. Marginal cells of the leaf, 8. Middle cells of the leaf showing oil-bodies, 9-10. Underleaves, 11. Male plant, 12,14. Male bracts, 13. Male bract with two antheridia, 15. Female plant, 16. L. S. of female inflorescence, 17-21. Female bracts, 22. Bracteole, 23. T. S. of perianth, 24. Perianth cells at mouth, 25. Perianth cells at middle, 26. T. S. of young seta.

this species, has not received adequate attention by earlier workers possibly due to the paucity of suitable plants in the Type Specimens. However, AMAKAWA (1963) observed: "Male inflorescence terminal ; bracts 5-6 pairs." An examination of numerous male plants, recently collected, revealed male plants up to 20 mm long with flexuous apex and 12-18 or more pairs of intercalary male bracts—a feature commonly met with. However, occasionally young male plants may also be seen with terminal male inflorescences consisting of 5-6 or more pairs of bracts but these are apparently at a stage after which they will proliferate later in the season. The perigynium and the perianth in the female inflorescence are of particular interest as the former is an erect tubular sheath of cauline tissue formed around the young sporophyte which, by basal growth, carries the terminal foliar structures including the perianth, bracts and bracteoles (Text-figs. 15, 16) while the latter is long, fusiform and exerted from the female bracts and bracteole. An almost similar type of perigynium and perianth have been reported in *N. sieboldii* and *N. subclavata* (St.) Amak. Influenced by this, INOUE (1971a) proposed a section *Subclavatae* under subgenus *Geoscypharia* for these three allied taxa.

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