

ON THE ECOLOGY AND ANATOMY OF *PHYLA NODIFLORA* GREENE
AT ALLAHABAD, U. P.

By

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INTRODUCTION

Phyla nodiflora (L.) Greene (= *Lippia nodiflora* Rich.) is a widely creeping much branched perennial herb. The species is distributed throughout the greater part of India, in Ceylon and in all tropical and warm-temperate regions including the Mediterranean region (Duthie, 1960). The authors' attention was drawn to this plant on account of the compact and extensive communities it forms on the exposed riverbed of the Ganges in certain places at Allahabad.

FIELD STUDIES

Observations were made on the exposed riverbed of the Ganges on the south side near Curzon Bridge. The soil here is alkaline, the pH as measured by Lamotte soiltesting outfit being 7.8. The spot was repeatedly visited in the early morning from April to August 1962. There was a belt of damp sandy soil immediately next the flowing water (habitat 1) and next to this damp belt there was a broad belt of superficially dry sand (habitat 2). In habitat 1, *Phyla nodiflora* formed an almost continuous ground cover whereas in habitat 2, the cover was discontinuous, the individual plants of *Phyla nodiflora* occurring on small mounds of sand which clearly indicated the role of this plant as a sand binder (Photo 1).

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In *Phyla nodiflora* the creeping stems with erect branches extend in all directions from the taproot and root at the nodes (Photo 2). Where the surface sand is damp (habitat 1) the taproot is poorly developed and slender whereas it is well-developed, stout and deep-penetrating in habitat 2 where the surface sand is dry. In this habitat of dry shifting surface sand the taproot serves as an effective anchor and generally reaches a depth of 30 cm. and more. The growth of the upright shoots is more pronounced in habitat 2 in harmony with the deep-penetrating taproot whereas the growth of the horizontal stem-system is more pronounced in habitat 1 where the taproot is poorly developed.

In habitat 1 (damp sandy soil) the following species were found associated with *Phyla nodiflora*: *Eclipta prostrata* L., *Pulicaria crispa* Benth., *Dentella repens* Forst., *Verbascum chinense* Santapau, *Eragrostis poaeoides* P. Beauv., *Launaea nudicaulis* Less., *Cyperus rotundus* L., *Fimbristylis dichotoma* Vahl, and *Scirpus maritimus* L. In habitat 2 (sand superficially dry) the following species were found associated with *Phyla nodiflora*: *Chrozophora rotleri* Spreng., *Solanum nigrum* L., *Polygonum plebejum* R. Br., *Tamarix* sp., *Nicotiana plumbaginifolia* Viv., *Solanum surattense* Burm. f., *Echinochloa colonum* Link, *Euphorbia thymifolia* L., *Alternanthera sessilis* R. Br., *Portulaca* sp. plus all the species listed for habitat 1 except *Fimbristylis dichotoma* and *Scirpus maritimus*. Thus it is evident that the associate species in the dry habitat (habitat 2) are more numerous than those in the wet habitat (habitat 1), probably on account of the more open development of the *Phyla nodiflora* community in the dry habitat.

ANATOMICAL STUDIES

Little anatomical work appears to have been done on *Lippia* (cf. Metcalfe and Chalk 1950) and therefore information has been gathered for the present species from anatomical studies of the material collected near Curzon Bridge.

Stem: In transverse section, the young stem is quadrangular and there is a large pith invested by an interrupted zone of primary xylem which is mainly developed at the four angles (Photo 3). The phloem occurs external to the xylem elements. There are small irregular patches of sclerenchyma external to the phloem and then a continuous endodermis with casparian strips on the radial

cells. The cortex consists of thin-walled cells except in the outer layers where the thick-walled cells are interrupted by groups of hypodermal collenchyma. The outer part of the epidermis is cutinised and stomata and T-shaped unicellular hairs are present. Secondary growth, initiated by the cambium between the xylem and the phloem, is mostly confined to the four angles of the quadrangular stem.

Leaf: T-shaped hairs and stomata are present on both the surfaces of the lamina, the stomatal frequency being about 243 per sq. mm. on the abaxial epidermis and 180 per sq. mm. on the adaxial epidermis. In cross-section of the lamina, the palisade parenchyma is found next to both the adaxial and the abaxial epidermis but is better developed next to the adaxial epidermis (Photo 4). The spongy parenchyma is well developed between the two palisade layers. The almost equal development of palisade parenchyma on both sides of the leaf may be explained by the fact that the younger leaves instead of extending horizontally tend towards the vertical, the light thus being almost equally available to the two sides.

SUMMARY

Phyla nodiflora Greene forms extensive communities on the exposed sandy riverbed of the Ganges near Curzon Bridge at Allahabad, where the observations were made. The soil here is alkaline (pH 7.8).

On wet sandy soil *Phyla nodiflora* formed an almost continuous cover. Where the surface soil was dry the *Phyla* cover was discontinuous, the plants occurring on small mounds of sand and thus demonstrating their function as sand binders.

In *Phyla* the creeping stems with erect branches extend in all directions from the taproot and root at the nodes. Only in the dry habitat was the taproot well developed, penetrating to a depth of 30 cm. and more, thus functioning as an anchor in the shifting sand.

On wet sand, on account of the continuous *Phyla* cover, the associate species were few, whereas on superficially dry sand the associate species were many, probably on account of the open *Phyla* cover.

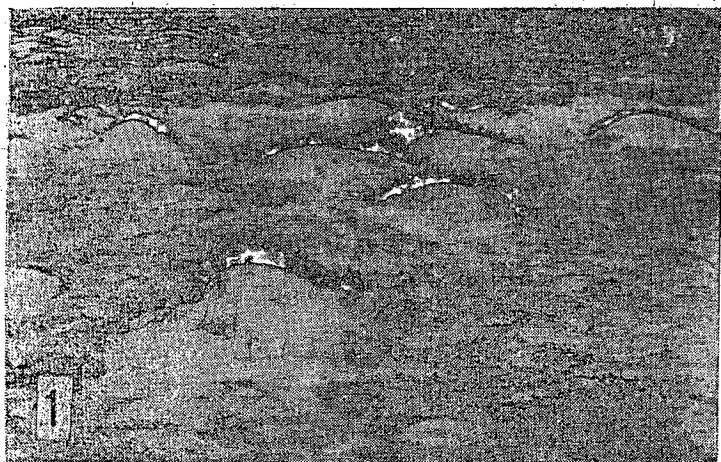
The stems of *Phyla* are quadrangular and secondary growth is more pronounced at the four angles. The younger leaves of *Phyla* instead of extending horizontally tend towards the vertical, the light thus being almost equally available to the two sides. This is reflected in the almost equal development of palisade parenchyma on both sides.

ACKNOWLEDGMENT

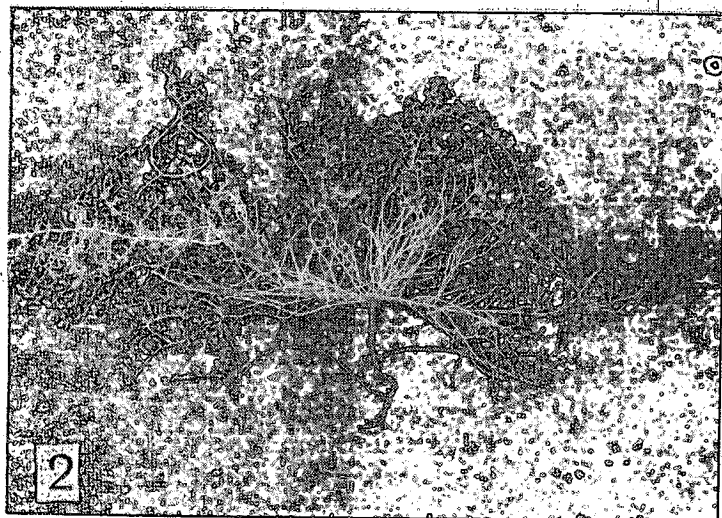
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REFERENCES

1. Duthie, J.F., (1960). *Flora of the Upper Gangetic Plain and of the adjacent Siwalik and Sub Himalayan Tracts*. Vol. II, p. 84-85. B.S.I., Calcutta.
2. Metcalfe, C. R. and Chalk, L., (1950). *Anatomy of the Dicotyledons*, Vol. II, pp. 1030-1041. Clarendon Press, Oxford.



to 1. *Phyla nodiflora* on small mounds of sand on the exposed riverbed of the Ganges at Allahabad.



to 2. The general habit of *Phyla nodiflora* showing the prominent taproot.

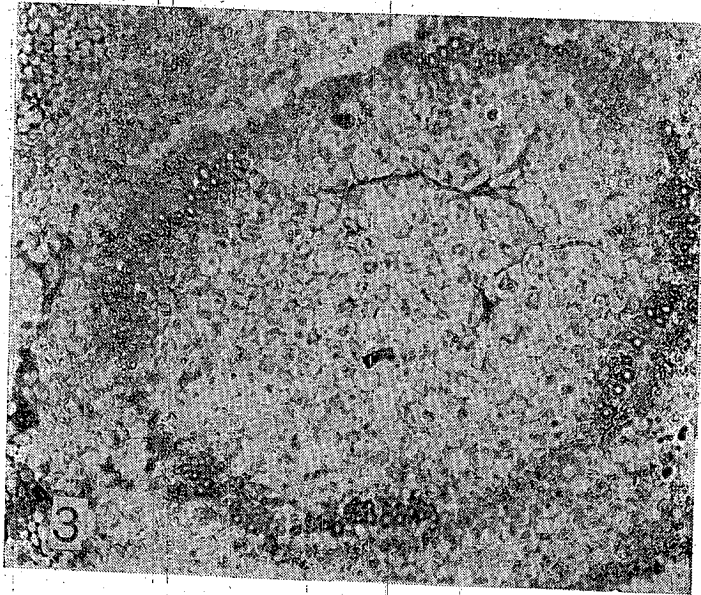


Photo 3. Transverse section of the stem of *Phyla nodiflora* showing xylem development at the four angles. x 100

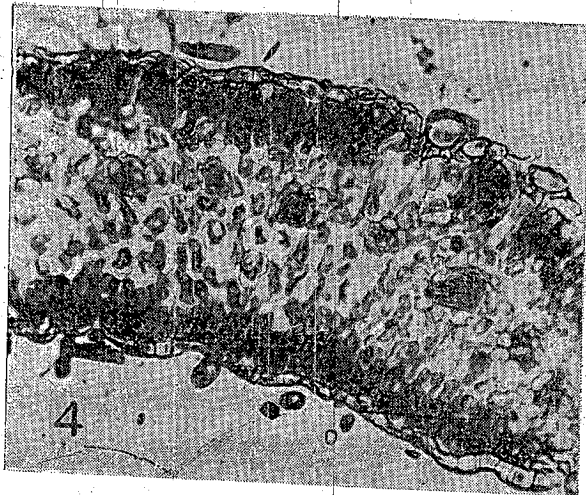


Photo 4. Transverse section of the leaf of *Phyla nodiflora* showing palisade parenchyma next to the adaxial and the abaxial epidermis. x 100.