MORPHOLOGICAL STUDIES IN PLANTAGO

III. Nodal Anatomy

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INTRODUCTION

The only reports on the nodal anatomy of Plantago are by Sinnott (1914) and Sinnott and Bailey (1914) who describe trilacunar node in Plantago stem. The present author, while investigating the vegetative anatomy of different species of Plantago, observed certain variations in their nodal structures. He, therefore, undertook a detailed work. The present paper deals with P. coronopus, P. lagopus, P. major, P. ovata and P. pumila. Serial sections of the nodes of these were studied (cf. Misra, 1963).

OBSERVATION

P. pumila possesses distinct nodes and internodes with opposite, decussate leaves on its stem while in the rest the stem is condensed with spirally arranged leaves. The species of Plantago studied here are found to possess three distinct types of nodes: (i) one trace, unilacunar, (ii) trilacunar and (iii) multilacunar. The first type is met with in P. coronopus and P. pumila, the second in P. ovata and the third in P. lagopus and P. major. Due to these variations further descriptions of each type have been taken up separately.

The vascular tissue of the internode of P. pumila forms a continuous ring. On approaching the nodal region, the axis as well as the vascular ring becomes slightly flat in the direction of the leaf-traces (Fig. 1). Two large, arch-shaped leaf-traces diverge out from the vascular cylinder in the region of the node at opposite ends of the flattened axis (Fig. 2). A single leaf gap is formed by each of these leaf-traces, and each leaf-trace, soon after the separation from the vascular cylinder, branches out to form two small laterals and one large median strand (Fig. 3). All the three strands move out obliquely towards periphery and finally they enter the leaf-base (Fig. 4).
Figs. 1–7. Figs. 1–4. *P. pumila.* Fig. 1. T.s. internode, ×19·8. Figs. 2, 3. T.s. branching of the single leaf-trace to form two small laterals and a large median bundle, ×19·8. Fig. 4. T.s. stem shows leaf-base with 3 traces, ×19·8. Fig. 5. T.s. *P. ovata* stem shows the emergence of 3 leaf-traces forming 3 gaps and a leaf-base receiving 3 bundles, ×19·8. Figs. 6, 7. T.s. *P. lagopus* stem showing emergence of 5 leaf-traces forming the same number of leaf gaps, ×4·1. (lb, leaf-base; lr, leaf-trace; ph, phloem; xy, xylem.)
**P. coronopus** resembles **P. pumila** in so far as the origin and number of traces to each leaf is concerned. Unlike the latter, however, **P. coronopus** stem shows a vascular supply of discrete bundles and a single leaf-trace from the main vascular ring at each node instead of two as in **P. pumila**. It may be recalled here that **P. coronopus** possesses a condensed stem with spirally arranged leaves on account of which several leaf-traces are seen in a single section.

**P. ovata** shows three leaf-traces forming three distinct gaps placed quite apart one from the other. The median leaf-trace is large and moves out first. It is closely followed by two small laterals (Fig. 5). All the three traces, thus resulted, pass out to the leaf-base without forming any branch. The node therefore is trilacunar.

**P. lagopus** and **P. major** show five leaf-traces emerging out from the axial ring of bundles resulting in five distinct gaps (Figs. 6, 7). The distribution of these gaps covers almost 2/3 the total circumference of the main ring of bundles. The median leaf-trace enters the leaf-base at the lowest level followed by both submedian traces slightly higher up, while both the laterals enter the flanks of the sheathing base at a still higher level. The node, therefore, in **P. lagopus** and **P. major** is multilacunar.

**DISCUSSION AND CONCLUSION**

Sinnott (1914) has given great importance to the nodal structure in establishing phylogenetic relationships of various taxa of different plant groups. He considers unilacunar as well as multilacunar nodes to be derived from the primitive trilacunar type. Later investigators (Marsden and Bailey, 1955; Camrigh, 1955) consider two-trace unilacunar node as the primitive from which nodal evolution in dicotyledons has taken place in two directions: (i) two trace, unilacunar → one trace unilacunar ≡ trilacunar → multilacunar; (ii) two trace, unilacunar → many trace unilacunar → one trace, unilacunar.

The nodal types in the present **Plantago** species reveal all three types of nodes, the unilacunar, trilacunar and multilacunar. The single genus thus shows great plasticity in the nodal types. This makes it difficult to be able to trace any evolutionary sequence in the nodes of different species. Sinnott and Bailey’s contention of the nodal anatomy, as a valuable adjunct in showing real relationship of families or otherwise of genera or species, at once puts **P. lagopus** and **P. major** in one group, and **P. coronopus** and **P. pumila** in the other. Several morphological and anatomical dissimilarities displayed by these plants, such as vegetative and floral structure, vegetative and floral
anatomy and ovule numbers per fruit (refer Misra, 1963), do not show any true relationship between these species.

The present findings, however, reveal that the broad leaf and sheathing base show multilacunar modes (as seen in *P. lagopus* and *P. major*), while comparatively a narrow leaf and base shows trilacunar node (as in *P. ovata*). The leaf and its base are further reduced in *P. coronopus* and *P. pumila* which have unilacunar nodes. This tentatively shows that the larger the leaf size and its base, the greater are the number of leaf gaps and the narrower the leaf and its base, the lesser the number of gaps. A more or less similar relationship has also been established by Mittal (1961) in Umbellales.

**SUMMARY**

Node is unilacunar in *P. coronopus* and *P. pumila*, trilacunar in *P. ovata*, and multilacunar in *P. lagopus* and *P. major*.

The number of leaf gaps directly varies with leaf size and its base.

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**REFERENCES**


