

that RSM does not have any toxic influence on longevity of the flies when provided in the appropriate proportions with carbohydrates. This may be because the insect has a detoxification mechanism or the enzyme myrosinase is inactive in the insect. Such a suppression of toxic effects of RSM-glucosinolates is interesting in the insect system and requires further study.

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OCCURRENCE OF MULTIPLE PERFORATION PLATE IN THE VESSEL ELEMENTS OF *CALAMUS* (LEPIDOCARYOIDEAE)

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THE type of perforation plate of tracheary elements plays an important role not only in phylogeny and taxonomy but also in efficiency and safety of

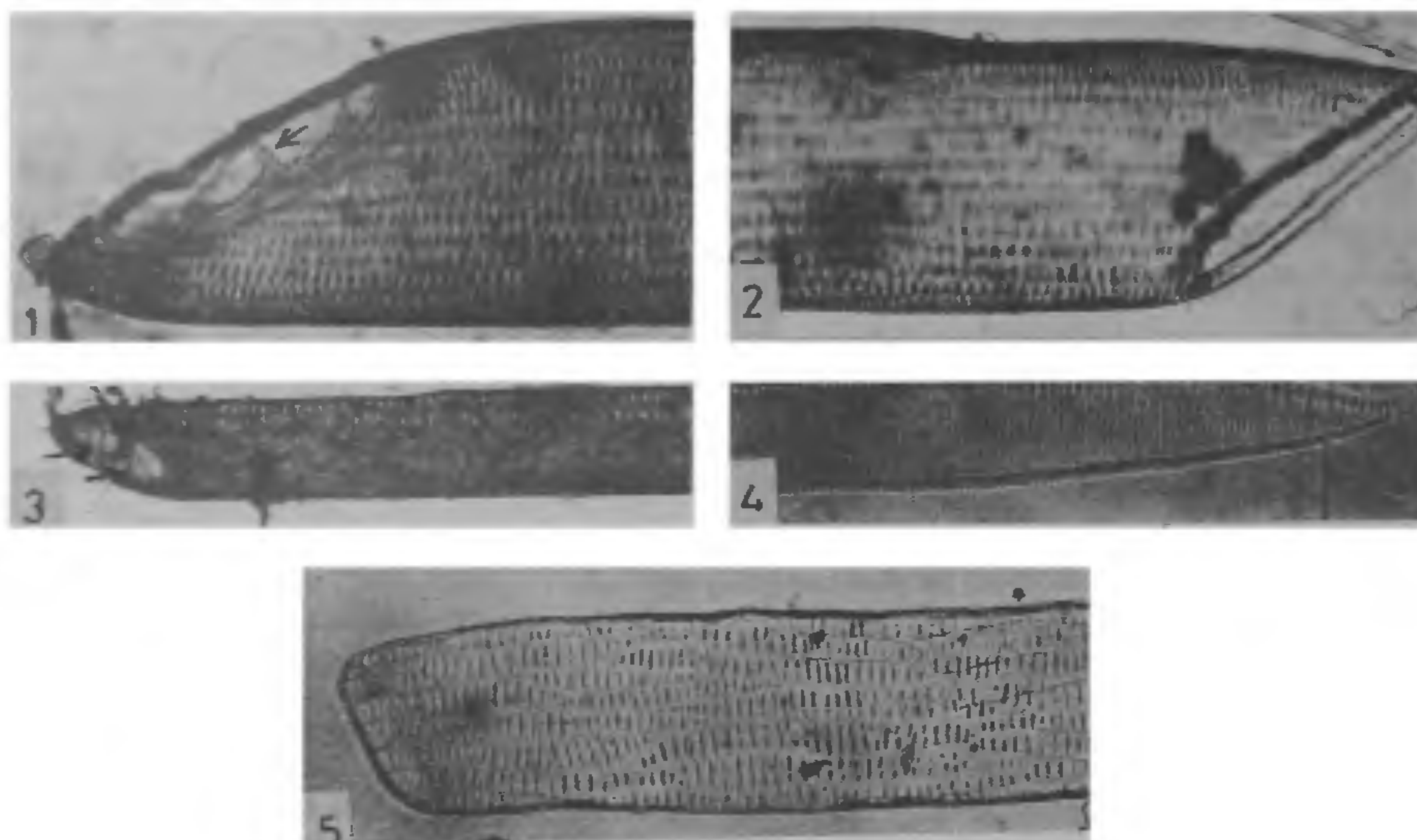
water conduction in seed plants¹. Monocotyledons particularly palms received relatively little attention of anatomists to examine the vessel perforation plates. According to Cheadle², vessel members with simple perforation plates are the most specialized and those vessel members with long scalariform plates are the most primitive. Based on the perforation plate character, chamaedoreoid and iriarteoid palms are considered to be "least specialized"; the arecoid, nypoid and phoenicoid palms to be "unspecialized"; the caryotoid, cocosoid, coryphoid and nonscandent lepidocaryoid palms to be "moderately specialized" and the borassoid and scandent lepidocaryoid palms to be "most specialized"³. Tomlinson⁴ reported that end wall of tracheary element in stem and root of the genus *Calamus*, a lianoid lepidocaryoid palm, is simple and transverse in contrast to the scalariform and oblique type in leaf. Klotz³ supported the view that the lepidocaryoid lianas, being the most specialized group, have simple perforation plates in the stem in contrast to the occurrence of multiple, mixed multiple and simple or simple perforation plates in the stem of lepidocaryoid palms.

The purpose of this paper is to present the anatomical observations on the form of vessel perforation plates of nine *Calamus* species (lepidocaryoid lianas) growing in Kerala forests (table 1). For each species, basal most internode was selected from two stems and small slivers were cut from inner two third of the cylinder in the middle portion of the internode for the maceration of tissues using 1:1 hydrogen peroxide and acetic acid mixture. Macerated cells were stained with Heidenhain's haematoxyline using iron alum as mordant after

Table 1 Specimens examined for stem anatomy of *Calamus* growing in Western Ghats in Kerala

Species	Locality	Identification/collection No.	Per cent of vessel elements with scalariform perforations
<i>Calamus dransfieldii</i> Dhoni, Renuka	Palghat	Renuka 2982:16.12.1983	—
<i>C. gamblei</i> Becc.	Pamba (Kakki)	Renuka 3173:24.5.1984	—
	Ranni		
<i>C. hookerianus</i> Becc.	Nelliampathy	Renuka and Muktesh 2727:6.1.1983	4
<i>C. meizianus</i> Schlecht.	Nilambur	Renuka 3061:27.3.1984	—
<i>C. pseudotenuis</i> Becc.	Peermedu	Nambiar and Renuka 2625:24.11.1982	2
<i>C. rotang</i> Linn.	Quilon Asram	Renuka and Sasidharan 3443:18.1.1985	—
<i>C. thwaitesii</i> Becc.	Achenkovil	Nambiar and Renuka 2903:8.2.1983	3
<i>C. travancoricus</i> Bedd.	Arienkavu	Nambiar and Renuka 2925:19.4.1983	5
<i>C. vattayila</i> Renuka	Thenmala	Renuka 4003:11.10.1985	—

— = Not found.



Figures 1–5. 1. Scalariform perforation plate of early metaxylem vessel element with three bars in *C. hookerianus*, arrow indicates a bar branching at one end ($\times 205$); 2. The other end of the same vessel element with oblique end wall showing simple perforation ($\times 205$); 3. Scalariform perforation plate with two bars in *C. travancoricus*, arrows show bars ($\times 160$); 4. Protoxylem vessel element with scalariform perforation plate with more than 28 bars in *C. thwaitesii* ($\times 102$), and 5. Late metaxylem vessel element with simple perforation plate in *C. thwaitesii* ($\times 154$).

thoroughly washing with distilled water. Separated xylem elements were mounted in glycerine for observation under the microscope.

The present study records for the first time the occurrence of mixed multiple and simple perforation plates, in the stem of more than one species of *Calamus* occurring in the Western Ghats of Peninsular India (figures 1–4). The species with this character are recorded in table 1. Occasional presence of reticulate perforation plate was also observed in *C. pseudotenuis* and *C. travancoricus*. We would like to point out that in the stem of *Calamus* mostly simple perforation plates occur in the wide metaxylem vessels with occasional mixed multiple and simple type. Mixed multiple and simple type is evident from figure 2 as it shows oblique end wall with simple perforation in the other end of the same vessel element which shows scalariform perforation plate. The current observation supports the view of Cheadle⁵ that most specialized elements in the xylem of monocotyledons always occur in the metaxylem as protoxylem elements examined in this study are either

tracheids or vessels with extremely oblique end walls in which the scalariform perforation plates have many bars (figure 4). It further adds that the late metaxylem with simple perforation (figure 5) is more specialized than the early metaxylem with perforation of 1–3 bars (figures 1 and 3).

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