9. *Lincolejemna zanthocarpa* (L. et L.) Evans (Fig. 91).—The oil-bodies are one in each cell, in the middle, at the margin and at the base of the leaf. They are usually elliptical or spindle-shaped, elongated, about 8.1-10.15 µ long and 4.0-4.8 µ broad, irregular in outline, prominently granular.

10. *Bazzania tridens* Nees (Fig. 10).—The oil-bodies vary from 2 to 7 in each cell of the leaf. They are usually elliptical, 4.0-10.17 µ long and 3.0-4.17 µ broad, rarely spherical, 2.0-4.07 µ in diameter, smooth in outline with somewhat prominent granules.

11. *Spruceanthes semirepanda* (Nees) Verd. (Fig. 11).—The oil-bodies are numerous in each cell, in the middle, at the margin and at the base of the leaf. They are usually spherical or globose, 1.4-3.08 µ in diameter, rarely elliptical, 3.8-4.07 µ long and 1.8-2.08 µ broad with regular outline and faintly granular.

12. *Lophocolea* sp. cf. *heterophylla* (Schrad.) Dum. (Fig. 12).—The oil-bodies are usually 2-6 in each leaf cell. They are spherical, rarely elliptical, 2.1-5.08 µ in diameter, smooth in outline and faintly granular.

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**STUDIES ON SANDAL SPIKE**

**Part IX.* Cation Exchange Capacity of Sandal (Santalum album Linn.) in Health and Disease**

SANDAL (*Santalum album L.*) is a root hemi-parasite which derives its sustenance partly from the host plant1,2 and partly from the soil.3 However, during the early growth of the plant, up to about one year, it can live by itself, thereby suggesting that its root system is fully capable of taking up the required mineral nutrients directly from the soil at that stage. It is also known that with the onset of the spike disease (mycoplasmal in nature4-5) the haustorial connections cease and the tree gradually dies; this suggests that the direct nutrient intake is very much restricted, if at all it exists. Hence the cation exchange capacity (C.E.C.) of the roots of one-year old sandal plants (healthy) and well-grown ones (healthy and spiked) has been studied. The C.E.C. of some of the important host plants has also been studied, since it may throw some light on the host-parasite relationship.

The various well-grown plants, used for collecting root samples, were selected from the field, while the one-year old plants were grown in pots using the same soil as was occurring around the grown-up plants in the field. Separate samples were taken from ten plants in each category. Following the procedure of Crooke, the C.E.C. was determined by replacing the exchangeable cations in the root powder by hydrogen ions by treatment with excess of dilute hydrochloric acid, subsequently exchanging these hydrogen ions by potassium ions by treatment with excess of normal potassium chloride solution, and estimating the hydrogen ions thus liberated with standard dilute potassium hydroxide using either glass electrode or phenol red to indicate the endpoint. The results are presented in Table I.

**Table I**

<table>
<thead>
<tr>
<th>C.E.C.† of sandal and some of its hosts</th>
<th>One-year old</th>
<th>Well-grown</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Sandal</td>
<td>22.0-24.0 (without host)</td>
<td>10.5-12.0 (both healthy and diseased)</td>
</tr>
<tr>
<td></td>
<td>26.0-27.5 (with <em>Giricidia maculata</em> as host)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>18.5-20.0 (with <em>Cassia quinquefolia</em> as host)</td>
<td></td>
</tr>
<tr>
<td>2. <em>Casuarina equisetifolia</em></td>
<td>37.5-39.0</td>
<td>17.5-20.0</td>
</tr>
<tr>
<td>3. <em>Lantana camara</em></td>
<td>24.0-26.0</td>
<td>22.0-23.6</td>
</tr>
<tr>
<td>6. <em>Cassia siamia</em></td>
<td>12.0-13.5</td>
<td>10.5-12.0</td>
</tr>
</tbody>
</table>

† Milliequivalents per 100 g of dry root (average of 6 determinations).

From the above results it is seen that the C.E.C. of one-year old sandal plants is of a high order comparable to other plants, and it partly explains its ability to live without a host in the early stages. The C.E.C., however, gets reduced and stabilised as the plant grows, suggesting that even at the grown-up stage, sandal is capable of drawing its mineral requirements to some extent directly from the soil. Further, the C.E.C. is in no way affected by the onset of the spike disease, while the mineral content in the diseased plant gets reduced. It, therefore, appears that severe of haustorial connections, the second channel for the mineral intake, in the spiked
sandal is mainly responsible for the decrease in the total mineral content in it.

Another noteworthy point is that the C.E.C. of Cassia siamea, which is known to be a good host for sandal, is almost equal to that of sandal. It is, therefore, to be seen whether the proximity of the C.E.C. of a plant to that of sandal is one of the criteria to serve as a good host.

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August 12, 1971.


**OCURRENCE OF THE ALLIGATOR WEEP IN SOUTH INDIA**

The alligator weed Alternanthera philoxeroides (Mart.) Griseb, a native of South America, was first reported in India from Bihar and West Bengal (Maheshwari, 1965). This emergent aquatic weed which thrives in waters up to a depth of 2.5 m has been gradually spreading in north-east India in recent years and is now found also in parts of Assam. Early in July, 1970 the weed was collected in the lake at the Lal Bagh Gardens, Bangalore. It is still limited to isolated small patches along the northern shore of this lake, which is heavily infested by Eichhornia crassipes as the dominant weed. A few erect shoots of A. philoxeroides and Ludwigia adscendent were seen amidst dense stands of Eichhornia. There has apparently been no previous published record of the alligator weed from South India. The weed is likely to invade other areas in peninsular India as well as North India if timely measures are not taken up to control it in the limited areas of its present distribution. Although the weed produces flowers, seed-setting is rare and the weed propagates almost entirely by vigorous vegetative growth and regeneration of detached and dispersed clumps. The weed is very aggressive and like the water hyacinth it may become a menace to cultivation and inland water transportation. No satisfactory herbicidal controls against the alligator weed are known (Sculthorpe, 1967).

Elsewhere in the south-east Asia A. philoxeroides has been recorded only from Burma and Indonesia (throughout western Java), having been first found near Djakarta as far back as in 1975. Most probably it has spread to India from Burma.

In the U.S.A. the alligator weed grows in dense mats over thousands of acres, clogging recreational and flood-control waterways, disturbing wild life habitats and threatening rice cultivation. It is also believed to provide favourable breeding sites for mosquitoes. A leaf-feeding beetle, Agsticles sp., which is highly specific to A. philoxeroides, has been introduced there from South America and it is reported to be exerting satisfactory control of the weed in some of the infested areas where releases have been made. This biocontrol agent is worth introducing for trials in India. Three species of native insects, Cassia sp. nr. enervis Boh., Psara basalis Wkr. and P. stultalis Wkr., are known to attack the alligator weed in India but these have little control value.

The authors are indebted to Prof. Cecil J. Saldaanha, S.J., St. Joseph's College, Bangalore, for confirming the specific identification of the weed.

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August 14, 1971.

* This research is financed in part by a grant made by the United States Department of Agriculture under PL-480.

**A NOTE ON THE EFFECT OF SIMAZINE ON THE FODDER PRODUCTION OF M.P. CHARI (SORGHUM BICOLOR)**

Simazine is widely used as a herbicide. However, when it is used in smaller doses, it enhances the crop growth and crude protein yield (Rico, 1968). A trial was laid out at Indian Grassland and Fodder Research Institute,