partial methylation with 2 moles of dimethyl sulphate in the presence of potassium carbonate and acetone, when 2-C-prenyl-3, 7-dimethoxy-1-hydroxyxanthone was obtained identical with the one described earlier. The synthetic compound1 agrees in its m.p. with that described for natural compound.

Cyclodehydrogenation of the above 2-C-prenylxanthone (1) with DDQ in benzene medium gave osajaxanthone (II), m.p. 248–294° (lit.5 m.p. 248–250°), R, 0.65 (ethyl acetate : benzene, 10 : 90). Its NMR spectrum showed two characteristic doublets of the chromene ring at δ 5.64 and δ 6.75 ppm (J = 9.5 Hz) and a singlet of one aromatic proton in position 4 at δ 6.29 ppm. All the data agree with that described for natural osajaxanthone.

We express our thanks to Dr. Nitya Nand for the NMR spectra and the C.S.I.R., New Delhi, for a research fellowship to one of us (S. M. A.).

Department of Chemistry, A. C. JAIN.
University of Jammu, Jammu-I (India), August 5, 1972.

* Rf values recorded here are those on TLC using silica gel.


**TYPOLOGY OF FOLIAR SCLEREIDS IN A FEW TAXA OF THE THYMELAEACEAE**

According to Metcalf and Chalk1 the mesophyll frequently includes sclerenchymatous elements in species of Daphne, Daphnopsis, Enkleia, Syrinops, Lossiophyton, Peddiea and Stephanodaphne. The sub-tribe Linostomatiaceae of this family includes three closely related genera: Linostoma Wall. ex Endl., Enkleia Griff. and Lophostoma Meissn. which have been grouped taxonomically in various ways in the past. Recently, Neving2–3 has made an attempt to bring about realignment of the species of Linostoma, Enkleia and Lophostoma based on detailed study on each of the above-mentioned genera. The same author in conjunction with the description of vegetative morphology has given an account of veins, veinlets and the orientation of associated extra xylary fibres as well as the presence of sclereids in terminal disposition to the vein endings as they appear in surface view in cleared specimens. His descriptive account did not, however, include a detailed data on sclereids especially their form and structure. Further, it is reported by Ding Hou4 that sterile materials have a limited value and can hardly be identified even to genus. In the light of this statement, it was decided to examine the characteristics of foliar sclereids in the mesophyll of a few taxa of this family with the idea of finding out their utility in the identification of materials.

**MATERIALS EXAMINED**


**TYPES OF SCLEREIDS**

Sclereids of different forms have been observed in all the investigated species of Linostoma and Enkleia. They can be categorised into the following types.

**Spheroidal sclereids** (Fig. 1)

They are sclerosed mesophyll cells of irregular body shape and size. Mostly they are spheroidal or sub-spheroidal and show terminal relationship with vein-endings. Often, they were crowded at the vein-endings of the investigated species of Enkleia. Structurally the cell wall is striated with
innumerable pit canals. The width of the lumen varies considerably and rarely obliterated or possess crystals. This type of sclereid is absent in all the investigated species of *Linostoma* except *L. persimile*.

**Vermiform sclereids (Figs. 5–9)**

This type of sclereid is found in the lamina of all the investigated species of *Linostoma* and *Enkleia*. They are enlarged unbranched sclereids with round ends, wavy outline and wide lumen of uniform width. They are confined to the veinlet endings either in twos or threes only in *Linostoma*. Structurally, the cell wall is striated with innumerable pits.

**Fusiform sclereids.**—This type of sclereid differs from unbranched trichosclereids only in size. They are of short size form, more or less fusoid at both ends and have a lumen of uniform width. They are freely disposed in the mid-mesophyll area of laminae.

**Idiofibrosclereids** — This type is common in all the species of the two genera. In a few species of *Enkleia* they form a conspicuous feature in the leaf expanses and often show criss-cross pattern. Transectional view of the laminae clearly indicates their subepidermal, horizontal or oblique disposition, crooked branching nature and blunt tip-ends (Figs. 2, 4).

**Taxonomic significance.**—The presence of more than one type of sclereid in various combinations is noticed in almost all the investigated species of *Linostoma* and *Enkleia* of the sub-tribe Linostomatinae of this family. The distribution pattern varies from species to species within the mesophyll only as seen in the cleared preparations as well as in transection of leaves. Further, it is noticed that the spheroidal sclereids of *Enkleia* has terminal appearance with reference to veinlets, whereas in *Linostoma* terminal sclereids mostly are of vermiciform type. Furthermore, the trichosclereids in the mesophyll of both the genera show no terminal relationship with the vein endings. On the other hand they have conspicuous diffuse disposition in the leaf expanses. Similarly, in the investigated species of *Linostoma* prominent diffuse fusiform sclereids are present in the mid-mesophyll part of the laminae. Of the five types of sclereids, it is clear from the present study that apart from the occurrence of vermiciform sclereids in *Linostoma* and spheroidal sclereids in *Enkleia*, the other types, namely, trichosclereids and idiofibrosclereids are of common occurrence in both the genera. Thus one could account in the sub-tribe Linostomatinae of the Thymelaeaceae an interesting assemblage of sclereid bearing taxa. This is suggestive of the homogeneous nature of the two genera within the recognised sub-tribe complex. Furthermore, it is suggested that the typology of sclereids indicates that sterile materials of the few taxa under study could be identified with the utmost exactitude in combination with other anatomical characters.

Thanks are due to Dr. K. Subramanyam, Director, Botanical Survey of India, for kind encouragement.
Letters to the Editor

Botanical Survey of India, T. ANANDA RAO.
76, L.C. Road, Calcutta-14.
and
G. C. Bose Biological O. P. BHUPAL.
Research Unit (Bangabasi College).

1957. 1 & 2
3. —. Ibid., 1961 b, 42, 373.

A PRELIMINARY STUDY OF HAEMOGLOBIN POLYMORPHISM IN SOUTH-INdIAN CATTLE

Haemoglobin polymorphism is one of the widespread polymorphisms in mammalian species, being polymorphic in some human populations1-2, cattle3-4, sheep5 and in some primate species6-7. In the present communication, the haemoglobin variations in three recognised breeds of South-Indian cattle, namely, Kangayam. Alambadi and Hallikar have been reported.

Blood samples were aseptically collected in ACD (Acid-Citrate-Dextrose) from carefully selected, healthy and unrelated animals. The red blood cells were washed with saline to free them from plasma proteins, and then lysed with an equal volume of distilled water. The haemolysates were mixed with one-quarter volume of toluene and left at 20°C overnight. After 24 hours, samples were thawed and centrifuged at 3,000 r.p.m. for 15 mts. and the clear haemoglobin solution separated and then subjected to starch-gel-electrophoresis according to Smithies8, using the tris-EDTA borate buffer system at pH 8-6. Gel was prepared from 12% hydrolysed starch (Connaught) in 1 in 20 diluted buffer.

In cattle, there are two common haemoglobins, Hb-A and Hb-B, which exist in three phenotypic forms Hb-AA, Hb-BB and Hb-AB, the former two being homozygous and the latter is heterozygous with respect to Hb-A and Hb-B, which are co-dominant alleles.

The percentage of haemoglobin variants in the case of the three breeds of cattle are presented in Table 1. From the results in Table 1, it is interesting to note that Hb-AA and Hb-BB, vary remarkably between the different breeds, whereas, the Hb-AB is found to be present almost equally in all the three breeds. Also, another electrophoretically different rare variant of haemoglobin of cattle designated as Hb-C reported to be present in most of the North-Indian breeds, excepting Gir9, is found to be absent in the three South-Indian breeds studied by us. It is felt that the above studies on the predominant South-Indian cattle will be useful for their specific breed description.

TABLE I

<table>
<thead>
<tr>
<th>Breeds</th>
<th>Hb-AA</th>
<th>Hb-AB</th>
<th>Hb-BC</th>
<th>Total tested</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kangayam</td>
<td>43.69</td>
<td>41.26</td>
<td>3.04</td>
<td>119</td>
</tr>
<tr>
<td>Alambadi</td>
<td>35.71</td>
<td>60.00</td>
<td>13.85</td>
<td>70</td>
</tr>
<tr>
<td>Hallikar</td>
<td>30.00</td>
<td>42.50</td>
<td>25.00</td>
<td>40</td>
</tr>
</tbody>
</table>

We are grateful to S. N. S. Mandradiar and Dr. G. Venkatchalam, Director of Animal Husbandry, for their kind permission to collect blood samples from the cattle farms.

University Biochem. N. S. RANGANATHAN,
Laboratories, E. R. B. SHANMUGASUNDARAM,
A. C. College Campus,

4. —. Ibid., 1957, p. 178.

CYTOMIXIS IN THE F1 HYBRID OF PISUM SATIVUM L. × P. ARVENSE L.

The present communication deals with the occurrence and significance of cytomixis in pollen mother cells of the F₁ hybrid of *Pisum sativum* L. T. 163 ² × P. arvense L. I.C. 13961 7. Passage of chromatin material from the nucleus of one PMC into the cytoplasm of an adjacent PMC of *Oenothera gigas* was termed 'Cytomixis' by Gates1. The phenomenon has been considered to be a fixation artefact or a degenerative effect2. The observations of West and Letchmere3, Sarvella4, Kamra5, Baqar and Husain6, Bhandari, Tandon and Jain7 and Gottschalk8 have proved that it is not due to faulty fixation, staining or squashing but it is a natural phenomenon occurring either during mitosis or meiosis. Cytomixis has been found to be mostly restricted in genetically unbalanced types such as