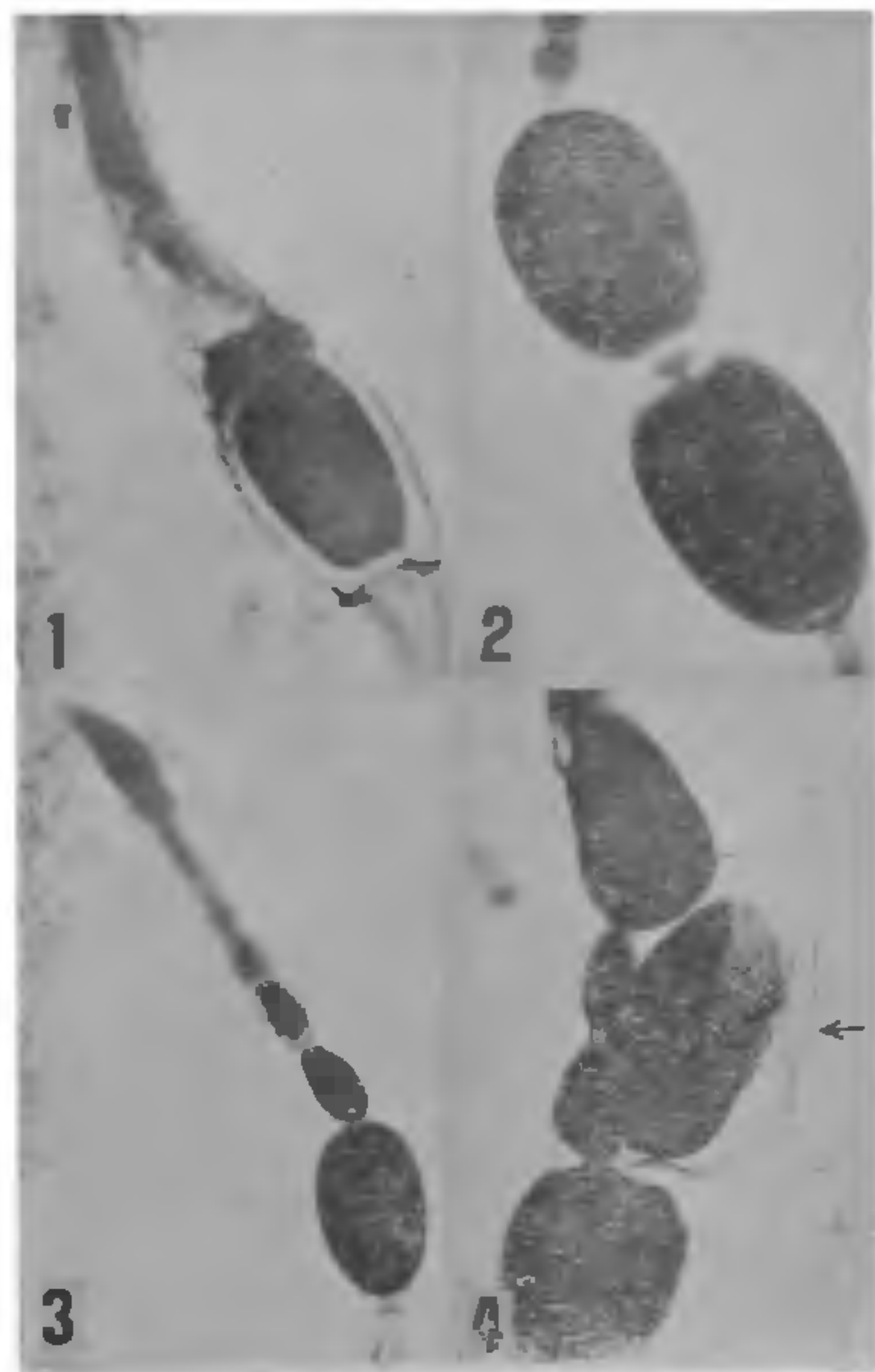


ovarioles similar to those reported by Divakar and Novak⁴ (Figs. 1-4).



FIGS. 1-4. Photomicrographs of the ovarioles affected by 'Paper Factor' in *Dysdercus cingulatus*. Fig. 1. Degenerated condition of the ovariole. Fig. 2. Development of only two eggs in the ovariole instead of six. Fig. 3. Development of only one egg in the ovariole. Fig. 4. Abnormality in the ovariole where a well-developed egg of the previous batch (marked with arrow) was found attached to the developing oocytes of the next batch.

In a separate experiment when a few freshly ecdysed males were treated and allowed to mate with normal untreated females of the same age, there has been a reduction in hatchability. This may probably be due to transfer of the active substance during copulation^{5,6} or due to defective sperms.

Thus the present investigation conclusively shows that the "Paper Factor" has considerable effect in inhibiting the reproduction of the red cotton bug, *Dysdercus cingulatus*.

Judson and Divakar are thankful to the C.S.I.R., New Delhi, for financial support.

Department of Zoology,
Osmania University,
Hyderabad 500 007,
India, January 23, 1976.

P. JUDSON.
B. JULIUS DIVAKAR.
B. KISHEN RAO.

1. Slama, K. and Williams, C. M., *Nature* (Lond.), 1966, 210, 329.
2. Saxena, K. N. and Williams, C. M., *Ibid.* 1966, 210, 441.
3. Slama, K., Romanuk, M. and Sorm, F., *Insect Hormones and Bioanalogs*, Springer-Verlag, Wien, New York, 1974, p. 239.
4. Divakar, B. J. and Novak, V. J. A., *Int. Symp. Regulation of Insect Reproduction*, Liblice, Czechoslovakia, 1974.
5. Masner, P., Slama, K. and Landa, V., *Nature* (Lond.), 1968, 219, 395.
6. Judson, P., Divakar, B. J. and Kishen Rao, B., *Curr. Sci.*, 1976 (in press).

ANTAGONISTIC EFFECT OF THIAMINE ON INDOLEACETIC ACID IN GREEN GRAM (*PHASEOLUS RADIATUS* L.)

A VARIETY of compounds can inhibit growth in the presence of auxin and reduce the effectiveness of the auxin, but its mechanism is not clear. Evans and Ray¹ have shown that after treatment with IAA, corn and oat coleoptile segments continue to grow at a slow rate for some time. Suddenly, a substantial increase in the rate of elongation occurs. Some investigators feel that IAA acts as an allosteric². No compound has yet been found which exerts strong competitive antagonistic action towards the plant growth hormone IAA. The present study has been designed to reveal certain facts with regard to this problem.

Seeds of green gram var. 525, were allowed to germinate and grow in petridishes for about 8 days in the dark. The vitamin B₁ (5 ppm) and IAA (5 ppm) treatment was given only for 24 hours, to avoid fungal or bacterial infection. The seedlings were then allowed to grow in distilled water in petridishes. Respiratory activity was measured by the usual Warburg manometric technique. The protein and soluble nitrogen were estimated using the method of Markham³ and Thimann and Loos⁴. IAA at 5 ppm, although inhibitory at the initial stages, promoted the growth to about 15% over control. The stimulatory effect of B₁ (5 ppm) on growth (Fig. 1) gradually declined from about 14% to nearly 10% inhibition, over the control. The combined effect of IAA and B₁ was quite inhibitory. The effectiveness of auxin was reduced by thiamine in relation to growth (elongation). The respiratory activity (Table I) was inhibited by IAA. The stimulatory effect of IAA on growth in later stages of growth was not due to the increased respiratory activity. Thiamine (B₁) reversed the respiratory inhibition by IAA thus indicating the antagonistic behaviour.

With IAA treatment, there was a reduction in protein and soluble nitrogen contents. Thiamine (B_1) treatment caused an increase in protein nitro-

gen content when compared to that of control as well as with that of IAA treatment. The decrease in soluble nitrogen content caused by IAA treatment was counteracted or reversed by B_1 treatment particularly on the 4th day. On the sixth day IAA treatment showed an increase in soluble nitrogen with a concomitant decrease in protein nitrogen as compared to thiamine treatment. This apparently indicates that B_1 treatment caused an enhanced protein synthesis (compared to control and IAA) and that IAA treatment reduced the protein nitrogen while increasing the soluble nitrogen content. Thus, the antagonistic effect of B_1 and IAA was partly revealed from the behaviour of protein metabolism.

Thiamine reversed the respiratory inhibition by IAA and the decrease in soluble nitrogen content with IAA treatment was also reversed by thiamine. B_1 was stimulatory in the initial stages and inhibitory at the later stages. IAA was inhibitory in the initial stages and stimulatory in later stages. This was a contrary behaviour indicating mutual

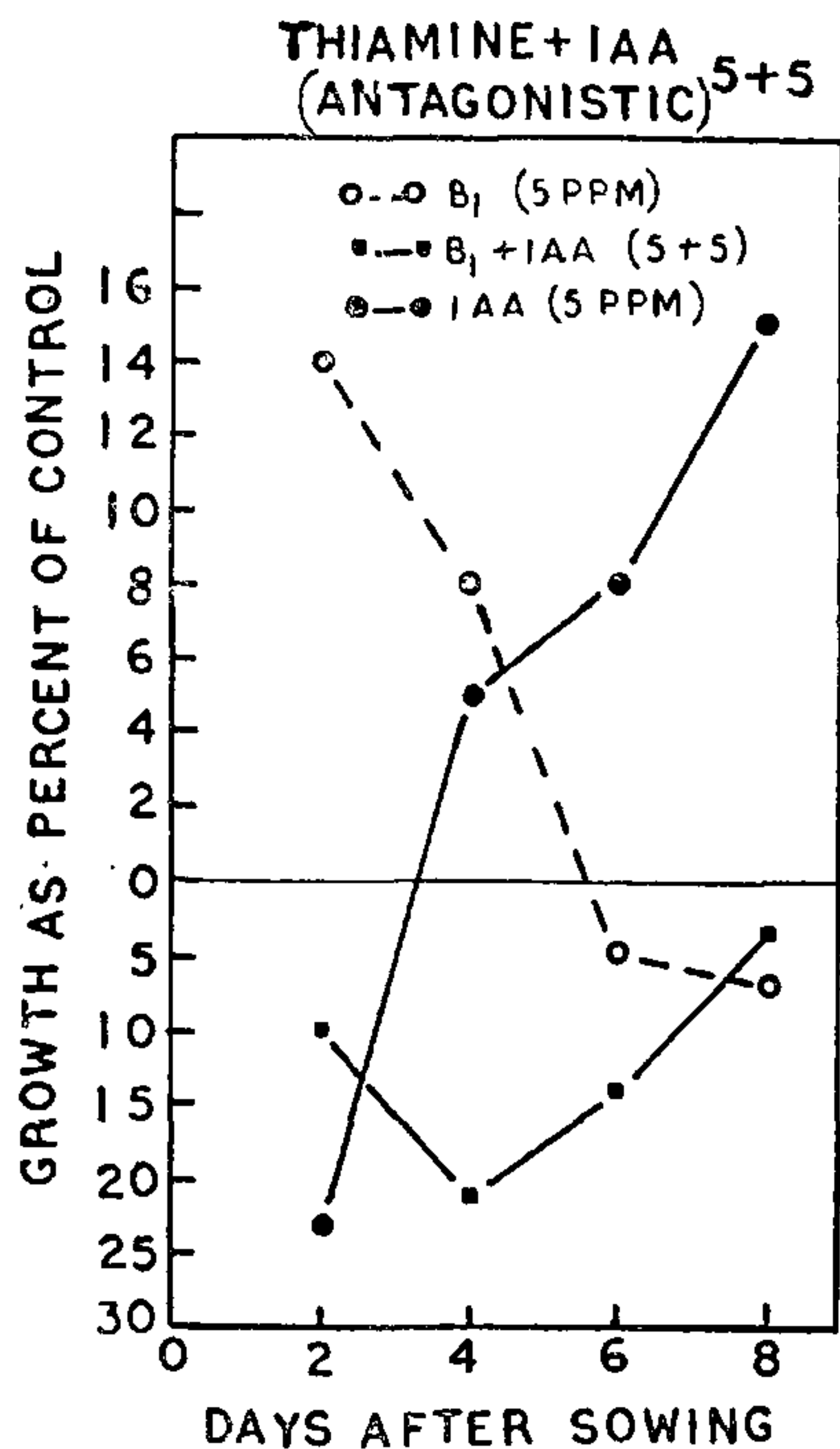


FIG. 1

TABLE I
Oxygen uptake (μ l/seedlings) of the seedlings
(The values are mean of two replications)

Treatment	Days after sowing			
	2	4	6	8
Control	6.0	40.0	25.5	18.0
B_1	15.0	43.0	49.0	19.0
IAA	11.0	26.0	18.0	12.0
$B_1 + IAA$	35.0	30.6	17.0	14.4

TABLE II
Nitrogen fractions (mg/gm dry wt.) of the seedlings
(The values are mean of three replications)

Treatment	Days after sowing					
	4			6		
	Total nitrogen	Protein nitrogen	Soluble nitrogen	Total nitrogen	Protein nitrogen	Soluble nitrogen
Control	49.56 ± 0.14	28.56 ± 0.11	21.00 ± 0.14	61.32 ± 0.14	21.84 ± 0.32	39.48 ± 0.14
B_1	52.08 ± 0.13	34.86 ± 0.15	17.2 ± 0.13	51.24 ± 0.37	30.24 ± 0.15	21.00 ± 0.37
IAA	43.68 ± 0.10	29.40 ± 0.27	14.28 ± 0.10	57.54 ± 0.12	23.10 ± 0.21	34.44 ± 0.12
$B_1 + IAA$	53.34 ± 0.30	29.82 ± 0.13	23.52 ± 0.30	57.96 ± 0.17	23.94 ± 0.87	34.02 ± 0.17

antagonistic nature of both. B_1 antagonised the efficacy of IAA in increasing protein nitrogen through decreasing the soluble nitrogen. Soluble nitrogen content was not utilized in protein synthesis in IAA treated seedlings. That IAA was inhibitory in the initial stages and promotory at the later stages can be corroborated by the earlier report of Evans and Ray¹. The role of thiamine in respiration in the conversion of pyruvate to acetyl CoA is well known. The possibility that B_1 may cause reduction in endogenous level of IAA cannot however be ruled out.

The authors thank Prof. V. S. Rama Das for his encouragement and for providing facilities.

Department of Botany, P. GOPALA RAO.
Sri Venkateswara University, N. RAJA KUMAR.
Tirupati, March 11, 1976.

1. Evans, M. L. and Ray, P. M., *J. Gen. Physiol.*, 1969, 53, 1.
2. Dahlhelm, H., *Planta*, 1956, 86, 224.
3. Wain, R. L. and Fawcett, C. H., *Plant Physiology*, Ed. F. C. Steward, 1969, 5A, 272.
4. Markham, R., *Biochem. J.*, 1942, 36, 790.
5. Thimann, K. V. and Loos, G. M., *Plant Physiol.*, 1957, 32, 274.

ON TERMINAL SCLEREIDS IN *BELLENDENA MONTANA* R.Br. (PROTEACEAE)

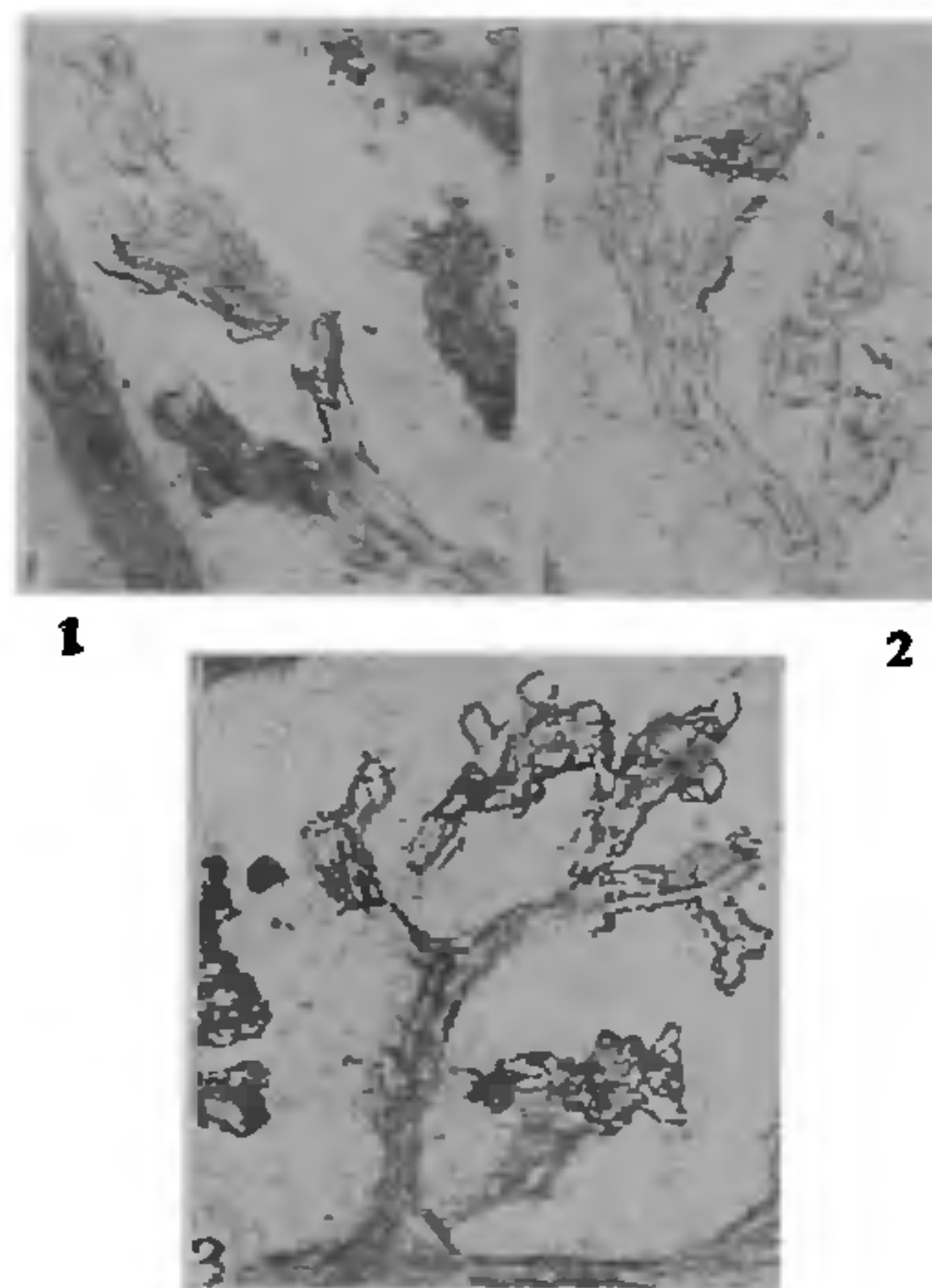
DURING the studies on the comparative morphology of foliar sclereids in angiosperms, a hitherto unreported case of a range in pattern of distribution of terminal foliar sclereids was observed in a remote member of the Proteaceae, which warranted a detailed study.

Materials

Bellendena montana R. Br. Tasmania, Summit of Mounts Wellington, Simson 688 (LE); Tasmania, Gunn. s.n. (LE); Nova Holland, Preiss 666 ((LE).

Cleared leaf sectors of the three specimens of *Bellendena montana*, a monotypic exclusively Tasmanian species have revealed very interesting association of sclereids at the vein endings despite the occurrence of thinly sclerosed sheathing cells along major and minor veins. The range in pattern of distribution of sclereids at the vein endings include (a) terminal spheroidal or vermiform sclereids in singles or twos and sometimes in threes in the submarginal periphery (Fig. 3), (b) a bunch of vermiform sclereids at the terminal or subterminal position in the proximal half of the leaf (Fig. 2), (c) vermiform sclereids overlapping or intertwined with each other in close juxtaposition with tracheids at the distal or subdistal portions of the forking minor veins and veinlets in the mid-half of the lamina (Figs. 1 and 2), (d) the same

pattern as in (c) but showing 'feather brush' pattern in having free round ended sclereids aligned along the vein leaning towards the adjoining mesophyll cells in the vicinity of midrib region (Fig. 4). This diverse pattern in all probability is a mechanical reinforcement to reduce the detrimental effects of external pressures on the exposed laminar surface, and also to solve the problem of optimization of self-weight against rupture or curling and retention of rigidity and elasticity to regain its own shape once the force is withdrawn.



FIGS. 1-3. Cleared laminae of *Bellendena montana* showing a range in pattern of distribution of terminal foliar sclereids, $\times 96$.

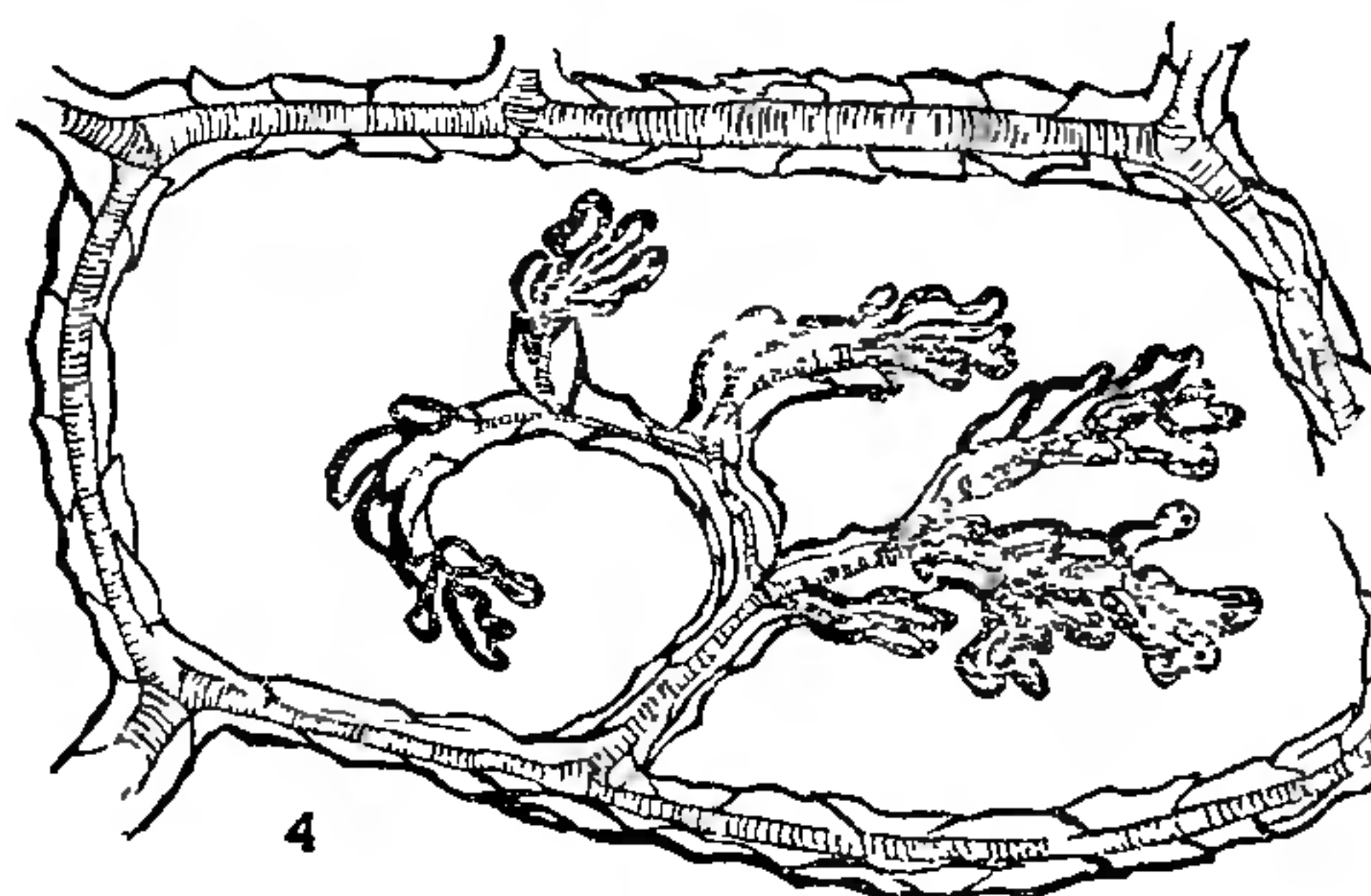


FIG. 4. Surface view of the lamina showing 'feather brush' pattern of foliar sclereids, $\times 60$.

Transections show that sclereids in contact with the tracheary veins are mid-mesophyll in position, and often show irregular lobes of round endings and occasionally the lobes are proliferated. The