

**Figure 1.** *Sordaria lappae* a. Perithecia ( $\times 100$ ) b. Ascospores ( $\times 450$ ).

$\mu\text{m}$ ; neck straight to bent on one side to rostrate; asci cylindrical, 8 spored,  $120\text{--}200 \times 12\text{--}20 \mu\text{m}$ ; ascospores uniseriate, dark brown at maturity, surrounded by a gelatinous sheath and provided with germ pores,  $20\text{--}40 \times 8\text{--}16.5 \mu\text{m}$  (figure 1).

Isolated from the forest soils of Jammu and Kashmir state during November 1981. The culture has been deposited with CMI, Kew, England (IMI No. 266994).

The authors are grateful to Prof. R. R. Das for facilities and to Dr D. W. Minter of CMI, Kew, England for confirming the identity of the fungal isolate. AKA wishes to acknowledge a teacher fellowship from UGC, New Delhi.

23 September 1982; Revised 28 February 1983

1. Saksena, S. B., *J. Indian Bot. Soc.*, 1955, 34, 262.
2. Warcup, J. H., *Nature (London)* 1950, 166, 117.
3. Martin, J. P., *Soil Sci.*, 1950, 69, 215.
4. Bilgrami, K. S. Jamaluddin and Rizwi, M. A., *Fungi of India*, Vols. 1 & 2, Today and Tomorrow's Printers and Publishers, New Delhi, 1979, 1981.

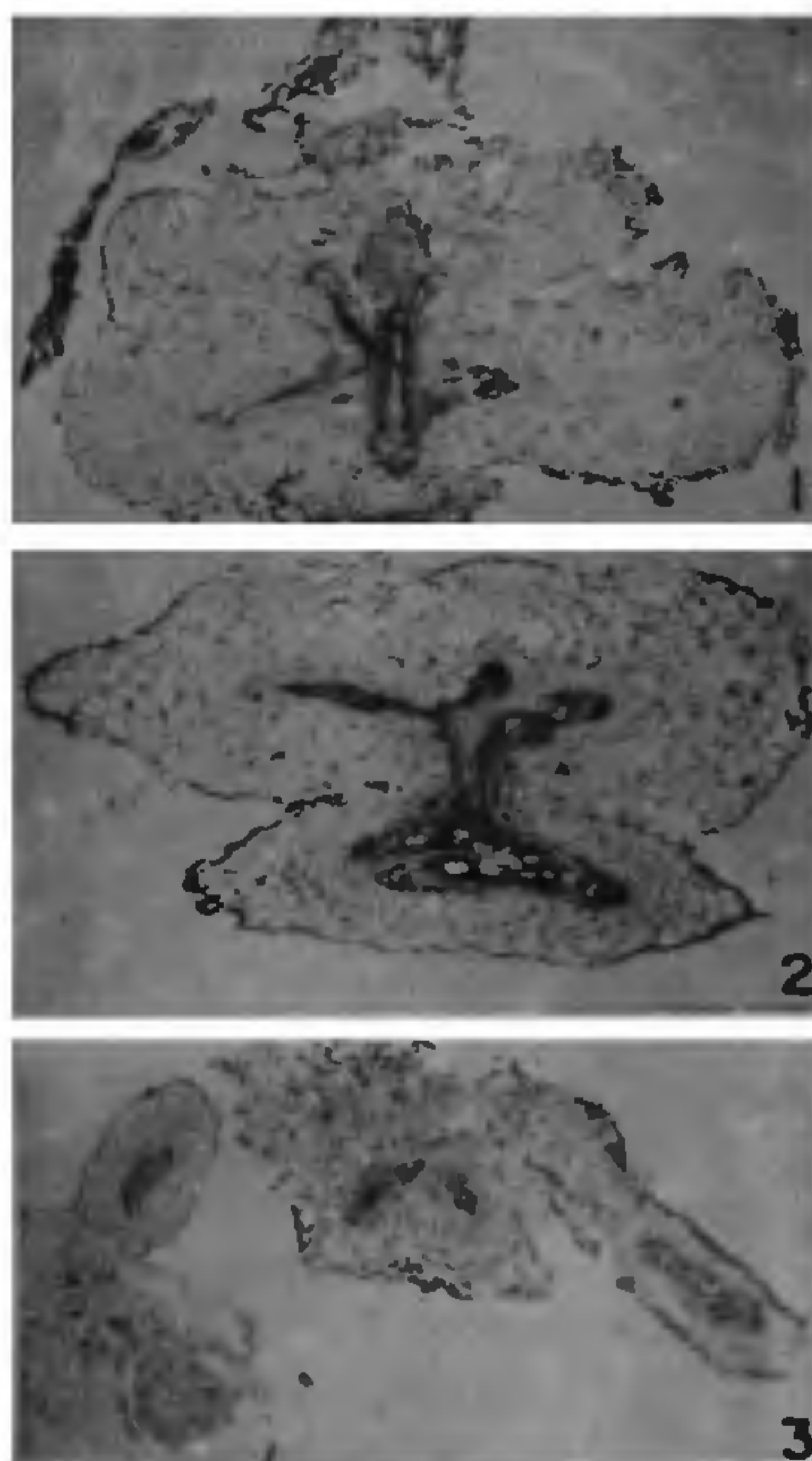
## PSEUDONODULES IN *CICER ARIETINUM* L.

P. S. JAIN, PURNIMA SHRIVASTAVA AND  
H. S. NARAYANA  
Botany Department, University of Rajasthan,  
Jaipur 302 004, India.

BEAL<sup>1</sup> observed swollen root tips in sweet pea induced by the foliar application of 4-chlorophenoxy acetic acid. Wilde<sup>2</sup> observed that red kidney bean grown in soil treated with 2,4-D produced distinctive terminal arrowhead swellings on the main roots. Histological

studies of these roots showed the pericyclic proliferation limited to the root tip areas. Allen *et al*<sup>3</sup> studied six leguminous species (*Lens esculentum*, *Pisum sativum*, *Arachis hypogaea*, *Glycine max*, *Vigna sinensis* and *Phaseolus vulgaris*) which were both inoculated by *Rhizobium japonicum* and treated with 2-bromo-3,5-Dichlorobenzoic acid. They found the hypertrophies resembling the typical root nodules in size, shape and location developed on the root system. Histological studies provided the evidence that these pseudonodular outgrowths were the modified rootlets. In the present paper pseudonodules which were formed as a result of addition of different rhizobial strains on *Cicer arietinum* L. are described.

During the cross-inoculation studies of 10 rhizobial isolates of leguminous weeds (*Erythrina suberosa*, *Lathyrus aphaca*, *L. sativus*, *Medicago polymorpha*, *Melilotus indica*, *Tephrosia apollinea*, *Trigonella corniculata*, *T. polycerata*, *Vicia hirsuta* and *V. sativa*) on *Cicer arietinum* it was observed that none of the rhi-



**Figures 1-3** *Cicer arietinum*. 1 and 2 Pseudonodules formed by inoculation with rhizobium of *Lathyrus aphaca*  $\times 24, 25$ . 3. Pseudonodules developed after cross-inoculation by rhizobium of *Trigonella polycerata*, note main root with lateral roots having swollen cortices at the base.  $\times 8$ .

zobial strains of the ten weeds was able to nodulate *Cicer arietinum*.

However, the pelleting of *Cicer* seeds with four rhizobial strains of *Lathyrus aphaca*, *L. sativus*, *Trigonella polycerata* and *Tephrosia apollinea* resulted in the formation of pseudonodules of varied size and shape containing enlarged parenchymatous cells without any bacterial infection (figures 1-3).

In one instance the histological studies of pseudonodules formed on *Cicer* under the influence of rhizobium of *Lathyrus aphaca*, consisted of a portion of primary root with its swollen parenchymatous cortex enclosing four lateral roots developed in close succession all round (figure 1). In another instance the main root which had branched off at one end bore two lateral roots with their swollen parenchymatous cortices (figure 2). The rhizobium of *Trigonella polycerata* influenced the formation of a pseudonodule consisting of a swollen cortices of the tap and lateral roots (figure 3). In this case the cause (non-homologous rhizobial strains or the type of their metabolites) for the development of pseudonodules deserves further study.

The authors are grateful to Prof. B. Tiagi for encouragement.

8 December 1982; Revised 8 February 1983

1. Beal, J. M., *Bot. Gaz.*, 1944, 105, 471.
2. Wilde, Mary. H., *Am. J. Bot.*, 1951, 38, 79.
3. Allen, E. K., Allen, O. N. and Newman, A. S., *Am. J. Bot.*, 1953, 40, 429.

## DEVELOPMENT OF THE EMBRYO IN *OREORCHIS FOLIOSA* LINDL.

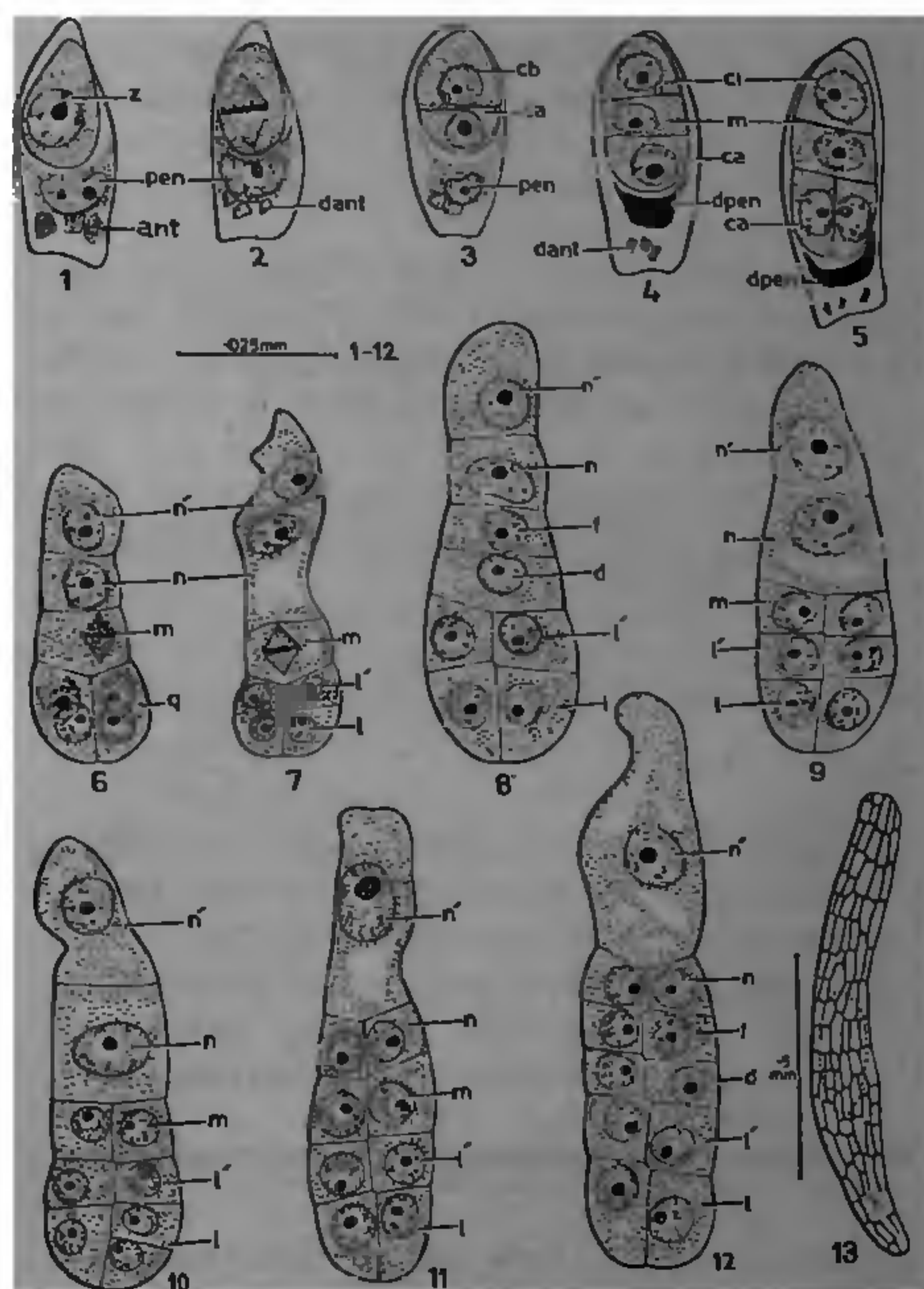
S. K. SOOD

Department of Biosciences, Himachal Pradesh University, Simla 171 005, India.

PERUSAL of the previous embryological works in Orchidaceae<sup>1-6</sup> revealed that the development of embryo in the genus *Oreorchis* Lindl., subtribe Cyrtopodiinae, tribe Epidendreae, subfamily Orchidoideae<sup>7</sup> is hitherto unknown and hence the present investigation was undertaken.

The zygote divides transversely resulting in a basal (cb) cell and a terminal (ca) cell (figures 1-3). The basal cell (cb) divides transversely forming a middle cell (m) and a suspensor initial (ci) cell (figure 4). The primary endosperm nucleus enlarges initially but degenerates at the three-celled stage of proembryo (figures 1-5). Longitudinal division occurs in (ca)

resulting in a T-shaped proembryonal tetrad (figure 5). The two daughter cells of the terminal cell (ca) divide longitudinally, at right angles to the first (figure 6), forming a quadrant (q) the cells of which are partitioned transversely leading to an octant which contains two tiers (l) and (l') of four cells each (figures 7,8). The middle cell (m) divides transversely to form (d) and (f) (figures 6-8) whereas (ci) segments (figure 6) into (n) and (n'). Occasionally (m) divides longitudinally (figures 9-11). The cell (n') elongates and enlarges to form 1-celled suspensor (figures 9-12). It elongates considerably and embeds into the tissue of placenta. However, no branching of suspensor is observed. The seeds are numerous, minute and non-



**Figures 1-13.** 1. Zygote, primary endosperm nucleus and antipodals. 2. Zygote in transverse division. 3. Two-celled proembryo. 4. Three-celled proembryo; note the degenerated primary endosperm nucleus and antipodal cells. 5. Four-celled, T-shaped proembryonal tetrad. 6-8. Seven-, 11-, and 12-celled proembryos. 9-12. Later stages in embryogeny; note enlarged and vacuolated suspensor cell *n'*. 13. Mature seed with embryo. (ant, antipodals; dant, degenerated antipodals; dpen, degenerated primary endosperm nucleus; pen, primary endosperm nucleus; z, zygote.).