(Smith *et al.*, 1971[13]; Ashton and Crafts, 1973[1]), phenoxys (2, 4-D) inhibits growth and Rnase activity (Ashton and Crafts, 1973[1], Corbett, 1974[4]), and nitroanilires (Planavin) increase the carbohydrate content but affect nucleic acid metabolism and root growth (Schieferstein and Hughes, 1966[12]; Ashton and Crafts 1973[1]). But in the present studies all the chemicals inhibited the biosynthesis of chlorophyll. The case of Bladex supports Glabiszewski *et al.* (1966)[10] and Gorden and Moiselise (1967)[11] that it damages chlorophyll. The side effect of herbicides (Dubey and Mall, 1972[6]; Dubey, 1974[7]) and fate of pesticides has been critically reviewed (Crosby, 1973[5]; Burnside, 1974[3]) indicating their disappearance in the environment but the residual assessment of the herbicides used confirms that these compounds are slow in getting leached, and are least bio, thermo and photo degradable (Dubey and Rao 1974[8], 1975[9]) and hence express strong residual activity. This quantitative reduction in chlorophyll indicates the pollution potentials of these herbicides with reference to the soils of this region.

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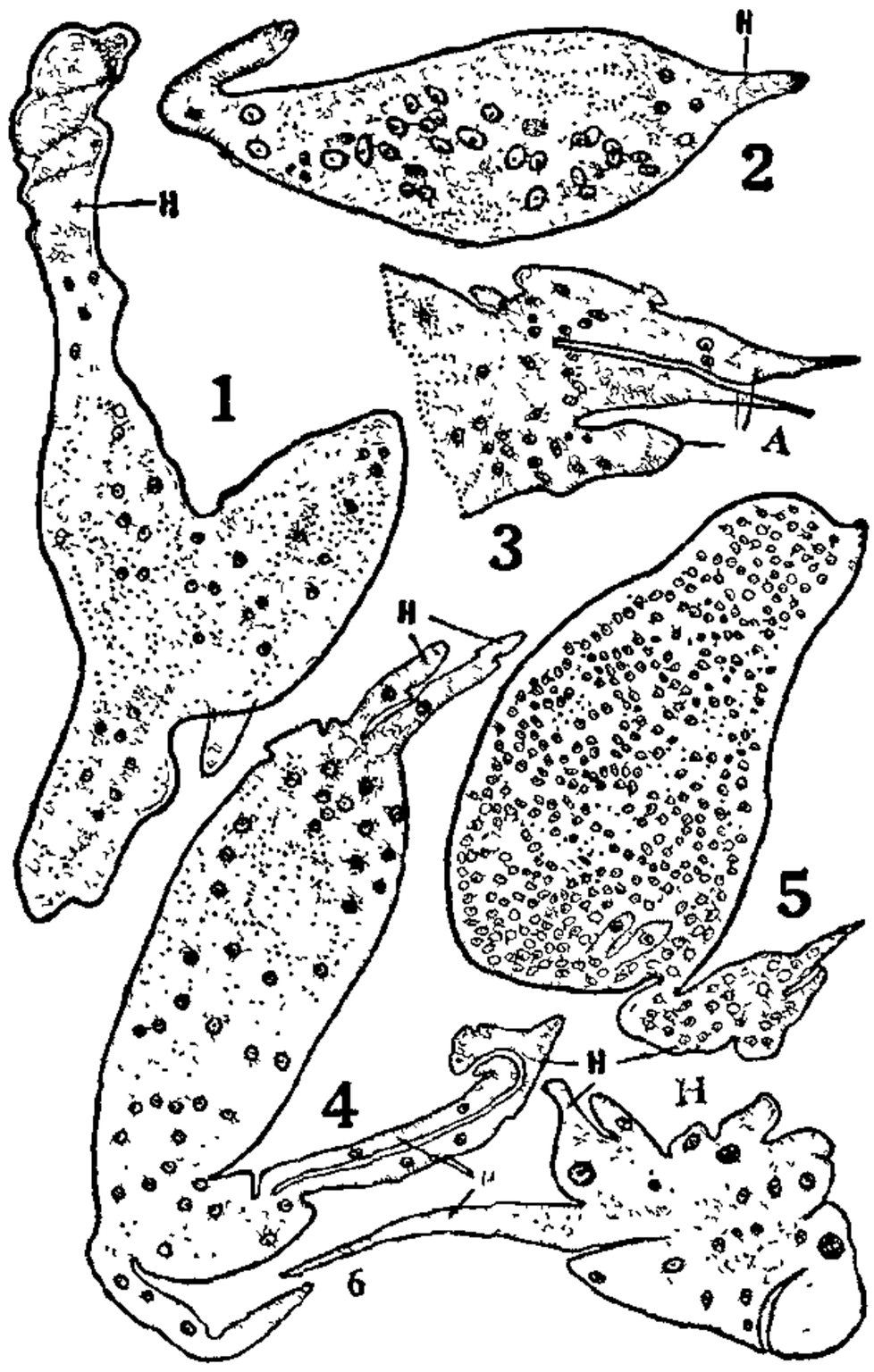
HAUSTORIAL APPENDAGES OF GIANT CELLS: ROOT-KNOT OF TOMATO (*MELOIDOGYNE INCOGNITA* CHITWOOD)

THE infective larva of the root-knot nematode enters the root and embeds its anterior end in the stele of the root. Profound histological changes are induced by inciting hypertrophy and hyperplasia in the pericycle, and xylem parenchyma of the host root. However, the nematode does not feed indiscriminately on these tissues. It incites in the soft stelar tissues around its head, a number of densely protoplasmic and multinucleate giant cells on which the nematode feeds.

The giant cells are formed either by repeated free nuclear mitotic divisions, without cell wall formation in a uninucleate hypertrophied initial cell[1] or a number of uninucleate initial cells fuse together by dissolution of their adjacent walls forming a syncytium in which the nuclei may divide mitotically[2,3] or before fusing, the uninucleate initials become multinucleate and later the nuclei may divide mitotically[4].

Many nematologists have studied the structure of giant cells by means of anatomical techniques including macerations and even by the electron microscope[5]. However, none so far has reported the appendages of the giant cells, described here (Figs. 1–6).



FIGS. 1–6. *Meloidogyne incognita*, giant cells with haustorial appendages (H), × 300. Fig. 3. A portion of the giant cell with pointed appendages. (A. appendages.)

It was suspected that the giant cells possess some mechanism for absorbing nutrients from the

adjacent stelar parenchyma. Therefore, the galls were cut into bits and macerated. The giant cells were dissected out. It was observed that they bear various kinds of irregular haustorial appendages, often with pointed ends (Figs. 3, 6). The appendages are intercellular and so densely protoplasmic that with haematoxylin, the nuclei and protoplasm take such a deep stain that the nuclei are hardly visible (Figs. 1, 2).

Some giant cells contain a large number of nuclei (Fig. 5) but others have a few of them (Figs. 2, 6). A giant cell shows some nuclei larger than others (Fig. 6).

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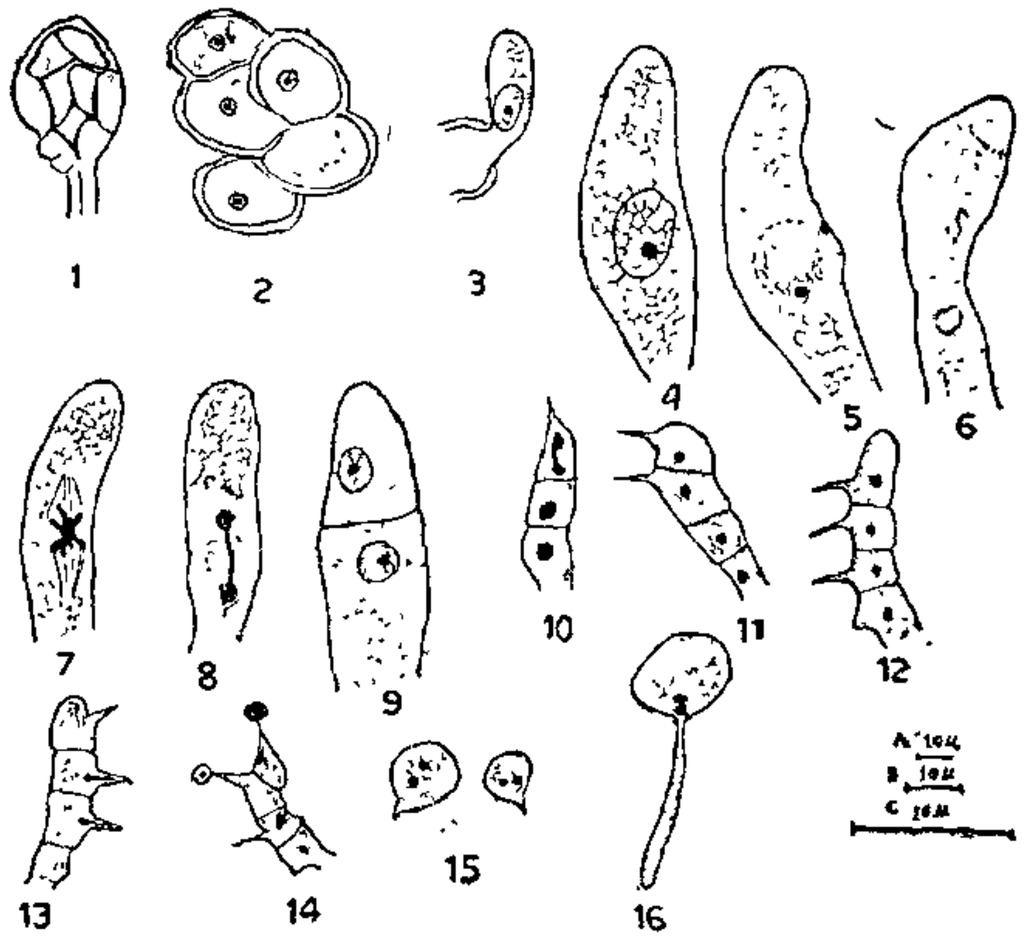
CYTOLOGICAL STUDIES IN THE GERMINATING TELIOSPORES OF *RAVENELIA ESCULENTA*

DETAILED observations on the behaviour of the diploid nucleus in the germinating teliospores of *Ravenelia esculenta* Naras. and Thirum., an autoecious rust, which parasitizes *Acacia eburnea* Willd. have been made. The telial material was collected near Nipani (Karnataka State) and the teliospores were germinated by hanging drop method. The spores germinated within 5 to 7 hours at room temperature without any resting period and remained viable for more than 10 days. Germinating teliospores were fixed at different stages of development in Allen's modified Bouin's fixative and stained in Heidenhain's haematoxylin and counterstained with Orange G. 1% acetocarmine stain also yielded satisfactory results.

The teliospore head consists of 4 to 12 spores grouped irregularly. The pedicel is compound and composed of 2 to 3 hyphae. There is a pendent cyst at the base (Fig. 1). In most of the cases more than 3 spores germinated from the spore head. Under excess moisture conditions, prolongation of germ tubes and sterigmata occurred. Each teliospore cell contains one diploid nucleus (Fig. 2). The teliospore cell germinates by giving rise to a papilla which elongates rapidly. The diploid nucleus migrates into the promycelium (Fig. 3). The migrating nucleus has a clear nuclear membrane with chromatin reticulum. Nuclear division commences when the interphasic nucleus approaches the middle part of the basidium (Fig. 4). At a later stage the nuclear membrane starts disappearing while the nucleolus and splitting reticulum move towards the periphery (Fig. 5). In the late prophase I the chromosomes spread out into two groups forming Diakinesis (Fig. 6).



FIGS. 1–16. Fig. 1. Teliospore head with pedicel, cyst and irregularly arranged spores. Fig. 2. Mature teliospore with diploid nucleus. Fig. 3. Migrating nucleus. Fig. 4. Nucleus in the middle of the Basidium. Fig. 5. Disappearing nuclear membrane with peripheral nucleolus and reticulum. Fig. 6. Diakinesis. Fig. 7. Metaphase I. Fig. 8. Anaphase I. Fig. 9. Late telophase I. Fig. 10. Division II, Anaphase II, upper nucleus. Figs. 11 and 12. Formation of sterigmata. Fig. 13. Migration of nuclei in the sterigmata. Fig. 14. Basidiospores on the sterigmata. Fig. 15. Binucleate basidiospores. Fig. 16. Germinating basidiospores.
(Magnifications : A—Fig. 1, B—2, 3, and 10 to 14, C—4–9 and 15 & 16).

During metaphase I, the chromosomes are at their shortest length. In the metaphase plate the chromosomes are arranged very compactly. Orientation of the metaphase spindle is rather indistinct with ill-defined fibres (Fig. 7). In anaphase I, the spindle contracts and the fibres coalesce into a single strand (Fig. 8). In telophase I the daughter nuclei are quite prominent and are separated by first cross wall formation (Fig. 9). A resting phase does not seem to occur as the first meiotic division is immediatly followed by a second division (Fig. 10). The nuclear behaviour in the second division is of a short duration as it is an equational one.

Even before the completion of the second nuclear division sterigmata are formed (Figs. 11, 12) which,