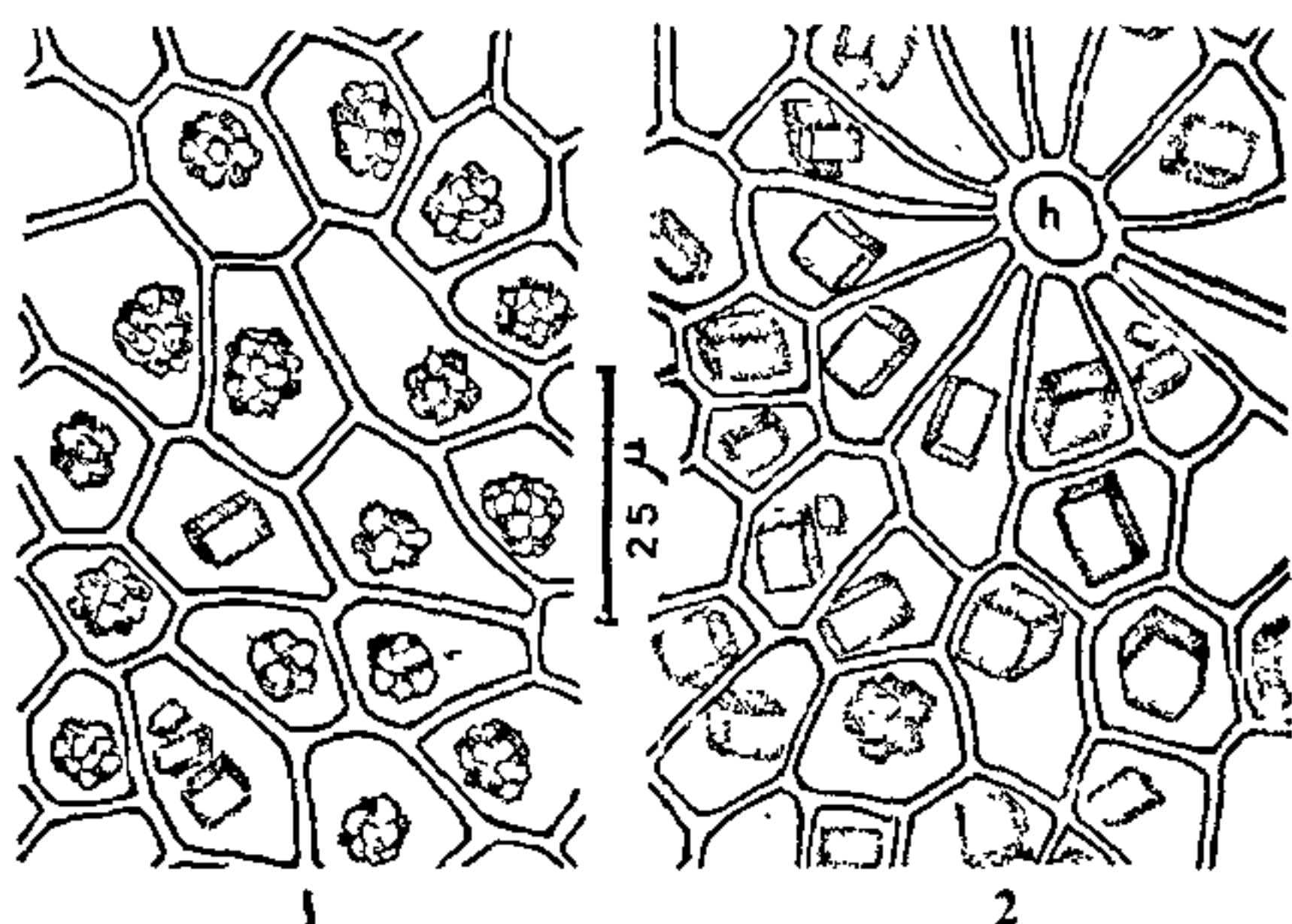


of the male plant (Fig. 2); one or two small crystals of the type found in the young leaves are seen in addition in some cells. In the epidermal cells of female plants (Fig. 1) the crystals are



FIGS. 1-2. Fig. 1. Portion of lower foliar epidermis of an adult plant of *M. fragrans*. Fig. 2. Same, of a male plant (h—hair-bearing cell.)

clustered to form large compound spherical masses (druses). Some epidermal cells of the male plants may have compound crystals of the female type; simple prismatic crystals of the male type are occasionally found in some epidermal cells of the female plant. The bisexual trees are similar to the male trees in the nature of the crystals. A study of 4-year-old grafted plants, in which seedlings of *M. contorta* Warb. are used as stalk, reveals that there is no apparent difference in the nature of the crystals in the foliar epidermis, even though crystals are absent in foliar epidermis of *M. contorta*.

As in the young leaves of adult plants, the foliar epidermis of young seedlings (one year old) contain 2-10 small prismatic crystals of nearly equal size. One of these crystals grows conspicuously larger as seedlings grow and gradually all or nearly all the others wane off in some plants while in the others the crystals get aggregated towards the middle of the cell. By the time the seedlings are two years old it is possible to distinguish the two types of plants, one having simple crystals and the other druses, even though the distinction is not as marked as in the adult plants. An analysis of 80 plants three to four years old in the University orchard revealed that 41 of them possess simple crystals of the male type and 39 possess druses in the cells of their lower foliar epidermis. This proportion of 51 : 49 nearly corresponds to the reported 50 : 50 proportion between male (including bisexual) and female plants in seed-raised plantations. It is reasonable to state that the sex of nutmeg plants can be identified from the nature of the crystals found in the lower foliar epidermis of seedlings which are

two or more years old i.e., five to seven years before the seedlings come to flower.

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HERBICIDAL POLLUTION-CHLOROPHYLL CONTENT AS AN INDEX OF RESIDUAL TOXICITY

PREFIX [2, 6-dichlorothiobenzamide], 2, 4-D [2, 4-dichlorophenoxyacetic acid], Bladex [2-(4-chloro-6-ethylamino-S-triazin-2-ylamino)-2-methylpropionitrile] and Planavin [4-(methyl sulphonyl)-2, 6-dinitro-N, N-dipropyl aniline] were mixed in the garden soil on 50 ppm by weight basis. The treated soils were kept in pots. About 20 cm rainfall was recorded during the experiment. Additionally these soils were leached with 16 litres of water. The gram (*Cicer arietinum*) was grown in these pots as test plant. Leaves of one month old plants were sampled for chlorophyll content and it was estimated by Bray² (1960) formula.

Apparently no difference could be marked in the leaves of the test plant grown in treated soils. But the data (Table I) indicate a reduction in chlorophyll contents with all the types of herbicides belonging to the different chemical groups. Planavin, residues

TABLE I

Chlorophyll content in the gram grown in treated soils

Herbicide	Chlorophyll content mg/g fresh weight				
	a	b	a/b Ratio	Total	% Reduction
Control	2.004	1.329	1.5	3.333	..
Prefix	2.242	0.946	2.3	3.188	4.5
2, 4-D	2.164	0.734	2.9	2.898	13.11
Bladex	1.872	0.736	2.5	2.608	21.6
Planavin	1.580	0.730	2.1	2.310	30.2

appeared most toxic as about 30.2% reduction was recorded. This is followed by Bladex (21.6%), 2, 4-D (13.11%) and Prefix (4.5%). It is known that different groups of herbicides have different modes of action as Prefix inhibits the respiration and protein synthesis

(Smith *et al.*, 1971¹³; Ashton and Crafts, 1973¹), phenoxys (2, 4-D) inhibit growth and RNase activity (Ashton and Crafts, 1973¹, Corbett, 1974⁴), and nitroanilines (Planavin) increase the carbohydrate content but affect nucleic acid metabolism and root growth (Schieferstein and Hughes, 1966¹²; Ashton and Crafts 1973¹). But in the present studies all the chemicals inhibited the biosynthesis of chlorophyll. The case of Bladex supports Glabiszewski *et al.* (1966)¹⁰ and Gordon and Monselise (1967)¹¹ that it damages chlorophyll. The side effect of herbicides (Dubey and Mall, 1972⁸; Dubey, 1974⁹) and fate of pesticides has been critically reviewed (Crosby, 1973⁵; Burnside, 1974³) 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 1974⁹, 1975⁹) 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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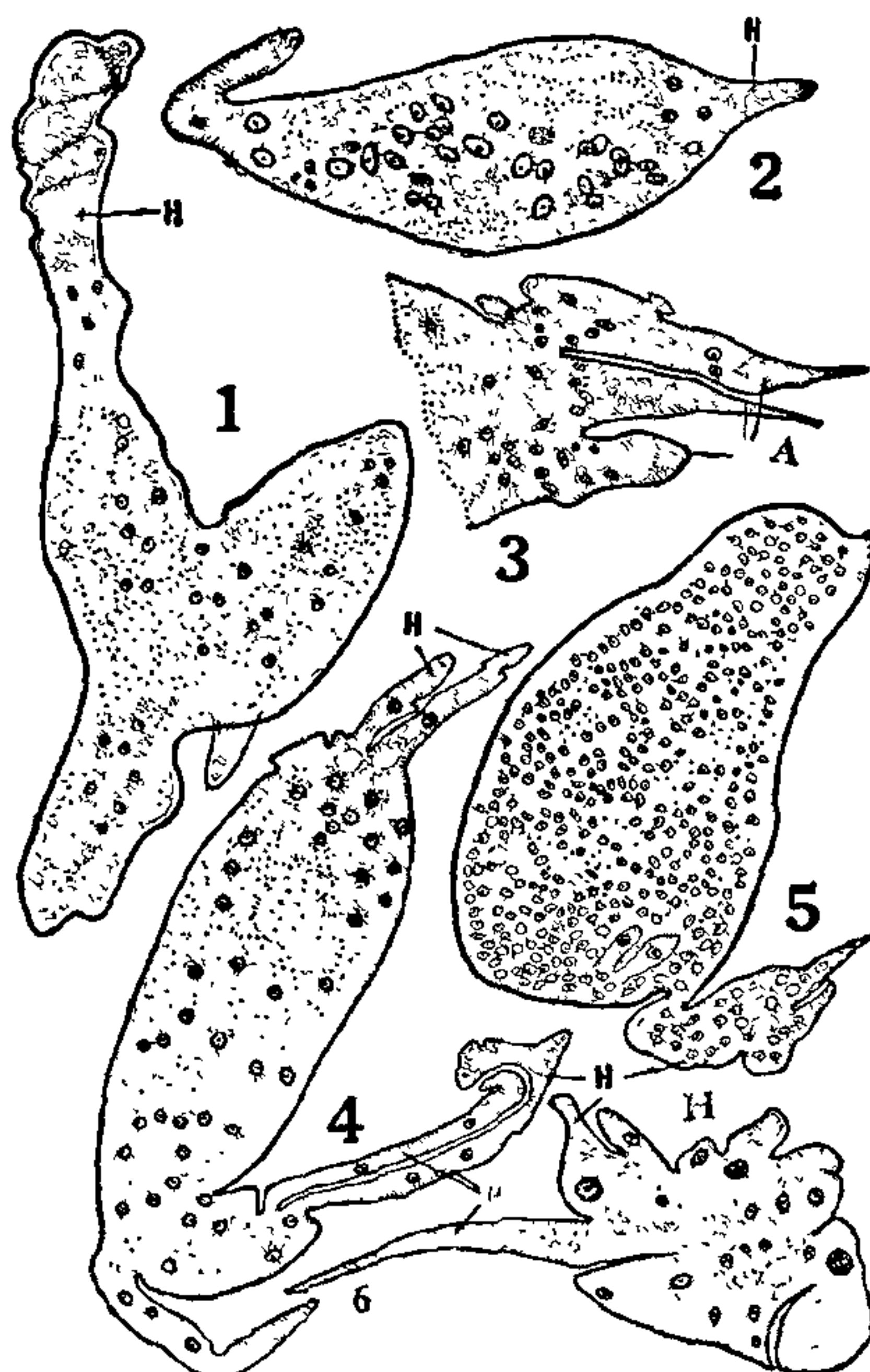
HAUSTORIAL APPENDAGES OF GIANT CELLS: ROOT-KNOT OF TOMATO (MELOIDOGYNE INCOGNITA CHITWOOD)

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 cell¹ 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 mitotically⁴.

Many nematologists have studied the structure of giant cells by means of anatomical techniques including macerations and even by the electron microscope⁵. 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), $\times 300$. 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