Deakin (1973) and artificially infected beans and tomato by Wong & Willetts (1969).

Roselle, *Hibiscus sabdariffa* L., is a host for *Meloidogyne* sp. (Bessey, 1911); however, it is more resistant to *M. incognita* (Kofoid & White) than the related plant *H. cannabinus* L. (Wilson & Summers, 1966).

[redacted]

present in the xylem and the cortex. Hypertrophy and hyperplasia were commonly observed at most infection sites. Juvenile development had commenced as indicated by an increase in body diameter visible in some sections.

After 15 days, giant cells were markedly enlarged and their walls were thickened (Fig. 3). Much more hyperplasia was observed in the phloem and adjacent cortex. Juvenile development had reached the late second, or "sausage", stage (Note spikate tail of juvenile in Fig. 4).

After 20 days, infection had progressed further with prominent disruptions in the vascular system caused by the increased size of giant cells, and some showed deterioration of the cytoplasm and an increase in size of vacuoles. One giant cell measured 470 μm in length. Some juveniles had increased considerably in diameter suggesting development to the young female stage. One longitudinal section showed an unusual orientation of nematodes in which the anterior end of one was directed toward the stem apex while another was directed toward the root (Fig. 5).

After 25 days, the infections were further developed with a larger amount of tissue involved in giant cell development, hyperplasia and hypertrophy. Walls of certain giant cells were conspicuously thickened (Fig. 6). Sections through developing females showed gonadal development and the presence of at least one shed cuticle indicating that the adult stage had been reached (Fig. 7).

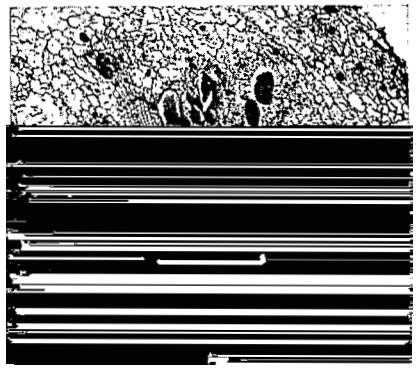
After 40 days numerous females were observed and most had deposited large numbers of eggs (Fig. 8). Young, vermiform juveniles were observed in the cortex, presumably as a result of reinfection.

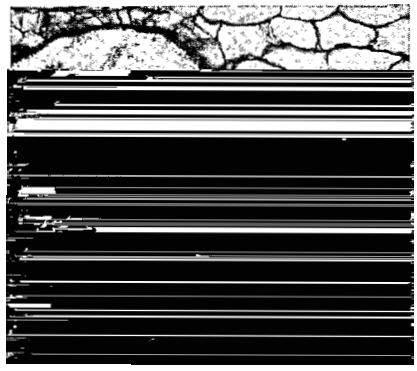
Mode of infection of juveniles. Examination of germinating seedlings prior to emergence consistently showed the presence of second-stage juveniles within hypocotyl tissue.

Species identification. Mature females were dissected from five infected stems of *H. sabdariffa.* A total of 50 perineal patterns were made (Taylor & Netscher, 1974), and all conformed to the description of *M. incognita.*

Inoculation with clones of M. incognita *and* M. javanica. To determine if *H. sabdariffa* stem tissue could be utilized to select *M. incognita* from a mixed population, a supplemental experiment was made in which the experiment previously described was repeated except that five pots were infested with egg masses from a clone of *M. incognita* derived from a single egg mass and an additional five pots were infested with egg masses from a clone of *M. javanica* derived from a single egg mass. Stem galls, as described above, were produced in this experiment on all plants of *H. sabdariffa* regardless of the species of *Meloidogyne* used. No differences were noted between galls induced by the two species.

Discussion. On the basis of the observations of second-stage juveniles of *Meloidogyne* within hypocotyl tissue of *H. sabdariffa* prior to seedling emergence, it is concluded that penetration occurs while the hypocotyl is still below the soil level. This supports the statement of Linford (1941) that juveniles enter during germination and that of Fassuliotis & Deakin (1973) who maintain that juveniles invade bean hypocotyls during emergence. These juveniles are then





carried passively as the aerial parts of the developing seedling emerge and expand. There is no evidence that the infection occurred after seedling emergence except for reinfection by second generation juveniles. Once within the stem juveniles were presumably protected from desiccation and radiant energy by the surrounding plant tissues and were able to establish a typical host-parasite relationship. Giant cell development appeared typical of *Meloidogyne* infections of roots. This same conclusion was reached by Wong & Willetts (1969) in infected stem tissues artificially inoculated with *M. javanica*. Although Linford (1941) and Wong & Willetts (1969) reported that juveniles in stem tissues always had the anterior end directed toward the stem apex, observations in this study established