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DEVELOPMENT AND PATHOGENESIS OF *MELOIDOGYNE JAVANICA* IN PEANUT ROOTS

by

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Very little information is available on the development and pathogenesis of the root-knot nematodes (*Meloidogyne* spp.) in peanut roots (Castillo *et al.*, 1973; Minton, 1963). In view of this, the present investigation was made to describe the development of *M. javanica* (Treub, 1885) Chitwood, 1949 in the roots of the peanut cultivar Giza 4 and the related anatomical changes.

Material and Methods

The nematode inoculum used in this study was originally obtained from peanut roots infected with *M. javanica* and collected from El-Tahreer Province. A single egg mass of an identified female was isolated and the hatched larvae were then cultured on peanut plants.

Peanut seeds of the cultivar Giza 4 were planted in steamed sandy loam soil in 36 clay pots, 20 cm diam. After emergence, the seedlings were thinned to two per pot, and then inoculated with 2,500 second-stage larvae per pot, 8 days after planting. Pots were kept outdoors (day temperature 33 $\pm$ 2°C, night temperature 21 $\pm$ 2°C)

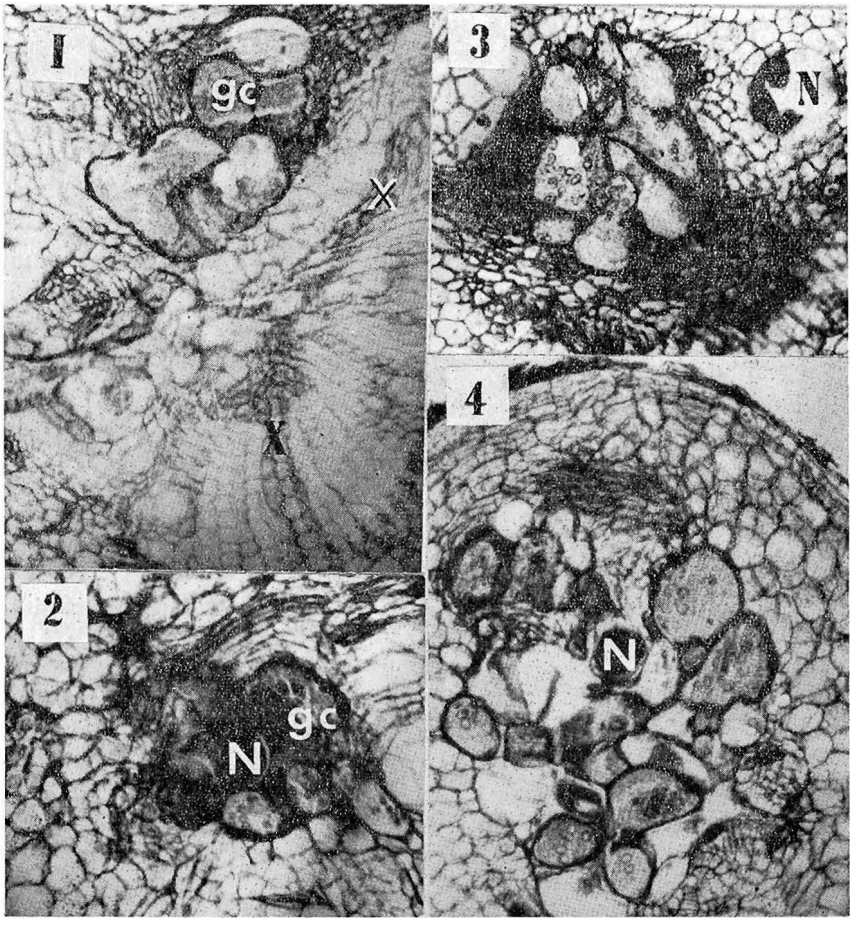
and watered daily. Seedlings of two pots were pulled gently from the soil at 12 hr, 1, 2, 4, 6, 8, 12, 16, 20, 24, 28 days and then at 2 days intervals up to 42 days following inoculation.

Galled parts of the infected root samples taken at each interval were killed and fixed in FAA. For studies of the nematode development and the related anatomical changes of infected peanut roots, root specimens were processed as described previously by Ibrahim and Massoud (1974).

Results

Microscopic observations of infected peanut roots revealed that second stage larvae invaded young roots within 12 hr after inoculation. Most of the nematode penetration occurred in the meristematic tissue of the root tips. Passage of larvae through the root tissues resulted in distortion of the nearby cells. Larvae were observed feeding in the cortex, pericycle and the regions where lateral roots were formed. In 4-6 days, hypertrophy and hyperplasia were detected in the cells surrounding the nematode feeding sites. Larvae increased in width until the eighth day and most of them had reached the third stage 10-12 days after inoculation. In 12 days, giant cells were well established in contact with the feeding sites of the larvae. In 16 days, fourth-stage larvae and well-defined giant cells were observed (Figs. 1,2). About 3-8 giant cells were present near the nematode head and each cell contained several darkly stained nuclei (Figs. 2,3). Walls of the giant cells were thickened and darkly stained. Dissolution of walls of the adjoined giant cells was observed and resulted in the formation of openings between adjacent giant cells which became multinucleate. Crushed and necrotic cells were found around the developing nematodes and giant cells in the cortex and stele (Figs. 3,4). Hypertrophy of the xylem parenchyma and giant cell formation resulted in malformation in the shape of the xylem vessels and the inhibition of secondary growth of the xylem and phloem tissues (Fig. 1).

Young and adult females were detected 20 and 24 days after inoculation, respectively. Adult females oviposited 32 days after inoculation. In 42 days, infection of roots by second stage generation larvae was observed.



Figures 1-4 - Transverse sections of peanut roots infected with *M. javanica*. 1, 2. Infected roots, 16 days after inoculation. Note cellular disorganization, hypertrophy and giant cells. 3. Groups of giant cells with dark-stained walls and several nuclei, 28 days after inoculation. 4. Heavily infected root, 32 days after inoculation, showing cellular disorganization and giant cells around the nematode body (N = nematode, gc = giant cells, x = xylem.

Discussion

The results showed that the peanut cultivar Giza 4 was a favorable host for the rot-knot nematode, *M. javanica*. Infective second-stage larvae penetrated young roots within 12 hr after inoculation and the life cycle of the nematode was completed in about 42 days.

In similar studies, Castillo *et al.* (1973) showed that the life cycle of *M. hapla* on peanuts was completed in 39 days.

The results also indicated that migration and development of *M. javanica* larvae were associated with the described anatomical changes of the infected root tissues. Anatomical changes included the formation of hypertrophy, hyperplasia and giant cells in the cortical and stelar tissues. A major consequence of nematode development and giant cell formation in the stele was the malformation of the xylem elements and the inhibition of secondary growth of the xylem and phloem tissues. These effects can be readly related to the restricted growth of infected peanut plants.

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