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STUDIES ON THE LIFE CYCLE OF *MELOIDOGYNE INCOGNITA* IN TWO CULTIVARS OF *TRIGONELLA FOENUM-GRAECUM*

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Summary. The life cycle of the root-knot nematode *Meloidogyne incognita* was studied in two cultivars of *Trigonella foenum-graecum*. The second stage juveniles entered the roots within 24 hours of inoculation. Egg formation was seen in the female body 36 days after inoculation in susceptible cv. UM-83 and 44 days after inoculation in resistant cv. UM-34. The life cycle was completed in 42-44 days in UM-83 in 48-50 days in UM-34.

Trigonella foenum-graecum L. is an important herb condiment that is widely cultivated in Rajasthan, India. It can be severely damaged by *Meloidogyne incognita* (Kofoid *et* White) Chitw. and usually high populations of the nematode are associated with poorly growing plants (Sharma and Trivedi, 1988). Preliminary studies of the life history and development of *M. incognita* have been undertaken in detail in a susceptible cultivar of tomato (Triantaphyllou and Hirschmann, 1960). This is the first time that the development of this root-knot species has been studied in susceptible and resistant fenugreek cultivars.

Materials and methods

Seeds of two cultivars of *T. foenum-graecum*, UM-83 and UM-34, were sown in 10 cm diam. plastic pots and when the seedlings were one week old they were thinned to two per pot. Each plant was inoculated with 500 freshly hatched second stage juveniles of *M. incognita*. After 24 hours, all the plants were uprooted, the roots carefully washed and transplanted into fresh sterilized soil to prevent further penetration of the nematodes.

The plants were grown in 10 cm diam pots for treatments up to 72 hours and in 15 cm diam pots for treatments extending beyond this time. Plants were uprooted carefully after 12, 24, 36, 48 and 72 hours initially, then daily up to 10 days after inoculation and finally at five day intervals until 50 days. Root samples were washed carefully in running water, stained in warm 0.1% acid fuchsin for 2 minutes and placed in lactophenol for several hours. Temporary mounts were prepared in lactophenol and observed with a stereoscopic microscope.

Various developmental stages of the penetrating nematode, from J_2 to ovipositing female, embryogenesis and formation of J_2 were observed with respect to time. Time of all the four moults were also observed. Morphometrical measurements were taken of the different stages of the nematode (Table I).

Table I - *Measurements of different developmental stages of* Meloidogyne incognita *in fenugreek varieties UM-83 and UM-34.*

Stages	Length x Width (µM)	
	UM-83	UM-34
Second stage - Infective juvenile	220 x 12.5	218 x 12
Second stage - Sedentary juvenile	235.7-280.6 x 30	227-262 x 28
Spike-tailed stage	210-250 x 48-128.4	200.4-239.6 x 45-126.6
Adult female	410.7-500.8 x 300.3-390.2	346.5-422.9 x 295.4-378
Ovipositing female	519-590 x 370-450	408-500.4 x 322.6-365
Adult male	1300 x 64	1288 x 58
Egg	80.5 x 33.5	79.6 x 33

Observations are mean of ten replicates.

Results

The second stage juveniles (J_2) penetrated the fenugreek roots within 24 hours. They penetrated the root tips, just behind the root cap, in the region of cell elongation. The terminal one cm of the root was very susceptible to nematode entry, however, the lateral root tips as well as their primordia, were common sites for penetration. Numerous laterals in variety UM-83, provided many sites for maximum penetration but penetration was very poor in UM-34. Second stage juveniles moved within the roots after penetration, migrated initially intercellularly in the cortex, away from the root tip and parallel to the root axis. They ultimately moved into the vascular parenchyma and induced giant cell initials. The J_2 became sedentary within three days after inoculation in UM-83 whereas in UM-34 the first sedentary juvenile was seen six days after inoculation.

The second moult of J_2 was observed nine days after inoculation in UM-83 and 13 in UM-34. This moult gave rise to the third stage juvenile J_3 which lasted for 8 days in both cultivars. The fourth stage juvenile lasted for seven days in UM-83 and 12 days in UM-34. The fourth moult followed rapidly and gave rise to a young female. The females increased in length and width and assumed typical swollen shapes. Egg formation was seen in the female body at 36 days after inoculation in UM-83 and 44 days after inoculation in UM-34. The female secreted a gelatinous matrix and most of the eggs in the matrix contained first stage juveniles by 38 days after inoculation in UM-83 and 46 in UM-34. Males were rare in UM-83, whereas large numbers were observed in UM-34. Not much variation was observed in the size of the various stages whether present in UM-83 or UM-34; however, adult ovipositing females in UM-34 roots were significantly smaller than those formed in UM-83.

The life cycle of *M. incognita* from egg to egg was completed in 42-44 days in UM-83 and in 48-50 days in UM-34 at 22 ± 3°C day temperature.

Discussion

The embryonic development, moulting and hatching of eggs of *M. incognita* were in accordance with that described by Bird (1959). Post embryonic development and the life history of *M. incognita* in fenugreek agreed with the description given for the species of *Meloidogyne* in *Vigna radiata* (Hussaini and Seshadri, 1976) and in tomato by Triantaphillou and Hirschmann (1960). The time taken for the juveniles to attain the spike-tail stage varied in both the cultivars of fenugreek, being longer (19 days) in UM-34 than in UM-83 (12 days). This agrees with the work by Hussaini and Seshadri (1976) on cultivar resistance of bean to *M. incognita* where J_2 lasted for 6-10 days in the resistant cultivar and 4-5 days in the susceptible cultivar. The life cycle from egg to egg took 42-44 days in UM-83 and 48-50 days in UM-34. However, no difference was seen in the total time taken by *M. incognita* to complete its life cycle in resistant and susceptible cultivars of mung bean (Hussaini and Seshadri, 1976). In UM-34 the numbers of juveniles that penetrated the roots were fewer than in UM-83 and their further development was inhibited or prolonged. The resistant nature of UM-34 may be due to this influence on the life cycle of nematodes.

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