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PATHOGENICITY AND LIFE CYCLE OF *MELOIDOGYNE*  
*INCOGNITA* ON SUGARBEET IN INDIA<sup>(1)</sup>

by

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In India, the acreage of sugar beet has increased considerably in recent years and root-knot nematodes (*Meloidogyne* spp.) have frequently been reported to cause damage to this crop (Singh and Misra, 1970, 1974; Mathur and Prasad, 1978). The most prevalent species found on sugarbeet in India is *M. incognita* (Kofoid et White) Chitw. on which investigations on the life cycle and pathogenic potential have been made and are reported here.

MATERIALS AND METHODS

Sugarbeet cv. Maribo-magnapoly seeds were sown in 23 cm diameter clay pots filled with sterilized soil. The seedlings were thinned to one per pot and when they were at the four leaf stage each pot was inoculated with second stage *M. incognita* larvae. Nematodes were added to provide a logarithmic series, with five replications each of 10, 100, 1,000 and 10,000 nematodes perpot, plus a control series without nematodes. To evaluate the pathogenicity of the nematode, after six months the growth of the plants were measured

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Table I - *Effect of Meloidogyne incognita on growth and sugar content of sugarbeet.*

Characters examined	Level of inoculum / pot					S. Em. ±
	0	10	100	1000	10000	
Fresh top wt. (g)	70.5	40.7	22.0	19.5	11.7	4.14
Dry top wt. (g)	7.	6.4	5.4	3.7	3.2	0.39
Sugar content %	15.4	13.2	11.9	11.0	9.8	—
Number of leaves	17.8	17.0	15.8	16.4	14.2	1.13
Length of petiole (cm)	141.6	136.0	111.0	81.2	104.7	8.19
Leaf area (cm)	676.6	551.0	386.6	260.4	258.8	42.12
Total fresh root wt. (g)	29.0	30.0	29.2	28.5	27.0	NS
Storage root wt. (g)	23.8	21.7	16.5	9.3	7.8	1.97
Length of tap root (cm)	24.2	18.4	13.5	7.6	6.8	2.29
Number of galls	—	44.2	162.2	247.6	258.0	12.3
Final larval population (in log scale)	—	2.944	3.283	3.986	3.892	0.006

Table II - *Comparison of measurement of second stage larvae of M. incognita from sugarbeet, tomato and brinjal (original inoculum) and as recorded in literature.*

Host plant	Body length (μ)	Tail length (μ)	Tail length Body length (c)	Tail length Anal body width (c)
Sugarbeet	429* (418-446)	53	8.1*	5.5*
Tomato, brinjal (original inoculum)	357* (343-380)	48	8.3*	5.2*
Carrot (Whitehead, 1968)	371 ± 16	46 ± 3	8.1 ± 0.67	—
Tomato (?) Chitwood, 1949 as given by Whitehead, 1968	360-393	—	8.0-9.4	—

\* Average of 50 specimens.

(Table I) and the numbers of galls on the roots and second stage larvae present in each pot were counted.

For life-cycle studies, 45 day old seedlings were planted in small waxed-paper cups containing sterilized sieved sand and each one inoculated with 500 second stage *M. incognita* larvae. Fortyeight hours after inoculation the seedlings were transferred to 10 cm diameter plastic pots filled with sterilized river sand. The pots were watered three times each week with Hoagland solution. Two seedlings were removed daily in the first week after inoculation and then every two days. The roots were stained in 0.01% acid fuchsin lactophenol and the nematodes then dissected from the roots and mounted in lactophenol to determine their stage of development. Observations were continued until fresh second stage larvae hatched.

## RESULTS

Increase in nematode inoculum was associated with progressive reduction in plant growth (Table I). The lowest inoculum level did not differ significantly ( $p = 0.05$ ) from the untreated control but the highest inoculum level caused more than 60% reduction in root weight and 79% reduction in tap root length. Nematode infestations also reduced the number of leaves per plant, leaf area and petiole length. Percent sugar decreased progressively with increase in nematode inoculum and the number of galls on the roots; sugar was 5.8% in the galled portions of roots compared with 15.4% in the ungalled portions (Table I).

*M. incognita* completed its life cycle (second stage to second stage larvae) in 39 days on sugar beet grown in pots and kept in a gauze house at an average ambient temperature of 20°C. Young females were found 27 days after inoculation and the first egg masses at 33 days. The number of eggs per egg mass ranged from 140 to 387. Second stage larvae started to hatch on the 39th day. Measurements of larvae from sugar beet showed them to be longer than those reared on tomato or brinjal plants, which were the host plants from which the initial inoculum was obtained (Table II). Body and tail length were influenced to a considerable extent by the host plant and the recorded minimum length (418  $\mu\text{m}$ ) of larvae from sugarbeet is more than the maximum length of larvae recorded from tomato or

brinjal (380  $\mu\text{m}$  and 393  $\mu\text{m}$  respectively) as reported in the literature (Whitehead, 1968).

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