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EFFECTS OF MANIFESTATION OF *MI* GENE IN A TOMATO HYBRID AND ITS PARENTAL LINE ON THE PENETRATION AND DEVELOPMENT OF *MELOIDOGYNE INCOGNITA*

by

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Summary. Effects of manifestation of *Mi* gene in a tomato F1 hybrid (FM-2) and its parental line (IIHR-550) on the penetration and post penetration development of *Meloidogyne incognita* (race 2) were investigated. Significantly fewer number of *M. incognita* juveniles penetrated tomato F1 hybrid (FM-2) when compared to a susceptible tomato cultivar (Pusa Ruby). Further, significantly lesser number of J2 *M. incognita* penetrated IIHR-550 (parent line of hybrid) when compared to the hybrid (FM-2). The development of juveniles into adult female was totally restricted in parental line, where a very few juveniles developed into adult females in hybrid, and out of those females very few females produced egg masses. Thus effects of manifestation of *Mi* gene were significantly different in tomato hybrid and its parent revealing that *Mi* gene activity is not completely transferred from parent to hybrid.

Root-knot nematodes, *Meloidogyne* spp., occur world wide and are important pests on many crops (Sasser, 1977). They can cause severe damage to the tomato crop (Lamberti, 1979), especially in tropical and sub-tropical areas. Gene *Mi* confers resistance against *M. incognita* in all the known tomato resistant lines and hybrids in the world (Viglierchio, 1978; Medina-Filho and Stevens 1980; Ammati, 1985).

The present study examines the expression of *Mi* gene in a tomato (*Lycopersicon esculentum.* Mill) F_1 hybrid (FM-2) and its parental line (IIHR - 550) on the basis of *Mi* gene manifestation on penetration and post penetration development of *M. incognita* Kofoid et White J. Chitw.

Materials and methods

Seeds of tomato root-knot nematode resistant F_1 hybrid (FM - 2), its parental line (IIHR-550) and nematode susceptible cv. Pusa Ruby were sown in seed pans, each filled with 3 kg of unsterilized soil infested with 2 J_2 *M. incognita* (race 2)/g of soil. Each treatment was replicated three times. As egg masses were not produced within 30 days, the seedlings were retained up to 45 days in the seed pans. Observations on penetration and development of *M. incognita* were recorded by staining the roots of five seedlings per pan at 15, 30 and 45 days after sowing. The technique of Byrd *et al.*, (1983) was followed for staining the nematodes in the roots.

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To study post transplanting penetration and development of *M. incognita*, one month old seedlings of FM-2, IIHR-550 and cv. Pusa Ruby, raised in sterilized soil, were transplanted singly into pots containing 2 kg of unsterilized soil harbouring 2 J_2 of *M. incognita* (race 2)/g soil. Each treatment was replicated 15 times and five replicates were harvested for each set of observations. Penetration and further development of juveniles were assessed by staining the roots of the transplanted plants of five replicates at 15, 30 and 45 days after transplanting.

Results and discussions

Meloidogyne incognita J_2 penetrated resistant hybrid (FM-2), its parent line (IIHR-550) and the susceptible cv. Pusa Ruby, but the extent of penetration differed significantly between the three. Significantly fewer juveniles penetrated FM-2 hybrid than Pusa Ruby (Table I). Of the total J_2 that penetrated into the roots of Pusa Ruby, 52-54% of them developed into adult females and most of these produced egg masses (Table I and II), whereas in FM-2, only

TABLE I - Meloidogyne incognita *penetration and development in nematode resistant line (IIHR-550), hybrid (FM-2) and susceptible cultivar (Pusa Ruby) of tomato in nursery seedlings before transplanting.*

Nematode resistant and susceptible tomatoes	No. of nematodes in 15 day old seedlings		No. of nematodes in 30 day old seedlings			No. of nematodes in 45 day old seedlings		No. of egg masses in 45 day old seedlings	No. of eggs per egg-mass
	J_2	J_3	J_3	J_4	Young females	J_4	Mature females		
Pusa Ruby	153	24	26	59	17	7	83	67	502
FM-2	81	10	8	31	3	30	9	4	315
IIHR-550	74	–	–	–	–	–	–	–	–
CD - 5%	19.57	2.73	2.58	8.42	1.82	3.57	9.57	7.15	47.18

TABLE II - M. incognita *penetration and development in nematode resistant line (IIHR-550), hybrid (FM-2) and susceptible cultivar (Pusa Ruby) of tomato after transplanting.*

Nematode resistant and susceptible tomatoes	No. of nematodes in 15 day old seedlings		No. of nematodes in 30 day old seedlings			No. of nematodes in 45 day old seedlings		No. of egg masses in 45 day old seedlings	No. of eggs per egg-mass
	J_2	J_3	J_3	J_4	Young females	J_4	Mature females		
Pusa Ruby	389	65	59	106	36	13	202	165	543
FM-2	173	22	17	68	8	68	19	6	327
IIHR-550	169	–	–	–	–	–	–	–	–
CD - 5%	33.78	9.57	8.12	11.57	2.67	9.76	23.98	19.76	58.62

7-8% of J_2 developed into adult females and a very few of them produced egg masses (Table I and II).

A similar pattern of penetration and development of *M. incognita* (race 2) was observed in tomato plants after transplanting (Table II). Although significantly fewer J_2 penetrated IIHR-550 when compared to FM-2, none of them developed into young or adult females. No developmental stages and not even trapped J_2 were seen in the roots of IIHR-550 at 30 and 45 days after sowing (Table I and II).

Development of a few *M. incognita* J_2 to adult females in F_1 hybrid (FM-2) and complete absence of the development of nematode in its parental line (IIHR-550) indicates that the *Mi* gene activity was not completely transferred from parent to F_1 hybrid. Rather that, only sufficient amount of *Mi* gene activity was transferred from parent to F_1 hybrid so as to express a durable form of resistance in FM-2 hybrid against *M. incognita*.

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