RESEARCH NOTES

Reproduction of Two Races of *Meloidogyne incognita* in Tomato Plants Grown at High Temperature[1]

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The effect of high soil temperature on resistance of tomato (*Lycopersicon esculentum* Mill.) to *Meloidogyne* spp. has been reported by several authors (3,4,5). However, the susceptibility of tomato grown at high soil temperatures to different races of *M. incognita* (Kofoid and White) Chitwood has not been reported. This matter must be considered an important factor in a tomato screening program for resistance to root-knot nematodes. Although there are four widespread races of *M. incognita* around the world (9), only two races were examined in this investigation.

Nine tomato genotypes were inoculated with either race 1 or race 4 of *M. incognita*. The *L. esculentum* genotypes were 'Floradade' (susceptible to *M. incognita*) and 'Nematex-22,' 'Patriot,' 'Piersol,' '74T2,' and the F_1 of Floradade × Nematex-22 (resistant to *M. incognita*); the *L. peruvianum* var. *dentatum* Dun. accessions were PI-129149-2(sib)-5-16 × 43, PI-129149-2(sib)-5-4, and PI 266376 (resistant to *M. incognita*).

Two races of *M. incognita*, each identified by host differential responses (6,7,8,9), were used as sources of inoculum. Race 1 was originally collected from tobacco (*Nicotiana tabacum* L.) in Gilchrist County, Florida, and race 4 was collected from tomato in Manatee County, Florida. Both populations were maintained on Floradade tomato in the greenhouse prior to their use in this investigation.

The experiment was carried out in a greenhouse with air temperatures ranging from 19 to 30 C. Plastic pots (12 cm in diameter and 16.5 cm deep), each containing ten 12-day-old seedlings of each genotype in autoclaved sandy soil, were placed in a water tank in which the temperature was maintained at 32.5 ± 0.5 C. Twelve days later the seedlings were inoculated with 200 eggs and infective juveniles per plant (1). Twenty-eight days after inoculation the plants were removed, the roots washed, and the number of egg masses per plant counted. The data obtained were statistically analyzed using the ANOVA procedure.

Comparative reproduction of races 1 and 4 of *M. incognita* on each tomato genotype are shown in Table 1. After 28 days, the numbers of egg masses produced by race 1 and race 4 were not significantly different on the susceptible cultivar Floradade. Also, no differences were observed between the races on *L. peruvianum* var. *dentatum* PI 129149-2(sib)-5-4 and PI 266376. The number of egg masses on their roots ranged from 23.7 to 29.7. This indicated some degree of resistance compared to the susceptible cultivar Floradade, according to the concept of host efficiency (2). The susceptibility of these tomato accessions to nematode infection with race 1 and race 4 could be considered similar. However, the number of egg masses produced by race 4 on all other genotypes (i.e., Nematex-22, Floradade × Nematex-22 (F_1), Patriot, Piersol, 74T2, and PI 129149-2(sib)-5-16×43) was significantly higher than that produced by race 1.

The finding that race 4 reproduced at a greater rate than race 1 in six out of eight more resistant genotypes helps to explain contradictory responses obtained from field experiments designed to evaluate tomato genotypes for resistance to *M. incognita* in different areas of Florida. These responses

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Table 1. The number of egg masses produced by two races of *Meloidogyne incognita* on each of nine tomato genotypes inoculated with 200 eggs and infective juveniles per plant and maintained at 32.5 C for 28 days. Mean of 10 replicates.

Genotype	Egg masses/plant*	
	Race 1	Race 4
Lycopersicon esculentum		
Floradade	108.2a	102.5a
Nematex-22	16.0e	54.2b
Floradade × Nematex-22(F_1)	41.0b	53.7b
Patriot	19.8de	46.2b
Piersol	32.0bc	60.5b
74T2	27.9cd	47.0b
Lycopersicon peruvianum var. *dentatum*		
129149-2(sib)-5-16×43	6.9f	14.9c
129149-2(sib)-5-4	24.9cd	25.0cd
266376	23.7cde	29.7c

*Means followed by the same letter within each race are not significantly different and underlined means within each tomato genotype and are not significantly different by Duncan's multiple-range test ($P < 0.05$).

have been observed to vary considerably with the testing location.

The differential reproduction of the two races of *M. incognita* among the nine genotypes are also shown in Table 1. The *L. peruvianum* accessions demonstrated a higher level of resistance to race 4 than did the *L. esculentum* cultivars. PI 129149-2(sib)-5-16×43 had the lowest number of egg masses among the nine tomato genotypes when inoculated with race 1 or race 4 of *M. incognita,* and one plant of this selection showed no egg masses when inoculated with race 1. These results may be explained in part by the fact that this *L. peruvianum* selection had been selected previously for resistance to race 4 at the Agricultural Research and Education Center at Bradenton, Florida, and for resistance to race 1 at Gainesville, Florida. The phenotypic variation exhibited between and among these accessions may indicate that residual genetic variation is still available for selection of lines with higher resistance against both races at high temperature.

These results suggest that making a survey of races within the *Meloidogyne* species found in tomato growing areas would be helpful in breeding for resistance under high temperature conditions.

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