Reaction of Beta spp. to Root-knot Nematodes

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Several root-knot nematodes (*Meloidogyne* spp.) are reported to be pathogenic to sugarbeet (*Beta vulgaris* var. *saccharifera* Alefeld) worldwide (5). They cause storage root yield losses with reduction of sugar content (1,4). Little information is available on the resistance of *Beta spp.* to root-knot nematodes (7). In an attempt to determine the host-parasite relationship of root-knot nematodes to sugarbeet, the reactions of different species, selections, and hybrids of *Beta* to five Italian populations of *Meloidogyne* species were studied in the greenhouse.

Populations of *M. arenaria* (Neal) Chitwood from peach (*Prunus persica* Stokes), *M. hapla* Chitwood from sugarbeet, *M. incognita* (Kofoid & White) Chitwood from tomato (*Lycopersicon esculentum* Mill.), *M. javanica* (Treub) Chitwood from bean (*Phaseolus vulgaris* L.), and *M. naasi* Franklin from durum wheat (*Triticum durum* Desf.) were used in this experiment. All populations were reared on sugarbeet cv. Kawemono in the greenhouse. Three pregerminated seeds of each *Beta* species, selection, and hybrid were sown in 170-cm^3 plastic pots containing steam pasteurized soil. Sugarbeets cvs. Kawemono and Monohil, known to be susceptible to the five root-knot species, were similarly grown as controls. After seed germination all pots were thinned to one seedling per pot and the pots were infested with 5,000 eggs and second-stage juveniles of one of the root-knot nematode species. A water suspension of inoculum obtained from infected sugarbeet roots by the NaOCl method (6) was poured into four holes made in the soil around the base of each sugarbeet seedling. Treatments were randomized in 10 replicates on a greenhouse bench and maintained at 25 ± 3 C. Two months after inoculation, plants were harvested and roots were washed free of soil. Nematode reproduction was evaluated by staining the roots with phloxin B (3) and counting the number of nematode egg masses per plant. Egg masses were rated according to the procedure of Taylor and Sasser (9): 0 = no egg masses; 1 = 1–2; 2 = 3–10; 3 = 11–30;

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Table 1. Egg masses indices of *Beta* species, selections, and hybrids to several *Meloidogyne* species grown under greenhouse conditions for 60 days.

Host		*M.*	*M.*	*M.*	*M.*	*M.*
Selections	Origin	*arenaria*	*hapla*	*incognita*	*javanica*	*naasi*
Beta maritima (P.I. 198758)	France	4.1 e*	3.1 bcd	...	2.1 bc	...
B. patellaris Moq.	The Netherlands	2.3 a	3.1 bcd	3 de	3.2 defg	...
B. patellaris	USA	2.8 abc	2.8 b	3.1 e	2.7 cd	...
B. procumbens Moq.	The Netherlands	3.8 de	0.2 a	0 a	0.1 a	2.5 b
B. procumbens	USA	3.5 cde	2.8 b	2.5 cd	2.8 cde	0.1 a
B. vulgaris L. Gr 5622_{2x}	Turkey	2.6 ab	3.5 bcd	4 f	3.5 efg	2.6 bc
B. vulgaris cv. Kawemono	USA	3.6 de	3.8 d	4.3 f	3.6 fg	3.2 d
B. vulgaris cv. Monohil	USA	4.1 e	3.8 d	4.2 f	3.1 defg	2.8 bcd
B. vulgaris (US H 10)	USA	3.2 bcd	3.7 cd	3.8 f	3.8 g	3.1 cd
B. webbiana Moq.	The Netherlands	2.7 ab	2.8 b	1.5 b	1.1 b	2.3 b
B. webbiana	USA	3.2bcd	3.2 bcd	2.2 c	2.6 cd	...
B. vulgaris Gr 5622_{4x} × *B. patellaris*	The Netherlands	2.5 ag	3.3 bcd	4 f	3.3 defg	...
B. vulgaris Gr 5622_{2x} × *B. procumbens*	The Netherlands	3.2 bcd	3 bc	4.1 f	3 def	0 a

*Values are means of 10 replicates. Column means followed by common letters are not different according to Duncan's multiple-range test ($P = 0.05$).

4 = 31–100; and 5 = more than 100 egg masses. A plant was considered to be poor to non-host when the rootknot and egg masses indices were less than 1. Data were statistically analyzed using Duncan's multiple-range test.

Beta procumbens Moq. (The Netherlands) was considered resistant to *M. hapla, M. incognita,* and *M. javanica,* but not to *M. arenaria* and *M. naasi* (Table 1). The selection of *B. procumbens* from the United States and the hybrid of *B. vulgaris* L. Gr $5622_{4x} \times$ *B. procumbens* were resistant to the Italian population of *M. naasi* (Table 1). None of the selections were resistant to the Italian population of *M. arenaria.* All other *Beta* species, selections, and hybrids were good hosts to all root-knot nematode species.

Resistance of *B. procumbens* to *Heterodera schachtii* Schmidt has been reported in France (2) and the United States (8). This test suggests that this species is also resistant to root-knot nematode species. Attempts to transfer the resistance gene to commercial sugarbeet cultivars should be considered.

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