

## Reproduction of Tennessee Soybean Cyst Nematode Population on Cultivars Resistant to Race 4

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### ABSTRACT

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A Tennessee population (TN-79) of the soybean cyst nematode *Heterodera glycines* reproduced well on Bedford and Nathan, soybean cultivars resistant to SCN race 4. TN-79 also reproduced well on Essex, Lee, Pickett 71, and PI 88,788 and moderately well on PI 87,631-1, J74-87, and Forrest. Soybean PI 89,772 and 90,763, cultivar Peking, and breeding lines D72-8927 and J74-88 were resistant to this population. TN-79 reproduced on soybean differentials similarly to SCN race 5 reported in Japan and a Minnesota population.

In 1970, four races of the soybean cyst nematode *Heterodera glycines* Ichinohe (SCN) were designated (2). Soybean (*Glycine max* (L.) Merr.) germ plasm resistant to the four races has been identified, and commercial varieties resistant to races 1, 3, and 4 (1,3-5) have been developed. Since then, reports exist of populations of the nematode that differ from the described four races (7-9).

In 1979, race 5 was reported from Japan (6).

A population (TN-79) of SCN reproducing on Bedford, a cultivar resistant to race 4, was discovered in 1979 on the West Tennessee Experiment Station in Hatchie loam soil. Bedford soybean or breeding lines with the PI 88,788 source of resistance had been grown in this plot area the previous 3 yr.

The purpose of this study was to determine the reaction of soybean plant introductions, breeding lines, and cultivars to the TN-79 population of the soybean cyst nematode.

### MATERIALS AND METHODS

The following soybean breeding lines, cultivars, and plant introductions were planted in soil infested with TN-79: Bedford, Essex, Forrest, Lee, Nathan,

Peking, Pickett 71, J74-87, J74-88, D72-8927, PI 87,631-1, PI 88,788, PI 89,772, and PI 90,763. Forrest and Pickett 71 derive SCN resistance from Peking. Bedford and Nathan have genes for resistance to SCN from Peking and PI 88,788. J74-87 derives SCN resistance from Peking and PI 87,631-1, D72-8927

**Table 1.** Number of soybean cyst nematode cysts per plant on 14 soybean lines grown in soil infested with new Tennessee population<sup>1</sup> (TN-79)

Soybean line	Cysts per plant (no.)
Bedford	115 a <sup>2</sup>
Essex	106 a
Lee	100 a
Nathan	89 a
Pickett 71	76 a
PI 88,788	69 ab
J74-87	53 ab
Forrest	48 ab
PI 87,631-1	46 ab
Peking	8 b
D72-8927	5 b
J74-88	3 b
PI 90,763	3 b
PI 89,772	2 b

<sup>1</sup> Soil was infested with 10 cysts per 100 cm<sup>3</sup>.

<sup>2</sup> Mean of 10 replicates; means followed by the same letter are not significantly different (Duncan's multiple range test,  $P = 0.05$ ).

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**Table 2.** Development of races, Minnesota population, and new Tennessee population (TN-79) of soybean cyst nematode on soybean differentials

Race or population	Differentials				
	Pickett 71	Pe-king 88,788	PI 89,772	PI 90,763	Lee
1	- <sup>a</sup>	-	+	-	+
2	+	+	+	-	+
3	-	-	-	-	+
4	+	+	+	+	+
5 <sup>b</sup>	+	-	+	-	+
Minnesota <sup>c</sup>	+	-	+	-	+
Tennessee	+	-	+	-	+

<sup>a</sup>+ = number of white females  $\geq 10\%$  of the number on Lee; - = number of white females  $< 10\%$  of the number on Lee (after Golden et al [2]).

<sup>b</sup>Data from Inagaki (6).

<sup>c</sup>Development of white females on differentials compared with development on Essex instead of Lee; data for Minnesota population from MacDonald et al (7).

derives SCN resistance from Peking and PI 90,763, and J74-88 derives resistance from Peking and PI 89,772.

Seed of each soybean line was planted in 7.5-cm-diameter clay pots containing 175 cm<sup>3</sup> of infested soil (10 cysts per 100 cm<sup>3</sup> of soil) and grown in a greenhouse at 26  $\pm$  4 C with one plant per pot. Each treatment was replicated 10 times. After 32 days, the soil and plant roots were

washed from the pots. The roots were rubbed lightly in water to remove the newly developed SCN cysts, which were then collected on a 60-mesh (250- $\mu$ m) sieve and counted.

## RESULTS AND DISCUSSION

TN-79 reproduced well on Bedford, Essex, Lee, Nathan, Pickett 71, and PI 88,788; moderately well on Forrest, PI 87,631-1, and J74-87; and slightly on Peking, J74-88, D72-8927, PI 89,772, and PI 90,763 (Table 1). These results indicated that Bedford does not contain all the genes for resistance to TN-79 that are in Peking. Significantly ( $P = 0.05$ ) more SCN cysts were recovered from roots of Bedford than of Peking.

This SCN population has the same reaction on the soybean strains tested as that reported for race 5 in Japan (6) and SCN reported in Minnesota (7) (Table 2). Golden et al (2) reported differences in tail lengths for the SCN races. The mean tail length of 10 larvae of this population was 48  $\mu$ m (range 43-52  $\mu$ m). This length is between that of races 3 and 4 (45  $\mu$ m) and of race 1 (50  $\mu$ m). It is longer than the tail length of race 2 (41  $\mu$ m) and shorter than that of the Minnesota population (54, range 48-60  $\mu$ m).

In addition to having similar reproduction on the soybean differentials as race 5 from Japan, TN-79 met the

criteria set forth by Riggs et al (8) for race 5 designation. They suggested that those populations that reproduce on SCN race 4 resistant cultivar Bedford be called race 5. The prime importance of TN-79 is that its use in a breeding program will enable the development of highly productive soybean breeding lines having a broader range of SCN resistance than the cultivars Forrest and Bedford.

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