Reaction of Field-grown Sericea Lespedeza to Selected *Meloidogyne* spp.[1]

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Abstract: Five sericea lespedeza (*Lespedeza cuneata* [Dumont] G. Don) breeding lines resistant to *Meloidogyne incognita*, *M. incognita acrita*, and *M. hapla* as seedlings in greenhouse tests and two varieties were resistant to *M. incognita acrita* in field experiments. Root-knot galling and larvae numbers were less for resistant entries than for the susceptible check when grown in root-knot infested field soil for three growing seasons. Forage yields were as much as 57 times greater for resistant entries than for susceptible check. Lines resistant to *M. incognita acrita* generally appeared more tolerant to *M. javanica* than the susceptible check in the field. A population predominantly *M. incognita acrita* built up on cotton (*Gossypium hirsutum* L.) and hairy vetch (*Vicia villosa* L.) shifted to *M. javanica* under sericea lespedeza.
Key Words: Resistance, Forage yield.

In 1966, we reported (4) several greenhouse-grown sericea lespedeza (*Lespedeza cuneata* [Dumont] G. Don) lines resistant to one or more of the following root-knot nematodes in greenhouse tests: *Meloidogyne incognita* (Kofoid & White) Chitwood, *M. incognita acrita* Chitwood, and *M. hapla* Chitwood. One line was resistant to all three species. Later we bred additional lines resistant to these nematodes by several generations of inbreeding and selection for resistance in greenhouse tests (1). No resistance to *M. javanica* or *M. arenaria* was found.

Information concerning the relationship of sericea seedling resistance in the greenhouse to mature plant resistance in the field to root knot is not available. Knowledge of this relationship is needed by plant breeders for planning and conducting a root-knot resistance breeding program.

The purpose of the present study was to determine resistance of mature plants in field plantings of sericea lines previously tested and found resistant to *Meloidogyne* spp. as seedlings in greenhouse tests. We also determined the effect of resistance on agronomic performance of these lines.

MATERIALS AND METHODS

Serica lines and varieties tested are listed in Table 3. Alabama lines 7, 8, 9, 10, and 11 were known to be resistant to *M. incognita*, *M. incognita acrita*, and *M. hapla* (1, 4). 'Alabama L 100' was highly susceptible.

Field plantings were made at five widely separated locations: Tallassee, Camden, Tuskegee, and Belle Mina in Alabama; and Tifton, Georgia. Soils ranged from a loamy sand to a heavy clay. Root-knot nematodes were present in large numbers only at Tifton and Tallassee. At Tallassee only *M. incognita acrita* was present; both *M. incognita acrita* and *M. javanica* were present at Tifton. At Tifton hairy vetch (*Vicia villosa* L.), which is highly susceptible to five species of *Meloidogyne* (3), was planted in

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the fall of 1967 to increase root-knot nematodes in the soil. Sericea was planted following vetch in the spring of 1968.

Experiments were begun at Tallassee in March 1967, and in March 1968 at the other locations. Plot size was 1.5 × 6.1 m except at Tallassee where plantings were made in rows spaced 1.0 m apart and 4.6 m long. All entries were replicated four times.

The level of root-knot nematode larvae in the soil at all locations was determined periodically by the centrifuge-sugar-flotation method (2). Perineal patterns were used for root-knot nematode species determinations (5). Roots from the Tifton test were rated periodically for galling and the relative numbers of the different root-knot species present in the roots were determined in 1970.

Forage yields were obtained in 1969 and 1970. Plants were cut at the hay stage twice each year at all locations except at Tifton where three cuttings were made in 1970.

Results

Root-knot nematodes were present in large numbers only at Tallassee and Tifton (Tables 1, 2). Few or no root-knot nematodes were found at the other three locations. Species identification indicated that *M. incognita acrita* was present at Tallassee while both *M. incognita acrita* and *M. javanica* were present at Tifton.

The relatively high number of *M. incognita acrita* larvae present under 'Ala. L 100', the susceptible check, and the low level under 'Serala' and the resistant breeding lines at Tallassee indicated that the resistance evident in greenhouse tests was also effective in the field (Table 1). Nematodes

Table 1. Root-knot larvae recovered from sericea plots, Tallassee, Alabama.

Sericea breeding line or variety	Mean number of root-knot larvae recovered from 150 cc soil†		
	6–2–69	5–15–70	8–7–70
'Ala. L 7'	0 a‡	0 a‡	1 a‡
'Ala. L 11'	0 a	0 a	10 a
'Ala. L 8'	1 a	0 a	32 a
'Ala. L 10'	44 ab	1 a	2 a
'Serala'	126 b	28 b	31 a
Susceptible check, 'Ala. L 100'	1270 c	256 c	447 b

† Data transformed to $\sqrt{N + 0.5}$ for statistical analysis.
‡ Means within a column followed by the same letter do not differ P = 0.01.

Table 2. Root-knot galling indices of sericea roots, number of larvae recovered from soil, and nematode species present at Tifton, Georgia.

Sericea breeding line or variety	Mean root-knot indices†			Mean number root-knot larvae recovered/150 cc soil			*Meloidogyne* species‡ June 1970	
	6–12–68	5–20–69	6–5–70	3–21–69	5–20–69	6–5–70	*M. incognita acrita* %	*M. javanica* %
'Ala. L 8'	1.2 a§	1.5 ab§	1.8 a§	12 a§	170 ab§	206 ab§	4	96
'Ala. L 10'	1.2 a	1.3 a	1.6 a	2 a	42 a	70 a	5	95
'Ala. L 9'	1.3 a	1.1 a	1.4 a	25 a	102 a	194 a	5	95
'Serala'	1.3 a	1.7 ab	2.5 bc	25 a	92 a	174 a	30	70
'N. C. nematode-resistant'	1.5 a	1.2 a	1.9 a	17 a	82 a	154 a	14	86
'Ala. L 7'	1.7 a	2.1 b	2.8 c	10 a	442 bc	1,028 c	21	79
'Ala. L 11'	1.7 a	1.6 ab	2.4 c	12 a	242 ab	327 b	5	95
Susceptible check, 'Ala. L 100'	2.8 b	4.2 c	4.6 d	152 b	770 c	500 c	14	86

† 1 = least galling, 5 = most galling.
‡ Based upon approximately 10 perineal patterns from each of four replications identified.
§ Means within a column followed by a letter in common do not differ P = 0.05.

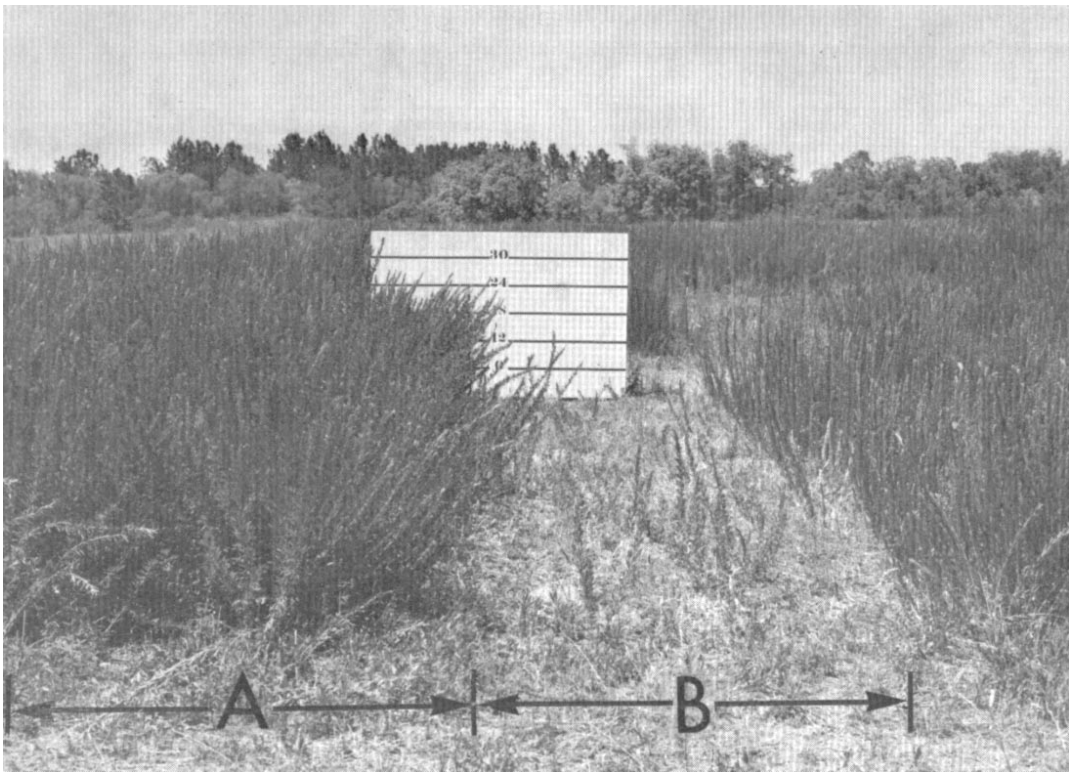

FIG. 1. Combined effect of *Meloidogyne javanica* and *M. incognita acrita* infection on sericea lespedeza after three years at Tifton, Georgia. **A.** Resistant 'Ala. L 10' and **B.** Susceptible 'Ala. L100' (Heights given in inches correspond to 15, 30, 46, 61, and 76 cm).

TABLE 3. Forage yields of sericea cultivars at five locations, 1969.

Sericea breeding line or variety	Green forage yield (Kg/plot)	Dry matter yield (Kg/ha)			
	Tallassee	Tifton	Camden	Tuskegee	Belle Mina
'Ala. L 7'	9.2 a†	3,738 b†	3,968 b†	9,441 a†	6,080 ab†
'Serala'	8.7 a	5,214 a	5,074 a	8,939 ab	6,702 a
'Ala. L 9'	.... ‡	4,807 ab	5,224 a	8,919 ab	6,375 ab
'Ala. L 11'	10.1 a	4,894 a	4,597 a	8,805 abc	6,001 ab
'Ala. L 10'	9.4 a	5,020 a	4,158 ab	8,119 cde	6,452 ab
'Ala. L 8'	6.6 b	2,779 c	3,666 b	7,658 d	5,180 c
'N. C. nematode-resistant'	.... ‡	4,464 ab	4,518 ab	8,377 bcd	6,085 ab
Susceptible check, 'Ala. L 100'	2.8 c	2,092 c	4,355 ab	8,476 bc	6,181 ab

† Means within a column with a letter in common do not differ $P = 0.05$.
‡ This entry was not included at this location.

TABLE 4. Forage yield of sericea cultivars at five locations, 1970.

Sericea breeding line or variety	Green forage yield (Kg/plot)	Dry matter yield (Kg/ha)			
	Tallassee	Tifton	Camden	Tuskegee	Belle Mina
'Ala. L 7'	10.4 a†	3,934 c†	8,998 a†	9.756 a†	10,120 abc†
'Serala'	10.3 ab	11,116 a	7,951 bc	8,598 abc	10,264 ab
'Ala. L 9'	..... ‡	8,219 b	8,719 ab	8,703 abc	10,537 a
'Ala. L 11'	8.1 abc	7,168 b	7,888 bc	9,156 ab	10,102 abc
'Ala. L 10'	7.4 bc	11,748 a	6,993 c	7,759 c	10,108 abc
'Ala. L 8'	7.0 c	3,654 c	7,665 c	8,526 bc	9,469 c
'N.C. nematode-resistant'	..... ‡	9,498 ab	7,933 bc	8,262 bc	10,164 abc
Susceptible check, 'Ala. L 100'	1.7 d	205 d	7,124 c	8,923 abc	9,716 bc

† Means within a column with a letter in common do not differ $P = 0.05$.
‡ This entry not included at this location.

killed all plants in some susceptible check plots, while good stands persisted for four years in plots planted to resistant material.

Only *M. incognita acrita* was identified in roots of cotton (*Gossypium hirsutum* L.) that preceded the sericea test at Tifton. However, in the summer of 1968 when the sericea was four months old both *M. incognita acrita* and *M. javanica* were present in the sericea roots. By 1970 *M. javanica* was the predominant species (Table 2). Despite the heavy *M. javanica* infection, differences in root-knot indices and larval levels occurred among the entries.

Entries producing high forage yields in both nematode-infested and non-infested soils were 'Ala. L 7', 'Ala. L 9', 'Ala. L 10', 'Ala. L 11', 'Serala' and 'N.C. Nematode-Resistant' (Tables 3, 4). Resistant 'Ala. L 10' and susceptible 'Ala. L 100' are shown in Fig. 1. 'Ala L 7' yielded well at Tallassee where *M. incognita acrita* was abundant and at all locations where nematodes were not numerous. However, it did poorly at Tifton where *M. incognita acrita* and *M. javanica* were present. This indicated that *M. javanica* may have caused poor performance of this line. Even though 'Ala. L 8' is highly resistant to *M. incognita*, *M. incognita acrita*, and *M. hapla*, its forage yields were relatively low at all locations because of low vigor. Forage yields of 'Ala. L 100', the susceptible check, were low both years at Tallassee and Tifton; but at locations where there were few or no root-knot nematodes, yields were comparable with those of several other root-knot nematode resistant entries.

CONCLUSIONS

The major differences in forage production among the sericea entries tested, with the possible exception of 'Ala. L 8' which is low in vigor, apparently are related to nematode resistance. The relationship between nematode resistance and high yields occurred consistently only where nematodes were present. Reductions in forage yields were usually related to the amount of root galling and nematode reproduction. Our results indicate a high correlation between resistance in the greenhouse and in the field. Thus, breeding for resistance may be accelerated by testing and selecting in the greenhouse; the breeder is able to test progeny, select resistant plants, and produce seeds for another cycle in one year.

The shift from dominance by one nematode species to another, which occurred at Tifton, probably occurs often where mixed

populations are present and hosts are changed.

The apparent level of tolerance to *M. javanica* at Tifton among the resistant lines may be linked to the high level of resistance of these lines to *M. incognita*, *M. incognita acrita* and *M. hapla*.

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