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RESPONSE OF SOME SELECTED *SESBANIA* SPECIES
TO ROOT-KNOT NEMATODE *MELOIDOGYNE INCOGNITA*

by
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Certain leguminous trees in the genus *Sesbania* Scop. are well known for their high forage value as well as commercial products like fuel-wood and gum. They are a rich protein source for livestock, particularly in lean periods and also improve the soil fertility because of their nitrogen fixing capacity. Seedlings of these trees have been found to be severely damaged or sometimes killed by *Meloidogyne incognita* (Kofoid *et* White) Chitw., but information about possible resistance to *M. incognita* among *Sesbania* species is lacking. Therefore, the present studies were made to screen 18 available cultivars, belonging to 8 species of *Sesbania*, against *M. incognita* and to determine the influence of *M. incognita* on the growth of *S. grandiflora* Poir. at different inoculum levels.

Materials and Methods

Seeds of the *Sesbania* species were surface sterilized in 95% ethanol followed by thorough washing with distilled water and then were sown in 500 ml beakers filled with autoclaved soil - sand - compost mixture (4:1:1). Seven days after emergence the seedlings were reduced to one per beaker. Each beaker was inoculated with 500 freshly hatched larvae of *M. incognita*. The experiment was conducted in the greenhouse at a temperature of 25-30 °C. Each cultivar was represented by five plants. Forty days after inoculation the plants

were removed from the soil and the roots were washed gently to remove the adhering soil particles. The number of galls and eggmasses per plant root were counted and root-knot index was recorded on a 1-5 scale which was determined as follows:

- 1 = no galls (no nematode in the root);
- 2 = 1 - 25 galls (without eggmasses);
- 3 = 1 - 25 galls (with few eggmasses);
- 4 = 26 - 50 galls (with moderate eggmasses);
- 5 = more than 50 galls (with numerous eggmasses).

The per cent index of resistance (Bingefors, 1957) was calculated as:

$$100 - \frac{\text{observed root-knot index}}{\text{maximum scale of root-knot index}} \times 100$$

The influence of initial population level was studied by inoculating one week old seedlings of *S. grandiflora* growing in sterilized soil contained in 10 cm diam clay pots with 0, 10, 100, 1000 and 10,000 freshly hatched larvae of *M. incognita*. For each inoculum level there were 5 replicates. Ninety days after sowing the plants were uprooted and growth of the plant, number of galls and nodules were determined as described earlier. The least significant difference (LSD) based on student's 't' test was calculated to compare the effects of different inoculum levels.

Results and Discussion

Observations on the varying degree of infection resulting in gall formation and eggmass production on the roots of *Sesbania* cultivars are presented in table I. Of 18 cultivars of *Sesbania* species evaluated for resistance to *M. incognita*, *Sesbania tetraptera* Hochst. and *S. macrocarpa* Muhl. '1535' were found to be resistant. This was based on limited galling and no eggmasses. *S. macrocarpa* '1536', *S. exasperata* H. B. et K. '1540', *S. aegyptiaca* Buch. var 'Sesban', *S. simpliciuscula* F. Muell., *S. sericea* D. C. '1577', *S. sericea* '1578', *S. sericea* '1579' were moderately resistant. *S. grandiflora* 'pink' and *S. macrocarpa* 'old' were highly susceptible and remainder of the cultivars were moderately susceptible to the nematode. None of the plants tested was found to be immune to the nematode.

The pathogenicity test with *M. incognita* gave conclusive evidence

Table I - Reaction of *Sesbania* species to root-knot nematode *Meloidogyne inco-*
gnita.

<i>Sesbania</i> species/cultivars	Number of galls/plant	Root knot index	Per cent index of resistance	Reaction
<i>Sesbania grandiflora</i> Poir 'Pink'	80	5	0	Highly susceptible
<i>S. simpliciuscula</i> F. Muell.	25	3	40	Moderately resistant
<i>S. tetraptera</i> Hochst.	8	2	60	Resistant
<i>S. exasperata</i> H. B. et K. '1540'	23.5	3	40	Moderately resistant
<i>S. exasperata</i> '1539'	30	4	20	Moderately susceptible
<i>S. aegyptiaca</i> Buch. var. 'bicolor'	36.5	4	20	Moderately susceptible
<i>S. aegyptiaca</i> var. 'picta'	37	4	20	Moderately susceptible
<i>S. aegyptiaca</i> var. 'Sesban'	25	3	40	Moderately resistant
<i>S. aegyptiaca</i> var. 'Picta' (tetraploid)	35	4	20	Moderately susceptible
<i>S. aculeata</i> Poir. 'yellow'	31.5	4	20	Moderately susceptible
<i>S. aculeata</i> 'dotted'	32	4	20	Moderately susceptible
<i>S. sericea</i> D. C. '1579'	15	3	40	Moderately resistant
<i>S. sericea</i> '1578'	22	3	40	Moderately resistant
<i>S. sericea</i> '1577'	25	3	40	Moderately resistant
<i>S. sericea</i> var. 'glabra 1580'	38	4	20	Moderately susceptible
<i>S. macrocarpa</i> Muhl. '1536'	13	3	40	Moderately resistant
<i>S. macrocarpa</i> '1535'	10	2	60	Resistant
<i>S. macrocarpa</i> 'old'	57.5	5	0	Highly susceptible

of the destructive potential of this parasite on *S. grandiflora* seedlings (Table II). The results indicated that growth of the plants was negatively correlated with the level of the initial nematode inoculum. Significant reductions in plant growth characters were observed at inoculum levels of 100, 1000 and 10,000 larvae/pot. The seedlings in

Table II - Effect of different inoculum levels of *Meloidogyne incognita* on growth characteristics and number of galls/plant on *Sesbania grandiflora*.

Inoculum levels (larvae/pot)	Length (cm)		Fresh weight (g)		Dry weight (g)		Number of galls/plant
	Shoot	Root	Shoot	Root	Shoot	Root	
0	110.5	20.5	54.5	17.5	8.9	2.7	0
10	105.0 (5.0)	18.0 (12.2)	49.5 (9.2)	16.0 (8.6)	8.0 (10.1)	2.4 (11.1)	6
100	75.0 (31.7)	17.0 (17.1)	44.0 (19.3)	15.0 (14.3)	7.1 (20.2)	2.2 (18.5)	19
1000	54.2 (51.0)	12.5 (39.0)	35.5 (34.8)	13.5 (22.8)	5.7 (35.9)	2.0 (25.9)	146
10,000	36.5 (67.0)	4.5 (78.0)	14.5 (73.4)	7.5 (57.1)	2.3 (74.1)	1.15 (57.4)	235
LSD (P = 0.05)	12.70	2.52	6.51	2.12	1.2	0.4	46.1

N. B.: Figures in parenthesis are per cent decrease over the control (0, inoculum level).

two of the pots inoculated with 10,000 larvae died 12 days after inoculation.

Generally the activities of *M. incognita* are confined to the roots of their hosts, but in the present studies conspicuous galls were also observed 1-2 cm up from the base of the stems of *S. grandiflora* inoculated with 10,000 larvae/plant. Such infections probably occur with exceedingly heavy infestations when the larvae migrate to the upper portions of the plant to find a more suitable habitat.

Meloidogyne incognita invades and causes a wide range of damage to *Sesbania* species when inoculated at the seedling stage. Since trees may become increasingly resistant with age, root-knot nematodes are more likely to be a problem in nurseries rather than in established forests (Wang, 1972; Wang *et al.*, 1975). Thus, consideration should be given to methods of limiting nematode populations in nursery soils. The present study identifies lines of *Sesbania* species that have useful levels of resistance to *M. incognita* and which may be useful in tree breeding programmes.

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S U M M A R Y

Eighteen cultivars belonging to 8 species of the genus *Sesbania* were tested for their suitability as hosts of *Meloidogyne incognita* by inoculating the one week old seedlings with 500 larvae. *S. tetraptera* and *S. macrocarpa* '1535' were found to be resistant. *S. macrocarpa* '1536', *S. exasperata* '1540', *S. aegyptiaca*, *S. simpliciuscula*, *S. sericea* '1577', *S. sericea* '1578' and *S. sericea* '1579' were moderately resistant. *S. grandiflora* and *S. macrocarpa* were highly susceptible to this nematode species. Pathogenicity of *M. incognita* to *S. grandiflora* showed a steady reduction in plant growth parameters at initial inoculum levels of 10, 100, 1000 and 10,000 larvae. Significant reduction in plant growth was observed at 100, 1000 and 10,000 larvae/plant. Galls were also observed on the stems of this plant species when inoculated with 10,000 larvae. The stem galls examined contained only fourth stage larvae and no mature egg producing females.

L I T E R A T U R E C I T E D

- BINGEFORS S., 1957 - Studies on breeding red clover for resistance to stem nematodes. *Vaxtodlong*, 8: 123.
- WANG K.C., 1972 - Investigations on the species of root knot nematode infecting trees in the nurseries. *Exp. Forest Nat. Taiwan, Univ. Tech. Bull.* 102, pp. 24.
- WANG K.C., BERGESON G.B. and GREEN R.J., Jr., 1975 - Effect of *Meloidogyne incognita* on selected forest tree species. *J. Nematol.*, 7: 140-149.

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