

TECHNICAL NOTE

OCCURRENCE AND EVALUATION OF DAMAGE CAUSED BY THE ROOT-KNOT NEMATODE, *MELOIDOGYNE JAVANICA*, ON *DESMODIUM HETEROCARPON* IN THE LLANOS ORIENTALES OF COLOMBIA

J. M. STANTON* and R. HERNANDEZ MERE**

*Centro Internacional de Agricultura Tropical (CIAT) Apartado Aéreo 6713. Cali, Colombia

**Instituto Nacional de Investigacion y Promocion Agropecuaria (INIPA) Apartado 9, Tarapoto, Peru

ABSTRACT

A field infestation of *Meloidogyne javanica* on *Desmodium heterocarpon* is reported for the first time in the Eastern Plains (Llanos Orientales) of Colombia. An experimental planting of 59 accessions of *D. heterocarpon* was evaluated for root galls, chlorosis, stunting and dieback caused by *M. javanica*. Forty-three accessions were found to possess practical resistance. Above-ground appearance was an unreliable guide to the extent of root galling suggesting that a direct examination of roots is necessary.

INTRODUCTION

Several species of *Desmodium* are promising pasture legumes for tropical South America (Anon. 1978; Grof 1982) and southern Florida (Kretschmer *et al.* 1979). These species include *Codariocalyx gyroides* (Syn. *D. gyroides*), *D. ovalifolium* (Syn. *D. heterocarpon*) and *D. heterocarpon*. Until 1981, no important diseases had been found on these three plant species in Colombia (Lenné 1981). At that time, however, Lenné (1981) reported field infestations of *Meloidogyne javanica* on all three *Desmodium* spp. at Santander de Quilichao, Cauca Department, and also on *C. gyroides* and *D. ovalifolium* at the ICA-CIAT Research Station at Carimagua, Meta Department, in the Llanos Orientales of Colombia. Periodic surveys up till May 1984 have failed to detect *Meloidogyne* spp. on *D. heterocarpon* at Carimagua. Greenhouse inoculations revealed that accessions of *D. heterocarpon* varied from moderately susceptible to resistant (Lenné 1981).

In May 1984, an experimental stand of 56 accessions of *D. heterocarpon* was found to contain necrotic, chlorotic, stunted and dead plants. The affected plants had heavy galling on roots with brown egg masses adhering to them. Many *Meloidogyne* females were found within the root tissue. This study seeks to identify resistance within the *D. heterocarpon* germplasm collection and to determine the relationship between above-ground symptoms and root galling and, therefore, the possibility of assessing root damage on the basis of stem characters alone.

MATERIALS AND METHODS

A two-year-old experimental stand of *D. heterocarpon* containing 56 accessions collected from Australia, Thailand, Malaysia, Fiji, India, China, and obtained from germplasm collections at the Universities of Florida and West Indies was evaluated. Plots were 2 × 1 m and replicated four times in a randomized block design. In July 1984, each plot was rated for symptoms of chlorosis, necrosis and stunting, using the following scale: 0 = no symptom expression, 1 = slight, 2 = moderate, 3 = severe, 4 = dead plants. As a measure of plant vigour, % ground coverage by the plant was estimated visually. The centre plant of each plot was removed and roots were rated for galls using the following scale: 0 = no galls, 1 = 1–2 galls per plant, 2 = 3–10 galls per plant, 3 = 11–30 galls per plant, 4 = 31–100 galls per plant, 5 = more than 100 galls per plant.

RESULTS

Identification

Perineal patterns of female nematodes from galled roots of affected plants were examined by the International Meloidogyne Project at North Carolina State University. The nematodes were identified as *Meloidogyne javanica* (Treub, 1885) Chitwood 1949.

Survey results

Of the 56 accessions surveyed, 19 had gall ratings of 0, 12 had gall ratings of 1, 12 of 2, seven of 3, four of 4 and two of 5 (Table 1). Accessions 13167, 13189 and 13173 died prior to survey and were not included. Correlation coefficients of gall rating vs. symptom rating, gall rating vs. % ground coverage and symptom rating vs. % ground coverage were 0.237, -0.638 and -0.738 respectively, all significant ($P < 0.05$).

TABLE 1

Gall rating of roots, symptom rating of stems and % ground coverage of 56 accessions of *Desmodium heterocarpon* plants infected by *Meloidogyne javanica* at Carimagua, Colombia.

CIAT Accession	Source ¹	Gall Rating ²	Symptom Rating ³	% Coverage	CIAT Accession	Source ¹	Gall Rating ²	Symptom Rating ³	% Coverage
3785	T	0	0	100	13146	T	1	2	90
13153	T	0	0	100	3984	C	1	2	15
13158	T	0	0	100	13173	T	1	2	5
3116	W	0	1	100	3786	T	2	1	90
3653	U	0	1	100	3749	A	2	1	40
3671	F	0	1	100	13288	M	2	1	5
3672	U	0	1	100	3751	A	2	2	65
3678	A	0	1	100	13148	T	2	2	65
3680	A	0	1	100	13169	T	2	2	60
3688	A	0	1	100	13186	M	2	2	25
3687	A	0	1	95	13150	T	2	2	20
13156	T	0	1	95	13180	M	2	3	65
13149	T	0	1	80	3843	T	2	3	55
3810	T	0	2	70	3700	U	2	3	30
13179	M	0	2	65	13166	T	2	3	30
3790	T	0	2	45	3675	A	3	1	30
3787	T	0	2	45	13142	T	3	2	75
3811	T	0	2	20	13162	T	3	2	30
13175	T	0	3	5	13177	T	3	2	10
3669	I	1	0	100	13182	M	3	3	15
13155	T	1	0	95	3753	A	3	3	10
13159	T	1	1	95	13165	T	3	3	10
3735	I	1	1	90	13152	T	4	2	55
3750	A	1	1	90	3755	A	4	2	10
13172	T	1	1	80	13185	M	4	3	20
13183	M	1	1	70	13187	M	4	3	5
13161	T	1	1	60	13351	T	5	3	20
13184	M	1	1	55	13176	T	5	4	5

CV. %:- Gall rating = 108.2; Symptom rating = 63.0; % coverage = 54.1

¹A = Australia, T = Thailand, F = Fiji, C = China, M = Malaysia, I = India, U = University of Florida, W = University of West Indies.

²Rating scale: 0 = no galls, 5 = more than 100 galls/plant.

³Rating scale: 0 = no chlorosis, necrosis or stunting, 4 = dead plants.

DISCUSSION

The first report of pathogenicity of *M. javanica* to *D. heterocarpon* (Lenné 1981) showed that the number of galls/plant of a limited range of accessions under glasshouse conditions varied from 0 to 10. In the field study reported here, gall ratings

on accessions ranged from 0 to more than 100 galls/plant. The generally higher gall numbers in the field may be because the plants were much older than those in the glasshouse. However, accessions 3669, 3671, 3672, 3675, common to both trials showed similar numbers of galls/plant. The range of reaction types of *D. heterocarpon* to *M. javanica* can now be extended to include very susceptible to very resistant types.

Forty-three of the 56 accessions had gall ratings of 2 or less, the level considered by the International Meloidogyne Project to represent a practical amount of resistance. Although this should be verified by measuring nematode reproduction, there seems to be a large number of accessions which could be productive in *M. javanica*-infested soil.

When gall rating was compared with herbage symptom rating and % ground cover for all accessions, all pairs of parameters were significantly correlated. This suggests that the symptoms measured and reduced plant vigour were caused by the nematode infestation and that one parameter may be estimated by measuring one of the other two. It would be preferable to assess above-ground symptoms as it is non-destructive. In several cases, however, this could lead to errors in evaluation and to rejection of valuable resistant material. For example, accessions 3790, 3787, 3811, 13170 and 13175 had very few galls but high symptom rating, and low ground coverage. If selection were based on above-ground symptoms only, these resistant accessions would have been rejected. Evaluation of root damage by *M. javanica* on *D. heterocarpon* must be made by examination of the roots. All accessions with low symptom rating and good plant growth had few galls on the roots. This material, therefore, would not have been misinterpreted as being susceptible by using above-ground evaluation alone. This situation may change, however, with other *D. heterocarpon* accessions or under different environmental conditions.

REFERENCES

- ANON. (1978)—Annual Report, Centro Internacional de Agricultura Tropical, CIAT, Cali, Colombia, pp. B19-32.
 GROF, B. (1982)—Performance of *Desmodium ovalifolium* Wall. in legume-grass associations. *Tropical Agriculture (Trinidad)* 59: 33-37.
 KRETSCHMER, A. E., BROLMAN, J. B., SNYDER, G. H. and COLEMAN, S. W. (1979)—'Florida' Carpon *Desmodium*—a perennial tropical forage legume for use in South Florida. *Proceedings of the Soil and Crop Society of Florida* 35: 25-31.
 LENNE, J. M. (1981)—Reaction of *Desmodium* species and other tropical pasture legumes to the root-knot nematode *Meloidogyne javanica*. *Tropical Grasslands* 15: 17-20.

(Accepted for publication, December 31, 1985)

NEW RELEASE OF PASTURE PLANT

GRASS

Setaria

Setaria sphacelata (Schumach.) Moss

var. *sericea* (Stapf) Clayton

(*setaria*)

cv. **Solander**

(Reg. No. A-8a-5)

Origin

Solander was selected from a population derived from crosses between frost tolerant accessions CPI 32930 and 33452 and the more robust frost-susceptible accessions CPI 19915, CPI 16413 (an off-type) and var. *splendida* CPI 15899. The accessions contributed 16, 34, 18, 24 and 8% of the germplasm of the F₁ generation respectively. Selection for winter yield and winter greenness were imposed during the F₂ and F₃ generations; the selected parents for each generation were inter-crossed in isolation. Three F₄ populations were sown as swards at two sites in comparison with existing cultivars. Seasonal yield and components of seed production were measured over several seasons. All three populations were markedly superior in seed production