

Effects of Root-knot Nematode on Growth and Development of Sugarcane

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ABSTRACT

The effects of root-knot nematode, *Meloidogyne incognita* on growth and development of twelve selected sugarcane cultivars were carried out in a screen house. All the cultivars were moderately to highly susceptible to nematode infection. The nematode reduced the top growth of 070, IAC 48/65, Mex 52/29 significantly without affecting tillering and development of internodes. Sugarcane cultivars Co 6806, Co 449, Co 404, Cp 36/111, Co 453, Co 976, DB 95/57, Co 691 and B 61208 were tolerant to attack. Symptoms of the disease include yellow discolouration of leaves and galling of the roots infected by the pest.

INTRODUCTION

Sugarcane (*Saccharum officinarum* L.) is attacked by various parasitic nematodes (Goodey *et al.* 1965). Root-knot nematodes, *Meloidogyne incognita* and *M. javanica* are major nematode pests of economic importance limiting sugarcane production in Nigeria. Sugarcane cultivars for propagation in the Nigeria Sugar Estates are imported from Barbados, India, USA, Australia and Guyana. Many of these Planting materials were found to be susceptible to *M. incognita* (Salawu, 1985; 1986; 1990). Some cultivars from Cuba, however, are tolerant to the same nematode infection (Legon and Rezjivin, 1980).

This work reports the results of an investigation on the effects of *M. incognita* on the growth and the development of some selected sugarcane cultivars. The cultivars are from India, Australia, Mexico, USA. and Guyana whereas they are not known to have resistance to *Meloidogyne* species.

MATERIALS AND METHODS

Sugarcane cultivars used in this investigation were collected from the University of Ilorin Sugar Research Institute Germplasm bank. Single bud setts from each of the twelve cultivars (Table 1) were collected, surface-sterilised in 1.5% sodium hypochlorite (NaOCl) solution for 10 min and later planted in steam-sterilised sandy loam top soil mixed with pure sand (2:1) in perforated 5-litre plastic pots and irrigated with tap water daily.

Three weeks after emergence of sugarcane above the ground, each pot was inoculated in the root zone with approximately 5000 second stage juveniles of *M. incognita* extracted from eggmasses on *Celosia argentea* L. using the modified extraction tray method of Whitehead and Hemming (1965). Each cultivar was replicated four times and randomly arranged on benches in the screen house. NPK fertilizer (2:1:1) was applied four-weeks intervals at 5g per pot.

Plants were harvested from the pots 140d after inoculation. Fresh shoot and root weight, the stalk length (from ground level to the topmost dewlap), the internode number, as well as the number of tillers per plant were recorded. The degree of infestation and plant resistance were determined by using the rating scheme of Taylor and Sasser (1978): 0 = no gall, immune; 1 = 1-2 galls, resistant; 2 = 3-10 galls, moderately resistant; 3 = 11-30 galls, susceptible; 4 = 31 galls and above, highly susceptible.

Five gram root samples were randomly taken from each cultivar per plant and macerated for 30 sec in a Waring Blender. Second stage juveniles of the nematode were extracted using the method described before and recorded.

RESULTS AND DISCUSSION

All the twelve sugarcane cultivars tested were attacked by *M. incognita* although the degree of susceptibility varied (Table 1). Galls on cultivars Co 691, Cp 36/111, Co 404, Co 453 and Mex 52/29 were fewer than other cultivars, whereas the number of second stage juveniles from the roots of B 61208, followed by Co 976, Q 70, DB 95/57 and Co 6806 were greater than others.

Table 1. Reaction of sugarcane cultivars Infected with *M. incognita* (Mean of four replications).

Sugarcane cultivars	Galls per plant	Second stage juveniles (per 5g root)	Degree of infestation	Host Reaction
Co 6806	205	2,019	4	Highly susceptible
Q 70	189	3,125	4	Highly susceptible
IAC 48/65	26	2,012	3	Susceptible
Co 449	208	1,857	4	Highly susceptible
Mex 52/29	10	908	2	Moderately resistant
Co 404	9	720	2	Moderately resistant
Cp 36/111	7	1,037	2	Moderately resistant
Co 453	8	705	2	Moderately resistant
Co 976	283	4,805	4	Highly susceptible
DB 95/57	195	2,046	4	Highly susceptible
Co 691	7	1,102	2	Moderately resistant
B 61208	212	4,809	4	Highly susceptible

Microscopic examination of the galled roots of all the cultivars revealed number of developmental stages of the nematode inside the tissues, accompanied by browning and severe decay of affected roots. All the cultivars displayed yellow discolouration of the leaves about 90d after inoculation particularly in cultivars Co 976, DB 95/57, IAC 48/65, Q 70, B 61208 and Co 6806.

Table 2. Fresh shoot and root weight, stalk length, internode and tiller number of sugarcane cultivars infected with *M. Incognita*.

Sugarcane cultivars		Fresh weight		Stalk length (cm)	Internode number	Tiller number
		Shoot (g)	Root (g)			
Co 6806	I	306.2 ± 17.0	172.5 ± 8.3**	72.3 ± 3.4	10	4
	U	284.6 ± 30.3	229.3 ± 5.8	73.0 ± 4.7	9	4
Q 70	I	312.3 ± 10.1**	157.6 ± 10.7**	87.5 ± 7.8	9	4
	U	460.0 ± 34.2	174.7 ± 17.1	1063.3 ± 0.3	7	4
IAC 48/65	I	335.7 ± 14.0**	118.8 ± 13.3	113.0 ± 4.5	10	3
	U	395.5 ± 2.6	117.5 ± 9.5	125.5 ± 0.9	9	4
Co 449	I	349.9 ± 14.3	189.7 ± 17.4	84.5 ± 1.9	9	4
	U	401.4 ± 34.0	245.2 ± 16.8	94.0 ± 2.6	9	5
Mex 52/29	I	426.5 ± 7.9**	180.3 ± 10.9	108.0 ± 2.5**	10	3
	U	503.7 ± 14.6	216.8 ± 16.9	123.0 ± 3.7	11	3
Co 404	I	323.8 ± 18.4	152.5 ± 8.4**	117.3 ± 8.9	10	5
	U	378.0 ± 18.2	194.9 ± 5.0	130.0 ± 3.1	11	4
Cp 36/111	I	427.5 ± 32.1	186.2 ± 4.3**	124.3 ± 9.0	10	4
	U	432.1 ± 37.8	215.8 ± 2.2	126.8 ± 4.5	10	5
Co 453	I	321.2 ± 22.2	177.3 ± 5.9**	89.5 ± 5.1	9	3
	U	426.4 ± 37.1	213.3 ± 8.0	105.8 ± 4.4	10	3
Co 976	I	362.8 ± 5.4	162.9 ± 11.1**	89.5 ± 3.8	10	5
	U	341.4 ± 11.4	246.9 ± 4.1	91.8 ± 2.0	9	4
DB 95/57	I	309.7 ± 32.3	209.1 ± 7.1	88.3 ± 4.4	9	6
	U	326.8 ± 10.9	193.7 ± 6.7	90.0 ± 1.8	8	5
Co 691	I	255.2 ± 20.1	203.3 ± 11.0	82.8 ± 2.2	10	4
	U	220.3 ± 6.1	238.6 ± 3.1	79.0 ± 1.9	10	4
B 61208	I	328.6 ± 21.4	101.3 ± 9.0**	96.0 ± 2.5	9	4
	U	360.5 ± 9.4	166.9 ± 10.7	89.0 ± 0.7	10	4

I= Infected

U= Uninfected

** Infected plants are significantly different from the uninfected (P=0.05).

Root proliferation was significantly reduced in sugarcane cultivars Co 6806, IAC 48/65, Co 404, Cp 36/111, Co 453, Co 976 and B 61208 whereas the weight of top growth of cultivars Q 70, IAC 48/65 and Mex 52/29 was significantly reduced compared with the uninfected plants (Table 2). The stalk length of Mex 52/29 was significantly shorter than the uninfected plants. Significant difference on the number of tiller and internodes was not evident in any cultivars tested compared with the uninfected plants.

Significant reduction in shoot weights observed in some of the cultivars tested accord with the earlier observation by Salawu (1990) who demonstrated that cultivars D 20/58 and BJ 654 known to grow green and vigorous in the field were reduced in growth by the nematode under the screen house conditions.

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