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Root-knot Resistance and Growth Response of Sugarcane Cultivars

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ABSTRACT

Root knot resistance and growth response of selected sugarcane cultivars propagated from polycross fuzz were evaluated under a screenhouse conditions. All progenies of sugarcane cultivar Co 453 and Co 443 were susceptible to *Meloidogyne incognita* infection. Cultivar BR 6225 had the highest percentage of progenies followed by Mex 52/29 resistant to the nematode pest. Disease symptoms were stunted growth and galling of the roots.

INTRODUCTION

In sugarcane *(Saccharum officinarum L.)*, the information is scanty about the resistance of the crop of root-knot nematodes *(Meloidogyne spp.)*. Since the establishment of the sugar industry in Nigeria improved cultivars of sugarcane for propagation in the sugar estates have been imported from India, Barbados, Australia, U.S.A. and Guyana. Several of these planting materials are known to be susceptible to the root-knot nematode, *M. incognita* (Salawu, 1985; 1986; 1991). In Cuba, planting of resistant cultivars of sugarcane have been found effective in controlling the same nematode (Legon and Razjivvin, 1980). In Nigeria breeding programme started at Sugar Research Institute, University of Ilorin, with both local and the exotic germplasm in 1983. Therefore, this work reports the results of the investigation on the degree of resistance of some of the polycross progenies of the selected cultivars to root-knot nematode *(Meloidogyne incognita)*.

MATERIALS AND METHODS

Few progenies of the polycross of 10 selected cultivars of sugarcane, with high vigour, were randomly selected after four months of germination and transplanted into steam-sterilised top loamy soil, mixed with pure sand in ratio 2 : 1 contained in 5-litre plastic pots. The plants were irrigated with tap water daily. The second stage juveniles of *M. incognita* used as inoculum were extracted from eggmasses on *Celosia argentia* using the modified extraction tray method of Whitehead and Hemming (1965). Approximately 2000 second stage juveniles of the nematode were inoculated at root zones of a plant per pot when the plants were five months old, arranged randomly on the screenhouse bench.

Plants were harvested from the pots 200d after inoculation. The roots were carefully washed with tap water to remove the adhering soil particles. Fresh shoot and root weights, and the tiller number were recorded. The degree of galling on the roots were determined using the modified rating scale of Taylor and Sasser (1978) : 0 = 0 gall,

resistant; 1 = 1 – 2 galls, moderately resistant; 2 = 3 – 10 galls, moderately susceptible; 3 = 11 – 30 galls, susceptible; 4 = 31 galls and above, highly susceptible.

RESULTS AND DISCUSSION

The results of the investigation are presented in the Table 1. All the progenies of Co 453 and Co 443 were susceptible to nematode attack, while 69.2% BR6225, 50% Mex52/29, 44% LAC 48/65, 44% CP 36/111, 44% Co 440, 33% LSI-033, 20% Co 396, and 8.3% [illegible]93 progenies were moderately resistant. On an average, root proliferation of progenies from the parent sugarcane cultivars LSI-033, LAC 48/65, and Co 443 followed by Co 453 was greater than the other progenies from other cultivars.

Table 1. Reaction of polycross progenies of selected sugarcane cultivars infected with *Meloidogyne incognita*.

Sugarcane cultivars	Progeny	Stalk length (cm)	Fresh weight		Tiller Number	Gall rating
			Shoot (g)	Root (g)		
Co 453	1	65	73.6	13.2	2	4
	2	40	60.2	15.5	2	4
	3	70	133.1	61.5	1	4
	4	58	85.0	73.9	5	4
	5	84	111.3	32.1	2	4
	6	80	196.8	49.4	2	4
	7	78	179.8	75.9	2	4
	8	76	246.2	84.7	1	4
	9	67	92.8	21.4	2	4
	10	61	120.4	25.5	1	4
	11	44	70.9	28.1	5	4
	Mean	65.7	124.6	43.8	2.1	
LSI-033	1	89	160.3	54.0	9	2
	2	80	165.2	60.8	2	2
	3	69	189.0	119.9	4	4
	4	68	113.1	51.6	3	4
	5	35	179.8	111.7	9	4
	6	62	102.9	114.0	6	4
	7	74	153.8	46.3	2	4
	8	38	52.1	27.0	7	4
	9	55	88.1	34.7	1	2
	Mean	63.3	133.4	68.9	4.8	
Mex 52/29	1	76	77.4	8.3	1	2
	2	111	219.8	73.0	6	4
	3	76	56.6	19.1	1	2
	4	64	186.2	66.1	1	4
	5	68	98.7	20.9	1	4
	6	98	129.9	36.1	11	2
	7	47	43.5	7.1	1	2
	8	49	26.3	4.6	1	2
	9	26	20.7	61.2	4	4
	10	52	52.9	10.1	3	4
	Mean	66.7	91.2	30.7	3.0	

Table 1 : (contd)

Sugarcane cultivars	Progeny	Stalk length (cm)	Fresh weight		Tiller Number	Gall rating
			Shoot (g)	Root (g)		
Co 440	1	52	61.2	11.9	1	4
	2	78	216.0	74.8	10	4
	3	96	33.2	86.1	11	2
	4	52	42.7	9.3	2	2
	5	102	150.3	20.7	2	4
	6	84	261.2	47.7	6	4
	7	89	191.3	55.1	3	4
	8	74	106.0	14.8	1	2
	9	93	144.7	32.1	3	2
	Mean	80.0	134.1	39.2	4.3	
LAC 48/65	1	40	34.3	13.8	1	4
	2	93	241.2	105.6	5	2
	3	85	142.6	20.2	1	4
	4	59	76.3	10.9	1	2
	5	71	95.7	23.9	1	2
	6	78	206.7	85.5	4	4
	7	86	140.9	27.5	2	2
	8	61	82.0	19.9	1	4
	9	114	311.4	117.6	4	4
	Mean	76.3	147.9	47.2	2.2	
Cp 36/111	1	84	177.1	19.6	1	4
	2	88	174.8	130.7	2	4
	3	79	122.9	12.3	1	2
	4	66	94.6	15.0	1	4
	5	60	61.9	32.2	1	4
	6	74	111.7	28.4	1	2
	7	67	179.1	25.9	7	3
	8	87	139.0	20.0	1	2
	9	66	122.0	17.5	3	3
	10	50	64.2	9.2	1	2
	11	93	156.9	25.2	3	3
	12	69	127.9	20.5	1	3
	Mean	73.6	127.7	29.7	1.9	
LSI-083	1	42	38.1	9.3	1	3
	2	49	41.9	11.6	3	3
	3	60	105.1	32.1	2	3
	4	54	57.2	7.3	1	2
	5	71	185.3	50.4	2	3
	6	42	54.5	34.2	3	3
	7	92	146.0	54.2	2	3
	8	79	167.0	49.4	3	3
	9	81	210.8	73.3	5	3
	10	67	57.8	10.6	1	3
	11	50	41.8	14.3	1	3
	Mean	62.5	100.5	31.5	2.2	

Table 1 : (contd)

Sugarcane cultivars	Progeny	Stalk length (cm)	Fresh weight		Tiller Number	Gall rating
			Shoot (g)	Root (g)		
Co 443	1	104	164.9	65.7	2	4
	2	71	169.4	61.6	2	3
	3	87	176.3	48.8	3	3
	4	73	136.8	35.0	3	3
	5	50	35.6	9.2	1	3
	6	85	70.3	13.0	1	3
	7	73	219.0	81.7	3	4
	8	68	119.4	26.7	1	4
	9	104	200.1	47.8	4	4
	Mean	79.4	143.5	43.3	2.2	
BR 6225	1	72	85.4	15.7	1	2
	2	50	34.7	4.8	1	2
	3	89	73.8	7.8	1	2
	4	30	12.9	1.9	1	2
	5	33	26.6	3.6	1	2
	6	76	184.4	26.7	4	3
	7	80	146.2	16.2	1	3
	8	96	125.9	22.2	1	2
	9	69	198.5	32.2	5	3
	10	59	54.1	5.3	1	2
	11	53	31.8	3.0	1	2
	12	45	58.9	32.6	1	3
	13	42	36.3	5.9	1	2
	Mean	61.1	82.3	13.7	1.5	
Co 396	1	120	196.8	44.9	5	3
	2	99	277.8	91.8	4	3
	3	68	117.6	13.0	1	3
	4	74	213.5	73.6	3	3
	5	82	95.8	49.6	1	3
	6	54	50.5	13.4	1	2
	7	60	82.4	32.8	3	2
	8	65	78.9	22.5	1	3
	9	94	138.7	41.2	1	3
	10	49	43.0	18.5	1	3
	Mean	76.5	129.5	40.1	2.1	

The average shoot weight of progenies of sugarcane cultivar LAC48/65 (147 g) was greater followed by Co443 (143 g), LSI-033 (133 g) and Co 396 (129 g). Similarly, on an average the progenies of sugarcane cultivars Co 440 grow taller followed by LAC 48/65, Co 443, Co 396 and Cp 36/111 than the others (Table 1). More tillers were produced by LSI-033 progenies followed by Co 440 than others.

The estimated annual losses due to nematode pest on sugarcane is 15.3% while in monetary term it is 16.5 billion dollars (Anon., 1984). In Nigeria, parasitic nematodes were responsible for total crop failure during the cropping season in 1966 to 1975 (Odihirin,

1976) in a sugar estate at Bacita. Five percent of the one million metric tonnes of refined sugar consumed in Nigeria is produced both at the Nigerian Sugar Company (NISUCO) and the Savannah Sugar Company in Numan. Since one of the best control measures of nematodes pests on agricultural crops is by planting resistant cultivars, breeding of sugarcane for resistance against the parasitic nematodes is desirable. In the investigation, certain progenies of some cultivars showed evidently a high degree of resistance to *M. incognita* attack. Further studies is required on breeding programme for root-knot resistance to prepare a package for the sugarcane growers.

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