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Interrelationships between *Pratylenchus brachyurus* and *Helicotylenchus pseudorobustus* in Sugarcane.

J.A. ONAPITAN[1] and J.O. AMOSU[2]

[1]*Sugarcane Improvement Programme,*
National Cereals Research Institute, Ibadan and
[2]*Department of Plant Science,*
University of Ife,
Ile-Ife, Nigeria.

Abstract

Greenhouse studies showed that *Pratylenchus brachyurus* and *Helicotylenchus pseudorobustus* singly and in all combinations tested, did not significantly suppress both top growth and root development of sugarcane. Data on mean population increase, showed that *P. brachyurus* multiplied faster than *H. pseudorobustus* singly and in all combinations, and had suppressive effect on the reproduction of *H. pseudorobustus.*

Introduction

In any given ecosystem, cohabitation between different nematodes *per se* as well as with other microorganisms has been shown to occur (Guerout, 1968; Amosu, 1974 and Sikora, 1970). This may result in competition, synergism and some other types of interrelationship (McNew, 1960). The factors influencing the population dynamics of nematodes in cases of niche overlap involving more than one species of the same or different genera are not fully known. Generally, it appears that the populations of some nematode species are enhanced in the presence of others in the same genus whilst inhibition occurs in the presence of species in a different genus (Guerout, 1968).

Pratylenchus brachyurus (Godfrey 1929) Fili]jev and Stekhoven 1941 and *Helicotylenchus pseudorobustus* (Steiner 1945) Golden 1956 have been reported to commonly occur in mixed communities in sugarcane plantations (Amosu, 1972; Apt.& Koike, 1962). However, nothing has been done to determine the joint effects of these nematodes on the host, and on their population development. This paper is a report on the effect of the interaction of *P. brachyurus* and *H. pseudorobustus* on sugarcane.

Materials and Methods

The commercially acceptable sugarcane cultivar C01001 was used in this study. It was obtained from the National Cereals Research Institute (NCRI) field at E_6 Agala in Ibadan. Single-bud sugarcane cuttings were heat treated in a water bath at 50°C for 2 hrs. to control virus and stem borers (Koike & Roman, 1970).

The nematodes were obtained from our greenhouse stock cultures which originated from the following sources – *H. pseudorobustus* isolated from soil around roots of upland rice at B_5 field of NCRI, Ibadan; culture purified by free hand-picking and subsequently maintained on sugarcane in the greenhouse. *P. brachyurus:* isolates obtained from Dr. M.O. Olowe of NCRI, Ibadan. *H. pseudorobustus* larvae were extracted from around the roots of sugarcane using a modification of the Christie-Perry method (1951),.while *P. brachyurus* was extracted from the roots of sugarcane using Young's incubation method (1954). The Christie-Perry method was modified by pouring the wet sieve suspension through a metal ring bounded on one side with a piece of white cloth fixed with rubber band. The metal ring was suspended by glass rods in a small plastic bowl containing water.

The potting medium used consisted of a steam-pasteurized mixture of top soil, sand and weathered poultry manure in the ratio 20:1:1. Treated sugarcane cuttings were planted in trays.(46cm x 92cm x 10cm 10cm) filled with this potting medium. Two weeks after sprouting, uniform sugarcane seedlings were transplanted to 500ml plastic cups and allowed to grow further for two weeks before inoculation. For the inoculation, five-litre buckets were filled with the potting medium and a depression created in the centre of each with 9cm diameter plastic cup. 50ml of nematode suspension was then poured into the depression to serve as inoculum. This was followed by setting selected transplants of uniform size in the depression and gently washing the soil from the periphery of the depression around the roots. The nematode species combinations and their levels in each treatment are presented in Table 1.

TABLE 1 – NEMATODE SPECIES AND THEIR LEVELS IN THE INOCULA USED FOR DIFFERENT TREATMENTS

Treatment Code	*Nematode species*	*Nematode level in inoculum*
H_oP_o (Control)	No nematode	–
H_1P_o	*H. pseudorobustus alone*	1000:0
H_oP_1	*P. brachyurus alone*	0:1000
H_1P_1	Both nematodes	1000:1000
H_5P_o	As in H_1P_o	5000:0
H_oP_5	As in H_oP_1	0:5000
H_5P_5	Both nematodes	5000:5000

The control received 50ml of water freed of nematode by passage through 325 mesh seive and kept in a water bath at 50°C for 30 mins.

There were three replicates for each treatment arranged in a randomized design on a greenhouse bench. The recommended fertilizer mixture of 75-45-100.kg of NPK per hectare (Ogunremi, 1972) was used as single application one week after inoculation. The ambient temperature of the greenhouse ranged from 25°C to 32°C, whilst average soil temperature at 3.00 p.m. and 6.00 a.m. were 32°C and 24°C respectively. In addition to natural light, plants were supplied supplemental illumination through three 1.20m long fluorescent tubes (EKCO 40W. Tropica day light, 6,500°K, G.R. Quick Start, made in England). These were hung 1.65m above the greenhouse benches for 8 hr/day (7.30 a.m. – 3.30 p.m.). The supplemental illumination was necessary to compensate sugarcane (a C_4 plant), for the insufficient natural light available in the greennouse.

Commencing from a week after sprouting, the seedlings were sprayed fortnightly with 8.5 ppm of dimethoate formulated as Rogor 40[1] to protect them against mites and stem borers. This was continued till the experiment was terminated 109 days after inoculation.

At the conclusion of the experiment, plant heights were measured and the tops were cut off at the surface of the soil, and weighed fresh. The cuttings were then oven-dried at 70°C to constant weight. Roots were carefully freed from soil, washed, blotted to remove excess water and weighed. They were subsequently cut into small sections and

[1] Marketed by UTC (Nigeria) Ltd.

mixed. 2g sample of this mixture was then macerated in 40ml of tap water in a top-drive blender made by Townson & Mercer Ltd., Croydon, England. The resulting slurry was washed through 325-mesh sieve and tne residue was placed in modified Baermann funnel set up. From tne latter, estimates of the level of both nematodes in the roots were made. The remaining root pieces were oven-dried to constant weight.

Tne soil from eacn bucket was washed into 5-litres of water. The numbers of soil-inhabiting nematodes were determined by processing one litre of total soil-water suspension using the modification of the Christie & Perry method described earlier.

Results

At different inoculum levels, top and root weights, either fresh or dry, did not differ significantly. However, top and root weights of the control were greater than in all other treatments except H_1P_0 and H_5P_0 (Table 2).

Inoculated roots were darker brown in colour than the roots of the un-inoculated control. Nematode inoculation treatments did not depress plant height (Fig. 1). *Pratylenchus brachyurus* multiplied faster singly and in all combinations than *Helicotylenchus pseudorobustus* (Table 3) and the rate of multiplication was also significantly higher ($P < 0.05$). In H_1P_5, rate of increases was 1.6 for *H. pseudorobustus* and 8.6 for *P. brachyurus* while in H_5P_5, the rate was 2.9 and 31.2 respectively.

Discussion

Pratylenchus brachyurus and *Helicotylenchus pseudorobustus* either singly or in combination had no significant effect on top growth and root development of sugarcane (Table 2). This agrees with Apt and Koike (1962) and Koike and Roman (1970) who reported no significant reduction in the top growth and root development of sugarcane when infected with either *H. nannus* or *P. brachyurus*. However, the interaction of the two nematodes led to a significant reduction in population levels of *H. pseudorobustus*.

When the ratio of the inoculum level was 1:1, increases in population of *P. brachyurus* was about two times that of H. *pseudorobustus*. This agrees with the assertion by McNew (1960) that when two organisms compete in the same niche, there are instances when com-

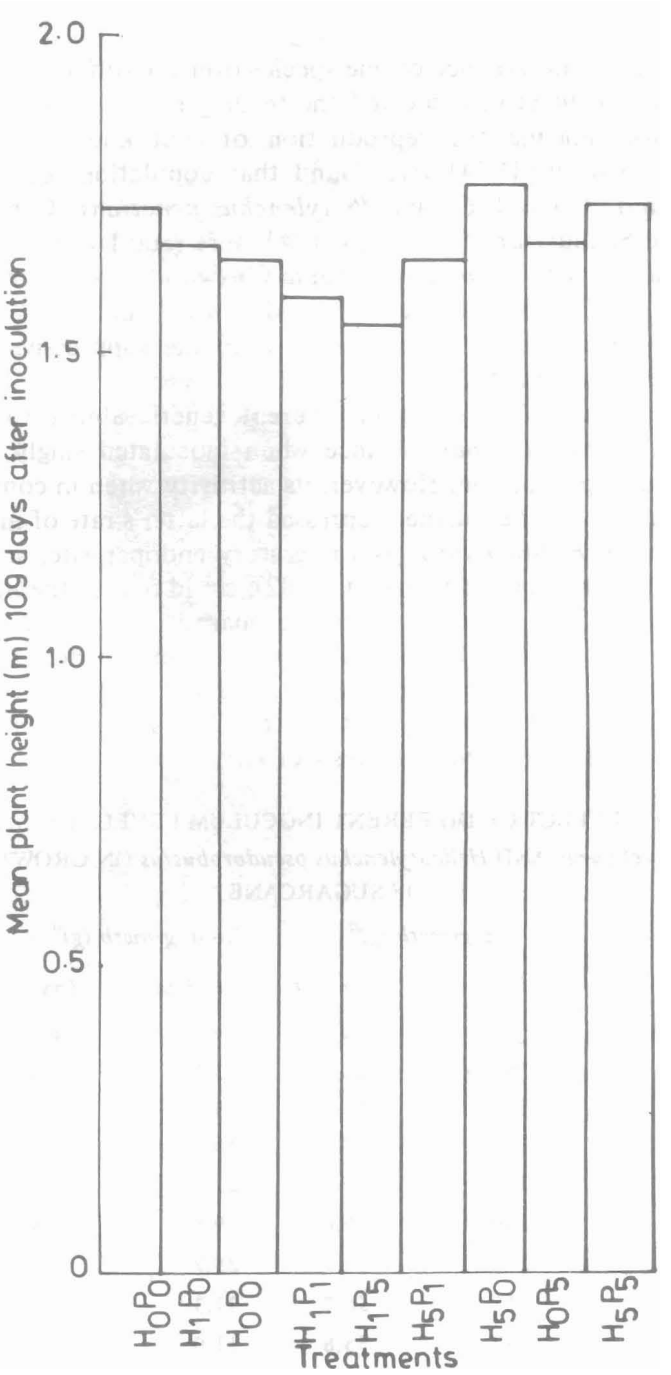

Fig. 1: Effects of different inoculum levels of *Pratylenchus brachyurus* and *Helicotylenchus pseudorobustus* jointly on the height of sugarcane 109 days after inoculation.

petition leads to dominance of one species over the other. It also agrees with Guerout (1968) who showed the feeding of *P. brachyurus* as the major factor limiting the reproduction of root knot nematode on pine-apple, Amosu (1974) who found that populations of *Tylenchorhynchus agri* Ferris, 1963 and *Pratylenchus penetrans* (Cobb, 1917), Filipjev and Schuurmans Stekhoven, 1941 were retarded when each was in combination with *Meloidogyne hapla* Chitwood, 1949 on red clover, and Sikora (1970) who attributed low *M. naasi* Franklin, 1965 population on Toronto C-15 creeping bentgrass to the suppressive effect of *T. agri* when co-inoculated.

P. brachyurus probably has an inherent genetic ability to multiply faster than *H. pseudorobustus* since when inoculated singly, it had a faster rate of reproduction. However, its actitivity when in combination with *H. pseudorobustus* further depressed the latter's rate of multiplication (Table 3). *P. brachyurus* is a migratory endoparasite, and lesions caused by it (Onapitan and Amosu, 1982), could reduce the number of suitable feeding sites available for the ectoparasitic *H. pseudorobustus* This may explain why the multiplication indexes when inoculated singly were 11.5 *H. pseudorobustus* and 38.8 P. *brachyurus* (ratio of 1:3) compared to the co-inoculation treatments such as H_1P_5 and H_5P_0 with ratios of 1:8 and 1:15 respectively.

TABLE 2 – EFFECT OF DIFFERENT INOCULUM LEVELS OF *Pratylenchus brachyurus* AND *Helicotylenchus pseudorobustus* ON GROWTH OF SUGARCANE

	Top growth (g)[a]		*Root growth (g)*[a]	
Treatment code	*Fresh wt.*	*Dry wt.*	*Fresh wt.*	*Dry wt.*
H_0P_0 Control	276.3	59.7	27.0	5.5
H_1P_0	296.0	60.5	23.5	5.0
H_0P_1	270.3	56.7	33.3	5.5
H_1P_1	240.0	52.8	36.8	6.6
H_1P_5	205.0	46.0	21.5	4.2
H_5P_1	260.7	59.0	29.5	5.8
H_5P_0	277.5	60.7	25.7	5.0
	255.8	56.7	31.3	5.5
H_5P_5	257.2	55.8	31.0	5.8

a = Each entry is a mean of 3 observations.

TABLE 3 – MEAN POPULATION INCREASES OF DIFFERENT INOCULUM LEVELS OF *Pratylenchus brachyurus* AND *Helicotylenchus pseudorobustus* ON SUGARCANE 109 DAYS AFTER INOCULATION.

	Mean population		*Increase*	
Treatment Code	*Hel.*	*Praty*	*Hel*	*Praty*
H_0P_0	0	0	–	–
H_1P_0	11,560		11.5x	–
H_0P_1	0	38,800**	–	38.8x
H_1P_1	16,300	31,700*	16.3x	31.7x
H_1P_5	1,600	43,300*	1.6x	8.6x
H_5P_1	14,700	31,200**	2.9x	31.2x
H_5P_0	35,700	0	7.1x	–
H_0P_5	0	90,900*	–	18.1
H_5P_5	5,000	19,000	1.0	3.8

* significant at 5% level.

** significant at 1% level.

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