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INFLUENCE OF THE LESION NEMATODE, *PRATYLENCHUS ZEAE*, ON YIELD AND QUALITY CHARACTERS OF TWO CULTIVARS OF SUGARCANE

by
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Summary. The pathogenicity of the lesion nematode *Pratylenchus zeae* was tested on sugarcane cvs. Co 6304 and CoC 671 by inoculating a logarithmic series of nematodes, 0, 10^2, 10^3, 10^4 and 10^5. Nematodes caused a significant reduction in yield, the maximum at an inoculum level of 10^5. In the ratoon crop in addition to loss in yield, nematodes affected quality of cane as Brix, sucrose and CCS% in cv. CoC 671.

Lesion nematodes, *Pratylenchus* spp., are recognized as the primary pathogen of sugarcane throughout the world (-Spaull and Cadet, 1990). In pot experiments, *Pratylenchus zeae* Graham has been shown to cause a reduction in growth and yellowing of the leaves of sugarcane, *Saccharum officinarum* L. (Khan, 1963; Gargantiel and Davide, 1973; Valle-Lamboy and Ayala, 1980). The work reported here is a detailed investigation on the pathogenicity of *P. zeae* to two sugarcane cultivars Co 6304 and CoC 671 and the resulting loss in yield and quality.

Materials and methods

Cement pots of 400 l capacity were filled with a sterile soil mixture of sand and silt (1:2). Four single budded setts of sugarcane cultivars Co 6304 and CoC 671 were planted in each pot. *P. zeae*, from a culture maintained on maize (*Zea mays* L.) were inoculated in a logarithmic series of 0, 10^2, 10^3, 10^4 and 10^5 nematodes per pot, thirty days after planting of the setts and initial root formation. The suspensions of nematodes were poured into holes around the germinating bud near the root zone. The five treatments were replicated six times and the experiment was a randomized complete block design arranged in a screen house. Pots were regularly irrigated with a measured quantity of water (5 l/day/pot) and the side shoots were periodically thinned to maintain only four plants per pot. Chemical pesticides were applied to keep plant free from aerial pests and disease.

Twelve months after planting, canes were harvested and data on weight of cane and quality as Brix, sucrose and purity (Chen, 1985) were recorded. Brix is a measure of the percentage weight of solids in pure sucrose solution (cane juice), while sucrose is the amount of sucrose present in the cane juice. Purity of sugarcane juice is calculated from Brix and sucrose content of juice.

Population densities of *P. zeae* were estimated from random samples of 10 g of fresh root and 100 ml of soil from each pot. After harvest, the experiment was maintained as a ratoon crop by stubble shaving and cleaning at the base of the crop. The ratoon crop was harvested after 12 months and the same data as for plant crop were recorded. From these data loss of yield and quality of sugarcane were calculated.

Results

Soil and root population densities of *P. zeae* at harvest significantly increased in relation to the initial inoculum level (Pi) (Table I). There was a significant loss of yield of the plant crop of both the cultivars at all inoculum levels, this being higher in CoC 671 than Co 6304. No significant loss in any quality parameter was recorded in Co 6304 in the plant and ratoon crops and in CoC 671 plant crop. However, in the ratoon crop of CoC 671, there was a reduction in the Brix at the highest inoculum level (Table II).

Concurrently, the sucrose content of the juice was also reduced significantly at Pi levels of 10^2, 10^4 and 10^5. Commercial cane sugar (CCS%) in juice, being dependent on yield and quality, showed significant reduction in CoC 671 at the maximum Pi in the ratoon crop.

Discussion

The per cent loss in crop yield due to nematode infection in both cultivars indicated that the losses caused to the root system was greater in the plant crop than in the ratoon crop. Such losses of the plant cane have also been reported by Cadet and Spaull (1985) who remarked that this was probably due to the cane plant largely depending on the sett root system during the period of tiller development. The yield loss in the plant cane of both cultivars was directly proportionate to the inoculum levels (Table I). The maximum yield loss occurred at an inoculum level of 10^5 nematodes. However, loss in yield is likely to occur at a low inoculum level of 10^2 nematodes/pot.

Analysis of the root population showed that in the ratoon crop there was a rapid increase in the root population. This increase can be explained by the fact that soon after harvest of the plant crop the initial young shoots are dependent on the roots of the previous crop (stool roots) before being replaced by new roots (Spaull and Cadet, 1990).

Besides loss in yield, quality of sugarcane was also influenced by the nematodes. Losses in Brix, sucrose and CCS% levels of the cane were not statistically significant in the plant crop. In the ratoon crop of CoC 671 there was a significant reduction in these parameters at the highest inoculum level (Table II).

P. zeae does not directly influence the quality of sugarcane at the economic threshold level, but if the levels were to rise beyond this limit, a drop in the quality can be expected. In the cane crop, as the CCS% involves both yield and quality parameters, the significant loss in yield would

TABLE I - *Influence of* Pratylenchus zeae *on the yield and quality of sugarcane at different inoculum levels in the plant crop.*

Initial population	Nematode soil population (100 ml)		Nematode root population (10 g)		Weight of cane (kg/pot)		Brix		Sucrose		Purity		CCS%	
	Co 6304	CoC 671	Co 6304	CoC 671	Co 6304	CoC 671	Co 6304	CoC 671	Co 6304	CoC 671	Co 6304	CoC 671	Co 6304	CoC 671
0	0.00	0.00	0.00	0.00	3.45	3.08	19.05	20.39	16.44	18.17	86.68	89.21	11.23	12.66
100	48.40	59.20	13.60	17.60	2.85	2.75	18.82	21.21	16.40	19.20	86.66	90.39	11.28	13.43
1000	52.40	93.00	21.00	23.00	2.85	2.14	18.29	19.70	15.64	17.83	87.06	89.25	10.74	12.26
10000	82.80	113.40	22.00	28.00	2.52	1.64	17.91	19.67	15.66	17.69	87.35	90.08	10.78	12.35
100000	102.60	132.60	29.40	34.00	2.10	1.32	19.32	19.50	16.59	17.59	86.45	89.31	11.35	12.27
SE	2.75	2.40	1.26	1.92	0.19	0.11	0.39	0.67	0.37	0.76	0.63	1.04	0.29	0.59
CD	8.46*	7.40*	3.87*	5.92*	0.56*	0.33*	NS	NS	NS	NS	NS	NS	NS	NS

* Significant with respect to control at P = 0.05.

TABLE II *Influence of* P. zeae *on the yield and quality of sugarcane at different inoculum levels in the ratoon crop.*

Initial population	Nematode soil population (100 ml)		Nematode root population (10 g)		Weight of cane (kg/pot)		Brix		Sucrose		Purity		CCS%	
	Co 6304	CoC 671	Co 6304	CoC 671	Co 6304	CoC 671	Co 6304	CoC 671	Co 6304	CoC 671	Co 6304	CoC 671	Co 6304	CoC 671
0	0.00	0.00	0.00	0.00	2.58	3.25	17.35	19.07	15.48	17.23	89.24	90.40	10.75	12.04
100	59.17	82.17	16.50	24.50	2.18	3.25	16.91	18.72	14.60	16.96	86.53	90.53	9.99	11.86
1000	72.17	83.50	30.17	31.00	2.04	2.30	17.33	19.84	15.10	18.03	87.07	90.89	10.37	11.32
10000	113.67	113.33	36.00	40.00	1.96	1.85	16.24	18.54	3.86	16.57	85.31	88.72	9.42	11.52
100000	154.33	187.00	37.17	56.00	0.26	1.00	17.14	17.31	14.98	15.29	87.36	88.17	10.31	10.57
SE	9.78	8.70	3.60	2.90	0.80	0.19	0.33	0.53	0.44	0.56	1.15	1.19	0.34	0.42
CD	29.47*	26.20*	10.63*	8.61*	NS	0.57*	NS	1.55*	1.28*	1.64*	NS	NS	NS	1.27*

* Significant with respect to control at P = 0.05.

consequently result in a loss in the total CCS%. The average yield loss was 23% in Co 6304 and 30% in CoC 671. It can be concluded that *P. zeae* causes economic damage to the sugarcane crop. Further it can be said that losses caused by nematodes vary according to the cultivar and Pi in the soil.

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