ANNUAL AND LONG TERM BENEFITS OF NEMATODE CONTROL ON YIELD OF SUGARCANE

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Plant-parasitic nematodes are ubiquitous in sugarcane fields throughout the South African sugar industry, and on poor sandy soils they are recognised as a serious constraint to cane production. By applying a nematicide at planting and to each of the following ratoon crops growers can increase cane growth and improve cane yield considerably. Treatment of one crop can have a beneficial, carry-over effect on the yield of the following crop. Other benefits from the use of a nematicide include the more rapid development of a full leaf canopy over the interrow, leading to suppression of weeds, and the development of a more extensive root system, resulting in a more efficient use of fertilisers and uptake of soil moisture. Yields of cane grown on sandy soil decline with time until a point is reached when the cost of further production would exceed the value of the crop. This yield threshold will be reached sooner by cane affected by nematodes than by higher yielding, nematicide treated cane. With the exception of studies on the carry-over effect of nematicide-treatment on the following one or two ratoon crops, trial work with nematicides has concentrated on the short-term increase in yield per harvested crop. This paper attempts to quantify the long-term benefit from sustained production of sugarcane through the use of nematicides to reduce the damage caused by nematodes in each crop.

The effect of treatment with a nematicide on sugarcane yields was studied in the plant crop and four or five ratoon crops in two variety-x-nematicide trials located on similar sandy soils on the La Mercy farm near Verulam in KwaZulu-Natal. Treatments were arranged on a split plot basis and comprised aldicarb at 3 kg/ha and an untreated control. These were applied to a total of 10 varieties in the two trials; N17, N23, N24 and NCo376 at one site, N8, N19, N21 and N27 at the other site, with varieties N12 and N16 common to both. Each whole plot comprised 10 rows in one trial and 12 in the other. The rows were 10 m in length. The plots were randomised within blocks with six replicates. Each crop was harvested at approximately 12 months. At harvest the mass of the three or four centre rows per plot was measured. Nematodes were sampled every year on at least one occasion in both the soil and roots in each of the plots.

Table 1. Estimates, derived from the logarithmic regression curve, of the number of crops at two sites that could be harvested before the yield fell to below the ploughout threshold, fixed at 40 t cane/ha. The LM2 site was infested with *Meloidogyne javanica.*

Site	Varieties	Years before 40t cane/ha threshold level		Average yield over the 5 (LM2) or 6 (LM1) treated crops (t cane/ha)
		Control	Treated	
LM1	N23	8	55	80.8
	N16	6	43	89.4
	N17	7	27	75.2
	NCO376	9	24	73.3
	N12	8	22	76.3
	N24	2	13	62.3
LM2	N16	3	20	71.9
	N12	3	13	80.9
	N8	2	5	44.0
	N21	2	4	56.8
	N19	2	3	55.4
	N27	1	3	45.2

The plant parasitic nematode communities were similar except that root-knot nematodes, *Meloidogyne javanica,* were absent from one site. Lesion nematodes, *Pratylenchus zeae,* dagger nematodes, *Xiphinema elongatum,* stubby root nematodes, *Paratrichodorus* spp, and spiral nematodes, *Helicotylenchus dihystera*, were common to both sites. Annual losses from nematodes, as measured by the response to treatment with the nematicide, were similar over successive crops, which meant that, with the declining ratoon cane yields, proportionally greater losses occurred with time. Data from both sites showed there to be a significant positive correlation between yield of the nematicide treated plots and size of the response to treatment. Comparison of the two sites showed that, over a 4-year period, *Meloidogyne* alone was responsible for 30% of the losses, equivalent to 15 t cane/ha/annum. The long term effect of nematodes on sugarcane production was measured after calculating a logarithmic function from the observed yields of successive ratoons. Without a nematicide the time taken for the yield to decline to a threshold of 40 t cane/ha/annum ranged from a minimum of one year, for N27 in the *Meloidogyne* infested site to a maximum of nine years for NCo376 in the other site (Table 1). Treatment with a nematicide increased this period considerably. Thus on the site with *Meloidogyne* it took a projected 20 years before the yield of N16 reached the threshold and 43 years at the other site. The use of a nematicide increased sustainable production, on average, by a factor of three at the *Meloidogyne* infested site and a factor of five at the other site. *Meloidogyne* was responsible for about 50% of the loss in sustainability. Differences between varieties in the rate at which ratoon yields declined meant that, over time, the best varieties at both sites were not the ones which gave the greatest annual yields during the first few crops after planting. The results clearly show that the problem from nematodes is much more serious than previously thought.