Effect of Reniform Nematode on Cantaloup Yields

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ABSTRACT

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The effect of the reniform nematode (*Rotylenchulus reniformis*) on the quality and yield of cantaloup (*Cucumis melo* 'Perlita') was compared in fumigated and unfumigated plots over a 3-yr period; 1,3-dichloropropene was used in 1975 and 1976, and 1,2-dibromo-3-chloropropane was used in 1977. Cantaloup yields were higher in fumigated treatments than in controls (105, 82, and 79% higher in 1975, 1976, and 1977, respectively). Reniform nematode populations were significantly reduced by soil fumigation. In 1975, the percentage of soluble solids was significantly higher in fumigated than in unfumigated plots.

The reniform nematode (*Rotylenchulus reniformis* Linford & Oliveira) causes economic injury to a wide range of plants in many tropical and subtropical areas of the world. The nematode is widespread in a three-county area of southern Texas (4) and causes economic crop losses to cotton and several vegetable crops (2,6,9). The nematode also causes significant reductions in root and stem growth of cantaloup in the greenhouse (5), and although reductions in cantaloup production suspected to be caused by the reniform nematode have been observed in the field, the extent of the injury cannot be determined without extensive study.

The objective of this research was to determine the extent of injury to cantaloup by the reniform nematode and the degree of effectiveness of fumigants in reducing nematode numbers and improving plant yield.

This paper reports the results of research only, and mention of a pesticide does not constitute a recommendation by the USDA or imply registration under FIFRA.

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MATERIALS AND METHODS

Experiments were conducted during 1975, 1976, and 1977 in a Hidalgo sandy loam naturally infested with the reniform nematode. A *Tylenchorhynchus* sp. was also found in six plots, but the population level was low. In 1975 and 1976, the experimental design consisted of randomized paired plots with rows 15 m long and 1 m wide, replicated eight times. A gravity-flow applicator was used to apply 92% 1,3-dichloropropene (1,3-D) to alternate rows at the rate of 47 L/ha with one shank per row, to a depth of 25 cm, 2 wk before cantaloup (*Cucumis melo* 'Perlita') was planted. In 1975, the percentage of sucrose was measured with a hand-held refractometer from five melons in each treatment of the eight replicates. In 1977, the experimental design was a randomized block with two

Table 1. Effect of soil fumigation on reniform nematode population, cantaloup yield, and sucrose content, 1975

	1,3-D (46.7 L/ha)	Control
Nematode counts per 100 g of soil 75 days after treatment	91	305
Yield (kg/12-m row)	26.6[a]	12.9
Percentage of sucrose	8.59[a]	5.93

[a]Significant increase at 1% level of probability.

Table 2. Effect of soil fumigation on reniform nematode population and cantaloup yield, 1976 and 1977

	1976			1977		
	1,3-D (46.7 L/ha)		Control	DBCP (9.3 L/ha)		Control
Nematode counts per 100 g of soil:						
Before treatment	36		38	80		150
46 days after treatment	4		18	0		26
88 days after treatment	70		226	93		625
Yield (kg/row)	26.7[a]	(12-m row)	14.7	96.6[a]	(24-m row)	53.9
Marketable cantaloup (kg)	10.4[a]		0.8	48.3[a]		18.0

[a]Significant increase at 1% level of probability.

Table 3. Calculated cost benefit of soil fumigation to control reniform nematode infection of cantaloup, 1977

	DBCP (9.3 L/ha)	Control
Yield (kg/24-m row)	48.3	18
Calculated yield/ha	10,819	4,636
Price per100 g[a]	$32.19	$32.19
Calculated gross to grower	$3,457.75	$1,492.33

[a]Based on price quoted in 1977 Texas Vegetable Statistics, p. 11.

treatments replicated four times. Each plot was 15 m long and consisted of three rows 1.5 m wide. Treatments were 1,2-dibromo-3-chloropropane (DBCP) at 9.3 L/ha injected as described for 1,3-D and the untreated control.

Composite soil samples (6 per sample) for nematode counts were taken to a depth of 15 cm from each plot at least once after treatment; in 1976 and 1977, samples were also taken before treatment. Samples were mixed by sieving, and 100-g subsamples were placed in Baermann funnels for nematode extraction. After 48 hr, 60 ml of the funnel contents was withdrawn, and nematode counts were determined by averaging the number in five 1-ml aliquots from each funnel. Nematodes counted consisted of larvae, males and four-stage vermiform females. In 1975 and 1976, yields were taken from a 12-m portion of each row, which left 1.5-m bands on each end. Statistical analyses were calculated by the *t* test for paired comparison. In 1977, yields were taken for 12 m of the two outside rows, leaving borders as above. Data were interpreted by analysis of variance, and significance was determined by LSD.

RESULTS

Nematode counts, cantaloup yields, and percentage of sucrose for 1975 are shown in Table 1. Yields increased significantly when the reniform nematode was controlled by soil fumigation. Cantaloup from fumigated plots had significantly ($P = 0.01$) more sucrose (44.8%) than that from unfumigated soil. Pretreatment counts of nematodes were not made for each plot in 1975, but random field sampling 2 days before treatment showed a mean of 86 reniform nematodes per 100 g of soil (range, 53–105). Nematode counts 75 days after treatments were significantly ($P = 0.05$) lower in the fumigated rows than in the untreated rows (Table 1). In 1976 and 1977, cantaloup yields were also significantly ($P = 0.01$) higher in fumigated rows than in untreated rows (Table 2). In 1976 and 1977, melons were graded according to size, and marketable fruit was determined from total yields (Table 2). Differences in marketable fruit yield were primarily due to size. Largest fruit was produced in fumigated plots, resulting in more kilograms of larger cantaloup. Table 3 shows the calculated dollar benefit of soil fumigation based on kilograms of marketable cantaloup per hectare. A gross increase of $1,965.42/ha for an investment of approximately $20 for soil fumigation was calculated.

DISCUSSION

The reniform nematode caused a significant reduction in cantaloup yield, primarily by reducing melon size, and directly affected quality of the melon, as indicated by a reduced percentage of sucrose when nematodes were not controlled. The data also show that the reniform nematode can be controlled economically with soil fumigants.

Other workers (1,3,7,8) have shown that *R. reniformis* can cause economic losses to various crops. This study has shown that *R. reniformis* is a limiting factor in cantaloup production in southern Texas and that soil fumigation is important in maintaining economic yields.

LITERATURE CITED

1. AYALA, A. 1961. Pathogenicity of the reniform nematode on various hosts. J. Agric. Univ. P. R. 46:73-82.
2. BIRCHFIELD, W., and L. R. BRISTER. 1962. New hosts and nonhost of reniform nematode. Plant Dis. Rep. 46:683-685.
3. BIRCHFIELD, W., and W. J. MARTIN. 1976. Effects of some organophosphate and carbamate nematicides on reniform nematode and sweetpotato yields. (Abstr.) J. Nematol. 8:279-280.
4. BIRCHFIELD, W., H. REYNOLDS, and C. ORR. 1966. Plant-parasitic nematodes of cotton in the Lower Rio Grande Valley of Texas. Plant Dis. Rep. 50:149-150.
5. HEALD, C. M. 1975. Pathogenicity and histopathology of *Rotylenchulus reniformis* infecting cantaloup. J. Nematol. 7:149-152.
6. HEALD, C. M. 1978. Effect of the reniform nematode on vegetable yields. Plant Dis. Rep. 62:902-904.
7. HOLTZMANN, O. V., and M. ISKII. 1963. Studies on the control of root-knot and reniform nematodes with soil fumigation in Hawaii. Hawaii Agric. Exp. Stn. Tech. Prog. Rep. 139. 6 pp.
8. TAYLOR, D. P., W. E. SCHLLOSSER, and A. T. SAAD. 1970. First report of the reniform nematode, *Rotylenchulus reniformis*, from Lebanon. Plant Dis. Rep. 54:435-436.
9. THAMES, W. H., and C. M. HEALD. 1974. Chemical and cultural control of *Rotylenchulus reniformis* on cotton. Plant Dis. Rep. 58:337-341.