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# YIELD LOSS ASSESSMENT CAUSED BY THE CITRUS NEMATODE *TYLENCHULUS SEMIPENETRANS* ON VALENCIA ORANGES IN CYPRUS.

by
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**Summary.** In a trial with 18-year old Valencia orange trees on sour orange rootstock high infestation levels of the citrus nematode (*Tylenchulus semipenetrans* Cobb) caused significant reduction in fruit weight (size) while total yield (kg/tree) was not significantly affected. It was calculated that the cost of nematicide treatment was repaid when nematode counts, under the conditions of the experiment, reached approximately 10,000 juveniles per kilogram of soil. The equation relating fruit weight (size) and nematode counts was Y: 196.448-0.68 x nematodes.

It is estimated that the world average yield losses to citrus caused by the citrus nematode, *Tylenchulus semipenetrans* Cobb, are 20 to 30%. Although much research has been conducted in controlling this nematode, estimates of yield losses caused by nematode populations, in properly designed trials, are scarce.

The purpose of the present study was to determine response of Valencia trees infested with different levels of citrus nematode occurring in a citrus orchard after applying three granular nematicides.

## Materials and methods

The work was conducted with 18-year old Valencia trees (*Citrus sinensis* L.) on sour orange (*Citrus aurantium* L.) rootstock. Annual records were taken for four years from the experimental plots. The granular nematicides prophos, aldicarb and oxamyl were applied in early June each year at rates of 3.3 and 2 g a.i./$m^2$ respectively. The chemicals were incorporated 7-10 cm deep in two bands, one on either side of each tree, with a hand applicator. Nematode numbers were determined from soil samples taken at 8-15 cm depth from the treated or untreated (control) areas in the spring and autumn each year. Second stage citrus nematode juveniles ($J_2$) were extracted from 250 g of soil by a combination of the sieving-decanting and Baermann funnel methods. Each plot consisted of three trees replicated four times in a randomized complete block design. Data were collected for four years (1983-86) and each nematode-yield data point (Fig. 1) represents the average for three years (1983 through 1986). At the initiation of the trial all the trees were of uniform size. At the end of the 4-year experiment the relationship between nematode densities and tree yields of each treated and untreated plot was subjected to regression analysis. Yields were expressed as Kilograms per tree while the average fruit weight was calculated by counting and weighing approximately 50% of the harvested fruits.

## Results and discussion

Linear regression analysis indicated a significant (r = 0.391) adverse effect of nematode populations on fruit weight (Fig. 1) while correlation between nematode densities and yield was not significant. The lack of significant

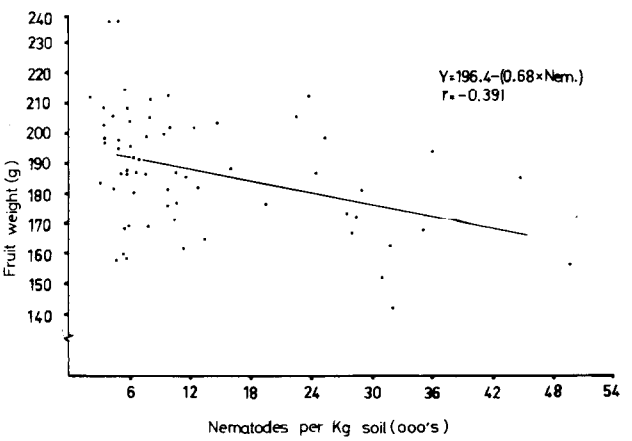


Fig. 1 - Relationship of citrus nematode populations to Valencia orange fruit weights in Cyprus.

correlation between yield (kg/tree) and nematode densities is not surprising since most cases concerning yield response after controlling the nematode refer to increase of fruit weight (boxes) (Timmer, 1977; O'Bannon and Tarjan, 1969; O'Bannon and Reynolds, 1963). Losses in terms of marketable fruit, however, were substantial in plots with high nematode populations as shown in Fig. 1. On the basis of the data of Fig. 1 it was possible to estimate the losses of marketable fruit at increasing nematode densities (Table I).

TABLE I. - *Predicted marketable fruit losses in Cyprus Valencia oranges at increasing citrus nematode density.*

| Nematode population ($J_2$/kg soil) | Predicted fruit weight (g) | Predicted marketable fruit loss* kg/tree | T/ha | |
|---|---|---|---|---|
| 0 | 196.4 | 0 | 0 | |
| 10,000 | 189.6 | 6.8 | 2.0 | 3.4% |
| 20,000 | 182.8 | 13.6 | 4.1 | 6.9% |
| 30,000 | 176.0 | 20.4 | 6.1 | 10.3% |
| 40,000 | 169.2 | 27.2 | 8.2 | 13.9% |
| 50,000 | 162.4 | 34.0 | 10.2 | 17.3% |
| 60,000 | 155.6 | 40.8 | 12.2 | 20.7% |

* Assuming that fruits/tree and number of trees/ha are 1000 and 300, respectively.

Considering that in the government-controlled area nematode-infested Valencia trees, over 15-years of age, occupy an area of 1,000 hectares (Papayiannis, personal communication) and assuming that infestation levels usually range between 20-30 thousand second-stage juveniles ($J_2$) per kg soil, then the annual average yield loss due to nematode attack reaches around 5 t/ha.

The annual cost of nematicides as used in our experiment, ranged between CY £ 65-136/ha. Thus, nematicide costs would be repaid if nematode counts reached 10,000 $J_2$ per kg soil. This is slightly different from the findings of Timmer and Davies (1982) working with grapefruits who found that cost of nematicide (aldicarb), including application, was repaid with the protection from yield loss occurring at around 20,000 juveniles per kg soil.

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## Literature cited

O'BANNON J.H. and REYNOLDS H.W., 1963 - Response of navel orange trees to a post planting application of DPCP for control of the citrus nematode. *Pl. Dis. Reptr*, *5*: 401-404.

O'BANNON J.H. and TARJAN A.C., 1969 - Increasing yield of Florida citrus through chemical control of the citrus nematode, *Tylenchulus semipenetrans*. Proc. 1st Internat. Citrus Symp. vol. II, pp. 991-998, 16-26 March, 1968, Riverside, California (U.S.A.).

TIMMER L.W., 1977 - Control of citrus nematode, *Tylenchulus semipenetrans* on fine-textured soil with DBCP and Oxamyl. *J. Nematol.*, *9*: 45-50.

TIMMER L.W. and DAVIES R.M., 1982 - Estimate of yield loss from the citrus nematode in Texas grapefruit. *J. Nematol.*, *14*: 582-585.

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