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# PRESENCE AND CONTROL OF *PRATYLENCHUS PENETRANS* ON POTATO IN CYPRUS

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**Summary**. The lesion nematode, *Pratylenchus penetrans*, was found to cause serious damage to potato, cv. Spunta, mainly in light soils in Cyprus. Nematicides reduced nematode populations in roots and soil, also increasing yields substantially. The largest yield response to nematicide treatment was obtained when both the nematode and vascular wilt, caused by *Verticillium dahliae*, were present. Overall, the best results were obtained with aldicarb and cadusafos applied at the rates of 3-4.5 and 5-5.2 kg a.i. per hectare, respectively.

In Cyprus, the potato (*Solanum tuberosum* L.) crop occupies an area of some 9,600 ha with a production value of about CY£ 23m (Anon., 1992) and is one of the major export crops. Previous investigations in the main potato growing area (Kokkinochoria) revealed the presence of the potato cyst nematode, *Globodera rostochiensis* (Woll.) Behrens (Philis, 1980). More recent investigations in the south and south-west of the island, where potatoes are also grown, have shown the presence of the lesion nematode, *Pratylenchus penetrans* (Cobb) Filipjev *et* Schuurmans Stekhoven. Infested plants matured 2-3 weeks earlier than usually and large crop losses were evident where there were high population densities of the nematode.

The present work includes a survey of the distribution of *P. penetrans* in the government-controlled potato growing areas of Cyprus and the results of trials undertaken to evaluate the efficacy of several nematicides for the control of the nematode and the protection of potato yields.

## Materials and methods

To ascertain the distribution of *P. penetrans*, 190 soil samples were taken from nine different locations representing the main potato production areas in Cyprus. Samples were taken from the field to the laboratory on the same day and then stored at 8-10 °C until required. Nematodes were extracted from 250 g aliquots of the soil samples by wet sieving through sieves with 53 and 38 µm apertures with final separation in a Baermann funnel. Counts of *P. penetrans* were made using a 1 cc counting slide and a X280 compound microscope.

Nematicide trials were undertaken in 1992, 1993 and 1994. Granular nematicides were applied before planting by broadcasting and then incorporating into the soil to a depth of 12 cm with a rotovator. Liquid applications of oxamyl were applied twice, at 68 and 96, 48 and 78, and 68 and 90 days after planting in 1992, 1993 and 1994, respectively. In each year the trials were in a randomised complete block design,

with plots of 20-24 $m^2$ and 3, 4 and 5 replicates of each treatment in 1992, 1993 and 1994, respectively. The cultivar Spunta was planted in each trial: 23 January 1992 and harvested 8 June; 12 August 1993 and harvested 16 December; and 12 January 1994 and harvested 9 May. Commercial yields of potato tubers were estimated by digging the two middle rows of each plot. Soil samples were taken immediately before the application of the granular nematicides at 5-6 locations in each plot using a 2.5 cm soil sampling tube. At harvest, 5 or 6 plants per plot were carefully uplifted and a sample taken from the soil adhering to the roots. Nematodes were extracted from 250 g aliquots as described above. Also, at harvest 2-3 g of roots from each of the plot samples were cut into 1-2 cm pieces, comminuted in a blender for 30-40 seconds and the nematodes then extracted in a Baermann funnel. In 1994 only, leaf measurements were made at 68 and 78 days after planting using a Digital Planimeter (PLACOM); the fourth leaf from the apex of each composite leaf was taken from ten to twelve plants from each plot.

## Results and discussion

The majority of the 190 soil samples collected from the various potato crops were from light soils (sandy clay to sandy clay loam) in which the maximum *P. penetrans* population densities were found (Table I). This agrees with Florini *et. al.* (1987) who reported that *P. penetrans* prefers lighter rather than heavier soils. The highest population densities occurred mostly in the south and south-west of Cyprus, with up to 1480 individuals per 250 g soil. Several of the soil samples yielded more than 100-250 *P. penetrans* per 250 g soil which Ooestenbrink (1966) regarded as the economic threshold for the nematode. Most of the potato crops growing in light soils were extensively damaged by *P. penetrans* with symptoms of chlorosis, stunting, poor root systems and negligible yields of tubers.

In the nematicide trials, all of the treatments reduced numbers of *P. penetrans* and increased yields compared with the untreated controls (Table II). In 1992, oxamyl, as granules and liquid, and aldicarb increased yields by 15.7 to

TABLE I - *Presence of* Pratylenchus penetrans *in potato fields.*

| Sampled areas | Region | Soil type[a)] | Number of samples examined | Maximum nematode population (250 g soil) |
|---|---|---|---|---|
| Akrotiri | South | SC-SCL | 15 | 780 |
| Trachoni | " | " | 11 | 950 |
| Episkopi | " | " | 14 | 1,480 |
| Mandria | S. West | " | 64 | 550 |
| Akaki | North | CL-C | 33 | 1,300 |
| Yeroskipou | " | C | 2 | 50 |
| Peristerona | " | C | 36 | 180 |
| Xylophagou | East | C | 13 | 50 |
| Paralimni | " | C | 2 | 25 |

[a)] SC-SCL (Sandy Clay to Sandy Clay Loam), CL-C (Clay loam to Clay), C (Clay).

TABLE II - *Effect of nematicides on* P. penetrans *and potato yield.*

| Nematicides | Application rate (a.i. kg/ha) | Nematode population at harvest per | | Yield (Tons/ha) | % Increase |
|---|---|---|---|---|---|
| | | 250 g soil | g of roots | | |
| Spring, 1992. Initial population *P. penetrans*: 525/250 g soil | | | | | |
| Aldicarb | 3 | 100 b | 37 b | 59 a | 15.7 |
| Oxamyl Gr. | 3 | 275 ab | 46 b | 60 a | 17.6 |
| Oxamyl L.[a)] | 3 | 350 a | 48 b | 62 a | 21.6 |
| Control | – | 475 a | 252 a | 51 b | |
| Summer, 1993. Initial population *P. penetrans*: 225/250 g soil | | | | | |
| Aldicarb | 3 | 75 b | 15 c | 17 ab | 41.6 |
| Oxamyl Gr. | 3 | 175 b | 24 b | 14 bc | 16.6 |
| Cadusafos Gr. | 5 | 75 b | 10 c | 19 a | 58.3 |
| Oxamyl Gr. + Oxamyl L.* | 3+(4) | 175 b | 23 b | 15 bc | 25.0 |
| Oxamyl L.* | 1+(4) | 125 b | 16 bc | 16 abc | 33.0 |
| Control | – | 350 a | 53 a | 12 c | |
| Spring, 1994. Initial population *P. penetrans*: 125/250 g soil | | | | | |
| Aldicarb | 4.5 | 32 c | 13 cd | 30 a | 25.0 |
| Oxamyl Gr. | 3.7 | 99 b | 23 bc | 25 b | 4.2 |
| Cadusafos Gr. | 5.2 | 33 c | 13 d | 29 a | 20.8 |
| Oxamyl L.* | 1+(4) | 88 b | 27 b | 24 b | |
| Control | | 159 a | 49 a | 24 b | |

[a)] Split in two sprayings (40-60%) held at 68 and 96, 48 and 78 and 68 and 90 days for 1992, 1993 and 1994, respectively (4,000 ppm). Treatments having the same letter in a column are not significantly different using Duncan's Multiple Range Test (0.05).

21.6% which were associated with 81 to 85.3% control of *P. penetrans* as measured in root populations. Oxamyl, however, was not as effective as the other treatments in 1993 and 1994. The greatest increases in yields compared with the control was achieved in 1993 with cadusafos and aldicarb; root populations of *P. penetrans* were reduced by 81.1 and 71.7% and yields increased by 58.3 and 41.6%, respectively. The overall large increase in yields achieved by these treatments is believed to be due to the combined effect of the nematicides against both *P. penetrans* and *Verticillium dahliae Kleb.* Rowe *et al.* (1985) reported the synergistic interaction between the two organisms which could result in the early death of potato plants and yield losses of 25-50%. Martin *et al.* (1981) also commented on the Early Dying Complex of potato associated with attack by *P. penetrans.* In 1993, examination of plants a few days prior to harvesting revealed a high incidence of vascular wilt disease in the untreated plots accompanied by symptoms of Potato Early Dying, while plants in the nematicide treated plots appeared healthier and greener.

Overall, nematode control in the soil ranged between 26.3-79%, 50-78.6% and 37.7-79.9% for

1992, 1993 and 1994 respectively over the untreaated. Best results were obtained with aldicarb and cadusafos (Table II). In Spring 1994, the same nematicides significantly increased the leaf area of plants between 15.1-19.7% over the untreated, as determined by leaf sampling at 68 and 78 days from planting. Oxamyl, applied either as granules, liquid or combined together, increased yields and decreased the nematode population in soil and roots but the treatments were inconsistent.

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## Literature cited

ANONYMOUS., 1992. Agricultural Statistics. Department of Statistics and Research. Ministry of Finance. Nicosia, Cyprus: 182 pp.

FLORINI D. A., LORIA R. and KOTCON J. B., 1987. Influence of edaphic factors and previous crops on *Pratylenchus* ssp. population densities in potato. *J. Nematol., 19*: 85-92.

MARTIN M. J., RIEDEL R. M. and ROWE R. C., 1981. *Verticillium dahliae* and *Pratylenchus penetrans*: Interactions in the Early Dying Complex of potato in Ohio. *Phytopathology*: *71*: 640-644.

OOSTENBRINK M., 1966. Major characteristics of the relationship between nematodes and plants. *Meded. Landb-Hoogesch Wageningen, 66*: 1-46.

PHILIS J., 1980. Life history of the potato cyst-nematode *Globodera rostochiensis* in Cyprus. *Nematologica, 26*: 295-301.

ROWER R. C., RIEDEL R. M. and MARTIN M. J., 1985. Synergistic interactions between *Veticillium dahliae* and *Pratylenchus penetrans* in Potato Early Dying Disease. *Phytopathology, 75*: 412-418.

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