

*Spyros Stavrinides Chemicals Ltd., P.O. Box 1278, 1505 Nicosia, Cyprus*

## **EFFECT OF CADUSAFOS AND CARBOFURAN AGAINST *PRATYLENCHUS PENETRANS* AND SOME ECTOPARASITIC NEMATODES INFESTING POTATO IN CYPRUS**

by  
J. PHILIS

**Summary.** Cadusafos (as Rugby<sup>(R)</sup>) and carbofuran (as Furadan<sup>(R)</sup>) at the rates of 4 and 6 kg a.i. per hectare, respectively, applied prior to planting of potatoes cv. Spunta, controlled the lesion nematode *Pratylenchus penetrans* in roots and soil increasing yields significantly by 26 and 13 per cent, respectively, over the untreated. At harvest, the numbers of *P. penetrans* within roots were negatively correlated with yield of potato. The nematicides produced only modest decreases in numbers of ectoparasitic nematodes which were not correlated with increases in yield.

Approximately 9,600 ha are planted annually with potato in Cyprus (Anonymous, 1992), the crop comprising one of the island's principal agricultural exports. As in other regions where potatoes are grown the potato cyst nematode, *Globodera rostochiensis*, is a major cause of crop losses. Other plant parasitic nematodes are associated with potato and some of them have been associated with poor growth and loss of yield (Philis, 1995a). The lesion nematode, *Pratylenchus penetrans*, has been reported to be damaging to potato in several countries (Dickerson *et al.*, 1964; Kimpinski, 1979; Olthof, 1986) and Oostenbrink (1966) calculated that the economic threshold was 100-250 nematodes per 250 g of soil. Information on the pathogenicity of ectoparasitic species that have been found in association with potato is scarce but *Paratylenchus sp.* (Evans, 1978) and *Merlinius (Tylenchorhyncus) brevidens* (Sethi and Gopal, 1968) have been implicated with some loss of yield. In Cyprus, several ectoparasitic species and *P. penetrans* (Cobb) Filipjev *et* Schuurmans

Stekhoven commonly occur with potato and therefore trials with the nematicides cadusafos (Rugby<sup>(R)</sup>) and carbofuran (Furadan<sup>(R)</sup>) were undertaken to establish their effect on growth and yield.

### **Materials and methods**

The experimental site was situated near Kition village in the south coastal area of the island where the soil, as determined by mechanical analysis, is clay loam. The experimental design was a randomized complete block with four replications of three treatments and with plot size 4x8 m. The two nematicide treatments were cadusafos and carbofuran, both applied as granules at the rates of 4 and 6 kg a.i. per hectare, respectively, and incorporated into the soil to a depth of 12 cm by rotary cultivation. Untreated plots, representing the control, were also rotary cultivated at the same time as the nematicide treatments. The potato (*Solanum tube-*

*rosam* L.) cultivar Spunta was then planted on 10 September, 1996 and the plots were harvested on 30 December, in keeping with normal commercial practice.

Before application of the nematicides, five soil samples of 100 g each were randomly taken from each of the plots, mixed thoroughly, and then 150 g were processed for the extraction of nematodes using a modification of the sieving-Baermann funnel (Philis, 1995b). Soil samples were similarly taken and processed at 51, 83 and 95 days after planting, except that they were taken in the root zone of the potato plants. At harvest of the crop, 6-8 root samples of individual plants were taken at random from each plot to ascertain the numbers of *P. penetrans* present; one root sample from each plot, weighing 4-5 g, was cut into 1-2 cm pieces, comminuted in a blender for 30-40 seconds and the nematodes then extracted using a modification of the Baermann funnel method. Plant growth was assessed visually at 75 days after planting using a scale from 1 to 5.

## Results and discussion

Nematode populations decreased throughout the growing season in plots treated with either nematicide (Table I). In particular, the numbers of *P. penetrans* were significantly decreased by 58 and 33 per cent, respectively, in plots treated with cadusafos and carbofuran compared with the untreated control. The mean population density for tylenchid nematodes present, mainly *M. brevidens* (Allen) Siddiqi, *Tylenchorhynchus dubius* (Buetschli) Filipjev and *Ditylenchus dipsaci* (Kuen) Filipjev was also significantly decreased by 45 per cent in the cadusafos treatment. Root samples taken at harvest indicated a significant reduction of *P. penetrans* with cadusafos (96 per cent) and carbofuran (64 per cent) associated with yield increases of 26 and 13 per cent, respectively, compared with the untreated control (Table II).

The number of *P. penetrans* recorded within the roots at harvest was negatively correlated with yield, giving a significant correlation (*r*) of -0.678 (Fig. 1). The initial and final population

TABLE I - Parasitic nematodes recovered from a potato field after application of nematicides.

Nematode	Treatments	Nematodes per 150 g of soil				
		Initial population	Days after planting			Mean
			51	83	95	
<i>Pratylenchus penetrans</i>	Cadusafos G		105 a	87 a	40 a	77 a
	Carbofuran G		137 a	125 b	95 a	119 a
	Untreated	104	206 a	169 b	156 b	177 b
<i>Paratylenchus</i> sp.	Cadusafos G		831 a	1.018 a	625 a	824 a
	Carbofuran G		1.318 a	1.575 a	924 a	1.272 a
	Untreated	924	1.318 a	1.437 a	1.456 a	1.403 a
<i>Other Tylenchida</i>	Cadusafos G		105 a	100 a	81 a	95 a
	Carbofuran G		212 a	187 b	112 b	170 b
	Untreated	260	194 a	173 b	156 b	174 b
<i>Total plant parasitic</i>	Cadusafos G		1.042 a	1.200 a	746 a	996 a
	Carbofuran G		1.593 a	1.800 a	1.131 b	1.508 a
	Untreated	1.287	1.718 a	1.778 a	1.768 c	1.754 a

Means having the same letter in a column are not significantly different based on Duncan's Multiple Range Test (*P* = 0.05).

TABLE II - Effect of cadusafos and carbofuran on *Pratylenchus penetrans*, plant growth and yield of potato.

Nematicides	Plant growth (1-5)*	<i>P. penetrans</i> per g of root	Yield (Tons/ha)
Cadusafos	4.2	13 a	39 a
Carbofuran	3.9	112 b	35 b
Untreated	3.6	309 c	31 b

\* Based on a scale of 1 (plant severely stunted and chlorotic) to 5 (plants in excellent growth condition).

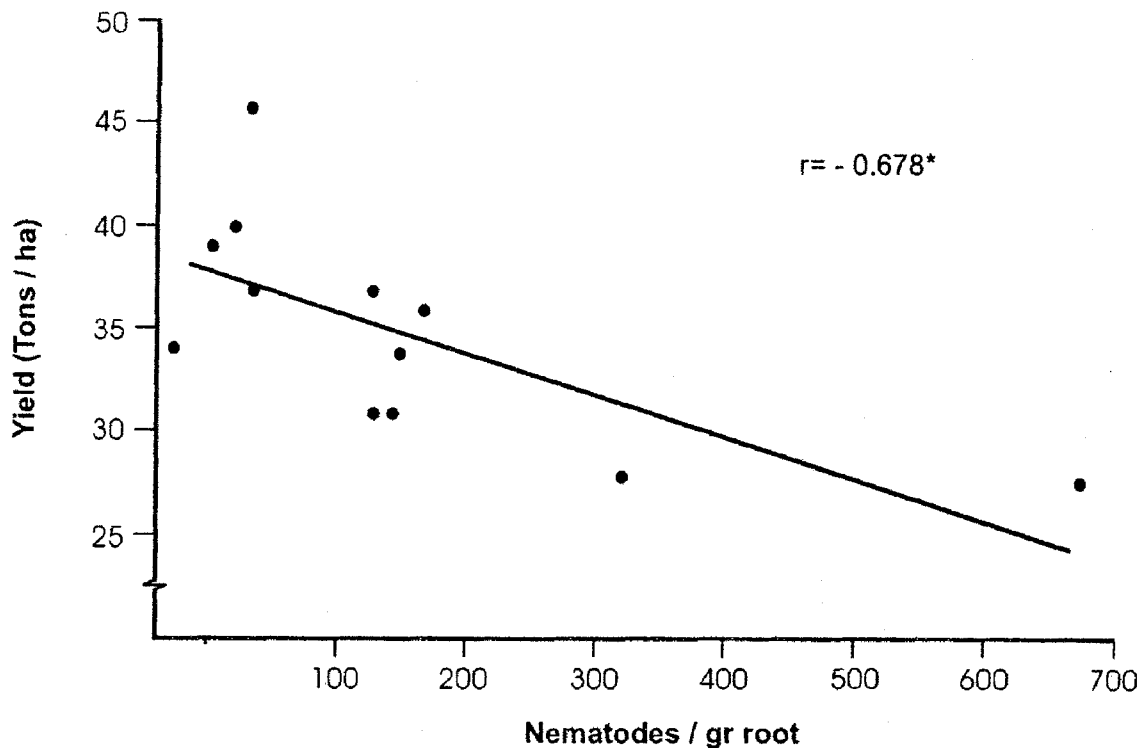


Fig. 1 - Relationship between *Pratylenchus penetrans* in roots at harvest and yield of potato.

densities also indicate that loss of yield was largely associated with *P. penetrans* and ectoparasitic nematodes present had little pathogenic effect. At the level of control of *P. penetrans* that was obtained, cadusafos achieved a profit: cost ratio of 6, thus greatly exceeding the cost of the nematicide treatment.

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