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EFFECT OF D-D, EDB AND DAZOMET ON POTATO CYST NEMATODE CONTROL IN CLAY SOILS OF CYPRUS

by

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The potato cyst nematode *Globodera rostochiensis* (Mulvey and Stone, 1976) was recently found at Xylophagou, Cyprus, (Panayi, 1974). The nematode, which may have been introduced on the island with potato seed from Europe twenty or more years ago (Jones, 1976), can affect potato yields and export of seed. Nollen and Mulder (1970) reported that injections of 300 kg/ha D-D into a well prepared sandy soil decreased nematode populations by 80%. Whitehead *et al.* (1973) found that dazomet and D-D at 446 and 896 kg/ha, respectively, resulted in fewer nematodes at the time of crop harvest and increased potato yield. When soil treatments provide an undamaged crop and nematode densities after harvest do not exceed those at planting, the nematode problem can be said to be fully controlled. If the post harvest nematode density exceeds the initial level but is less than in untreated plots, partial control of the nematode problem is obtained (Whitehead, 1975). According to Brown (1969), even when there are no obvious signs of disease in the haulm, yield losses due to potato cyst-nematode can be remarkable.

The aim of the trials was to assess the effectiveness of soil fumigants for the control of the potato cyst nematode in clay soils of Cyprus.

MATERIALS AND METHODS

In spring 1976, two trials with identical treatments were made in the Xylophagou area. D-D (1,3 dichloropropene and 1,2-dichloropro-

pane mixture), EDB (Ethylene dibromide as Edabrom) and dazomet (3,5-dimethyl tetraydro-1,3,5,2H, thiadiazine-2-thione as Basamid) were applied on the 2nd and 8th October, 1975 at 448, 63 and 292 kg a.i./ha respectively. The moisture content in the surface 20 cm of soil at the time of fumigation was 18 and 25 per cent, by weight for sites 1 and 2, respectively (Table I).

Table I - *Characteristics of the experimental soils* (0.20 cm depth).

Site	Particle size distribution			Field capacity (by weight)	% moisture at fumigation (by weight)	pH ($1:2.5 H_2O$)
	% Sand	% Silt	% Clay			
1	18	14	68	33	18	8.1
2	16	14	70	33	25	8.0

The three treatments and an untreated control were randomized and replicated four times. D-D and EDB were applied by hand injector 20 cm deep at 30 cm spacing. Dazomet was broadcast and incorporated with a rotary cultivator. Immediately after applying the nematicides, the plots were irrigated to wet thoroughly the top 2 cm of soil. Plots were 3.6 x 5.4 m. The potato cultivar Arran Banner was planted on the 15th and 30th of January, 1976, on sites 1 and 2, respectively. Samples of soil were taken from all plots before treatment, before planting and after harvest, consisting of 8-10 cores per plot to 20 cm depth. After thorough soil mixing, cysts were extracted from 200 g aliquots of air-dried soil (Fenwick, 1940), eggs were counted (Reid, 1955) and their viability determined (Shepherd, 1962). Up to 25 cysts were used to test viability. At site 1, marketable yield of potatoes was recorded from the entire plot while at site 2 the center three from six rows were harvested from each plot. Plots were harvested on the 13th May and 15th June, 1976, for sites 1 and 2, respectively.

RESULTS AND DISCUSSION

At site 1 all nematicidal treatments effectively controlled the nematode and increased yields by 20 per cent. The percent of dead

eggs found 105 days after applying D-D or dazomet was greater in all plots when compared to untreated plots, but not significantly so with applications of EDB. At site 2, the same treatments failed to kill the nematodes effectively, possibly because the soil was much wetter at the time of fumigation (Table II).

Table II - *Effect of nematicides on numbers of eggs and yield of potatoes.*

	Log_{n+1} (live eggs/g of soil)[ab]		Marketable tubers (t/ha)[b]	
	Site 1	Site 2	Site 1	Site 2
D-D	1.39 b	1.64 a	37.4 a	45.3 a
EDB	1.58 ab	1.67 a	37.1 a	45.9 a
Dazomet	1.49 b	1.81 a	37.6 a	44.1 a
Untreated	1.89 a	1.80 a	31.2 b	42.2 a

a) Tested 105 and 100 days after treatment for sites 1 and 2, respectively.
b) Treatments not having the same letter in any column are significantly different (Duncan's Multiple Range Test) at P=0.05 level.

At site 1, the number of eggs found post-harvest was lower than the initial sampling. At site 2, however, post-harvest egg populations were slightly higher than pre-harvest. In the untreated plots, at both sites, the post-harvest nematode numbers were higher than those detected before fumigation (Table III).

Table III - *Multiplication of potato cyst nematode after fumigation.*

Treatments	Eggs/g soil					
	Before treatment		*After harvest*		*Multiplication (x)*	
	Site 1	Site 2	Site 1	Site 2	Site 1	Site 2
D-D	122	147	92	173	0.8	1.2
EDB	128	117	109	154	0.9	1.3
Dazomet	137	158	104	203	0.8	1.3
Untreated	137	154	158	294	1.2	1.9

Fewer eggs were detected before planting than before treatment, presumably a result of natural hatching (Table IV). The crude multiplication rate of the nematode at both sites ranged from 0.8 to 1.9 (Table III), indicating that the level of infestation before treatment was near equilibrium. This is in agreement with the findings of Jones (1972) where, as the initial population density increases, the crude multiplication rate decreases from a maximum at low densities to around unity at high densities.

Table IV - *Effect of volatile nematicides on numbers of eggs of the potato cyst nematode.*

Nematicides	Rate a.i. per hectare	Log_{n+1} (Eggs/g of soil)					
		Before treatment		*Before planting*		*After harvest*	
		Site 1	Site 2	Site 1	Site 2	Site 1	Site 2
D-D	448 kg	2.09 a	2.17 a	1.53 a	1.71 a	1.97 a	2.24 a
EDB	63 „	2.11 a	2.07 a	1.69 a	1.73 a	2.04 a	2.19 a
Dazomet	292 „	2.14 a	2.20 a	1.64 a	1.86 a	2.02 a	2.31 a
Untreated	—	2.14 a	2.19 a	1.94 a	1.82 a	2.20 a	2.47 a

Complete elimination of potato cyst nematode cannot be obtained by soil treatment and therefore one should distinguish between a commercial degree of control and the ideal of complete eradication. At both sites, treatment with any of the three nematicides increased yields over the untreated. Control in the wet soil was uneconomical compared with that in drier situations. At site 1, the increase in yield due to treatment with D-D and EDB was 3.5 and 6.5 times respectively more than the cost of nematicides compared with the untreated, while dazomet, although it increased yield, at the rate used was not economical. It should be noted, however, that EDB can be phytotoxic to potatoes if applied too frequently (Wilson, 1965; Wilson and Hedden, 1967).

SUMMARY

Trials in Cyprus during 1976 to control the potato cyst nematode, *Globodera rostochiensis*, in clay soils with D-D, EDB and dazomet at 448, 63 and 292 kg a.i./ha, resulted in effective nematode control and increase in yield. Control by fumigation was poor in soil at 25% moisture but effective at 18% moisture.

RIASSUNTO

Effetto di D-D, EDB e Dazomet nella lotta contro il nematode cisticolo della Patata in terreni argillosi a Cipro.

Sono state condotte, a Cipro nel 1976, delle prove di lotta contro il nematode cisticolo della Patata, *Globodera rostochiensis*, in terreni argillosi. Somministrazioni al terreno di D-D (448 kg p.a./ha), EDB (63 kg p.a./ha) o Dazomet (292 kg p.a./ha) hanno dato un buon controllo del nematode ed incrementi di produzione nei confronti del testimone, quando il contenuto di umidità del suolo era intorno al 18%.

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