CHEMICAL CONTROL OF THE GOLDEN NEMATODE, HETERODERA ROSTOCHIENSIS: GREENHOUSE OBSERVATIONS ON THE USE OF DPX 1410 AS A POTATO SEED PIECE TREATMENT[1]

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Abstract

Treatment of whole potato tubers with solutions of Insecticide–Nematicide DPX 1410 [s–methyl 1-(dimethylcarbamoyl)–N–(methyl carbamoyl)oxy thioformimidate] before planting in pots of soil artificially infested with cysts of the golden nematode (Heterodera rostochiensis) reduced significantly the number of cysts in the soil at harvest. Treatment of cut seed also reduced cyst populations but some phytotoxicity occurred at the concentrations used.

Introduction

The use of chemicals to control the golden nematode (Heterodera rostochiensis Woll.) has been investigated for many years. Recently Peachey et al. have reviewed this aspect of nematode control and compiled a bibliography of relevant literature published between 1932 and 1967 (3-6). Some of the chemicals that have been used depend for their effectiveness on diffusion through the soil in the gaseous state, and an eradication program using such compounds was developed at Long Island, New York, by Spears (7). Best results with these chemicals were obtained when soil temperatures were above GO F (15.6 C) and the soil was fairly moist.

More recently chemicals have become available that appear to have insecticidal and nematicidal properties and it seemed of value to test the effectiveness of some of these in controlling the golden nematode. One such chemical, DPX 1410, has a broad margin of safety to many crops and because of its systemic activity suggestions have been made for its use in soil, foliar, and seed treatments (2).

Seed piece treatment

In August 1970 a preliminary investigation was commenced using DPX 1410 [s–methyl 1–(dimethylcarbamoyl)-N-(methyl–carbamoyl)oxy thioformimidate] as a seed piece treatment at the rates of 50 g and 100 g active ingredient per liter. Seed pieces of the potato cultivar Pink Pearl were dipped in the nematicidal solution for 2 minutes and then allowed to dry for 30 minutes before planting in 5–inch pots containing soil naturally infested with nematode cysts. Plants were grown to maturity in the greenhouse and cysts were extracted from the soil using normal flotation techniques. Seven replicates of each treatment were planted and cyst numbers were counted in two 25-g samples of air dried soil from each replicate.

Using DPX 1410 as a seed piece treatment at the rate of 100 g active per liter caused phytotoxicity, and the seed pieces failed to produce plants. This may have been partly attributable to the poor condition of the seed pieces since the tubers had been stored for 10 months before starting the experiment. At the 50 g active per liter rate no visible plant phytotoxicity occurred and yields were only slightly less than those of the control, as shown in Table 1. The reduction in the number of new cysts formed was extremely satisfactory and a further experiment was undertaken to investigate otiier concentrations of DPX 1410.

Table 1. Effects of dipping seed pieces of Pink Pearl potato in DPX 1410 solutions on tuber yield and on production of golden nematode cysts

Treatment (g active/liter)	Total cysts recovered (no./100 g soil)	Estimated no. new cysts formed (no./100 q soil)	Tuber yield (g/plant)
Control, water only	73	52	54
50	27	6	46
100	21	0	0

Whole tuber treatment

In the second experiment, eight concentrations of DPX 1410 were tested, ranging from 2 to 66 g active ingredient per liter (Table 2). Small whole tubers of the cultivar Arran Victory were dipped for 2 minutes and allowed to dry for approximately 5 hours. They were then planted in soil

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Table 2. Effects of dipping whole tubers of Arran Victory potato in solutions of DPX 1410 on tuber yield and on production of golden nematode cysts

Treatment (g active/liter)	Mean no. of cysts/pot at harvest	Mean yield of tubers (g/pot)	Mean no. of cysts/g soil
Control, water only	547	118	76.8
2	223	124	31.2
4	152	126	22.8
8	137	112	18.6
16	63	121	10.1
24	56	97	9.7
40	93	127	15.7
50	83	98	13.2
66	53	126	8.6
SE ±			1.3

artificially infested with nematode cysts at the rate of 50 cysts per 5-inch pot. Tests indicated that slightly less than 60% of the cysts contained viable contents. Each treatment was replicated five times and tubers were planted on 2 February and harvested 6 July 1971. No phytotoxic effects were observed with any treatment.

The weight of air-dried soil in each pot was determined and two 25-g samples of soil from each pot were then examined for nematode cysts. The number of cysts produced in each pot was calculated and the means determined for each treatment are shown in Table 2. Analysis of the cyst data was completed using a log (x+1) transformation, and the mean numbers of cysts/100 g soil calculated from the detransformed data are shown in column 4, Table 2.

Dipping tubers in DPX 1410 solution resulted in significantly fewer cysts than in the control. With increasing concentration of DPX 1410 the numbers of cysts declined markedly though not uniformly, since fewer cysts resulted from dipping in 16 g active per liter than from 40 or 50 g active per liter. This discrepancy was probably due to the difficulty of ensuring even distribution of the small number of cysts with viable contents added to each pot, and to experimental errors in estimating cyst numbers. Differences in tuber yield between treatments were nonsignificant. If these results are confirmed by field experiment DPX 1410 will provide a relatively cheap and simple method of preventing the build-up of nematode infestations in potato soils. Liquid treatments for the control of fungal or insect pests are not widely used but seed piece dusts for the control of fungal diseases, e.g. fusarium seed-piece decay, are now recommended (1). Investisations into the use of granular DPX 1410 together with a fungicide to give control of both nematode and fungal pests have been initiated.

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