

**NEMATICIDE SEED DRESSING FOR *PRATYLENCHUS*
MEDITERRANEUS CONTROL IN WHEAT**

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Wheat (*Triticum aestivum* cv. Lakhish) seeds were coated with Promet 666, a seed dressing formulation of furathiocarb, a systemic soil insecticide, at 5 and 15 ml/kg seeds. This treatment was evaluated for *Pratylenchus mediterraneus* control and wheat grain yield and compared with soil application of a granular formulation of Promet and with a nontreated control. All Promet treatments reduced the nematode population level and increased the yield. The best nematode kill (75%) was achieved by the soil application, followed by the high-dosage seed dressing (50%). The highest yield was obtained in the high-dosage seed dressing treatment, followed by the soil application. The results suggest that seed dressing protects the germinating seedling from nematode attack at the critical stage of its root system development.

KEY WORDS: Wheat; *Triticum aestivum*; *Pratylenchus mediterraneus*; seed dressing; furathiocarb.

Wheat (*Triticum aestivum*) is the major winter crop grown in the northern Negev, a semi-arid region in Israel with an average annual rainfall of ca 250 mm. Most of the wheat there has been cultivated continuously under dry farming, producing only modest yields. Under these conditions a consistent buildup of the population of *Pratylenchus mediterraneus* (formerly *P. thornei*) (2) was observed (5). Eliminating the nematodes either by agrotechnical means such as biannual fallow or by fumigating the soil with metham sodium, resulted in a considerable increase in yield (5). Conventional nematicide application is economically not feasible under the conditions described above. Application of ethylene di-

bromide (EDB) did not control *P. mediterraneus* (Orion, Amir and Krikun, unpublished data), and the method of applying EDB in an extremely low dosage, as developed in Australia by Brown (1), was thus ineffective. However, the concept of applying a nematicide in low dosages while seeding, aiming at the protection of the germinating seedling root system for a limited period of time, seems to be a practical way to reduce crop losses due to plant parasitic nematodes in low cash crops like cereals.

The experiment field, heavily infested with *P. mediterraneus*, was located in Kibbutz Erez, in the northern Negev region. The chemical tested was Promet (CGA 73102), a furathiocarb systemic soil insecticide made by Ciba-

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Geigy (Basel, Switzerland). The commercial product is distributed as Promet 666 SCO, a formulation containing 666 g a.i./l. Wheat seeds cv. 'Lakhish' were mixed with Promet at the desired dosages in a 50-l concrete mixer according to the manufacturer's directions, and dried with Zeolex, a drying agent produced by Ciba-Geigy.

Four treatments were carried out in six replicates of 18x2 m plots, in a randomized block design: (i) Promet 666 SCO at 5 ml/kg seeds; (ii) Promet 666 SCO at 15 ml/kg seeds; (iii) Promet 5% granular formulation at 30 kg/ha; and (iv) non-treated control. The granular formulation of Promet was applied by drill to the soil in the seeding furrow just before seeding, which was done with a commercial drill during November 1984.

Three times during the season, wheat roots were collected from four points along the diagonal of each plot to form one sample for *P. mediterraneus* counts. The nematodes were extracted from 10 g of roots incubated at room temperature on a screened funnel in a mist chamber for 7 days. At the end of May 1985, the wheat in each plot was harvested mechanically and weighed. From grain samples of each treatment, the weight per hectoliter and per thousand seeds was recorded.

The population levels of *P. mediterraneus* within the wheat roots are shown in Figure 1. The nematode population built up slowly at the beginning of the wheat growing season (not shown), followed by a rapid increase. Toward the end of the season the population level within the roots declined.

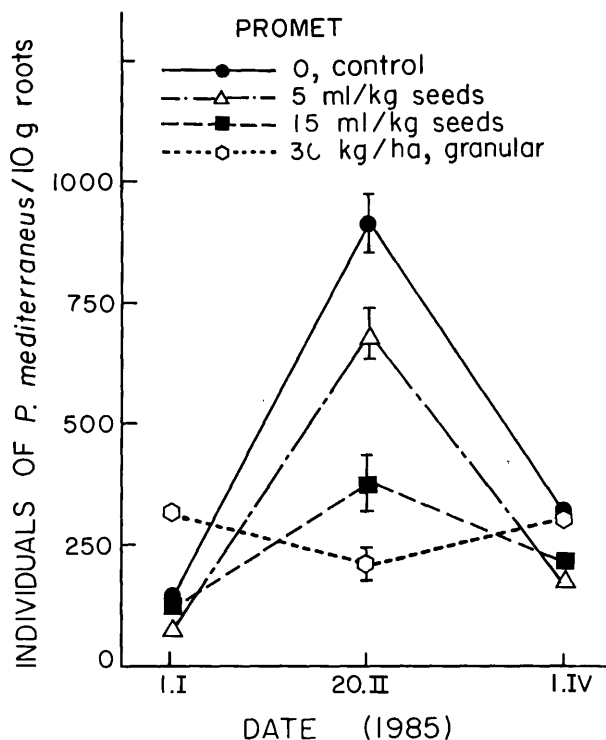


Fig. 1. *Pratylenchus mediterraneus* population level in wheat roots following treatment with Promet at seeding. Bars indicate the S.E. of the means.

as the nematodes migrated from the drying roots to the soil. All the treatments with Promet caused a reduction in the *P. mediterraneus* population level, but the most effective one was soil application of the granular formulation, which reduced the nematode population to approximately 25% of that of the control. Promet applied as a seed dressing at the high dosage reduced the number of nematodes by 50% as compared with the control, and the low dosage gave only modest nematode control (23%).

The yields of the various treatments are given in Figure 2. All the treatments with Promet caused an increase in the grain yield.

Seed dressing with the high dosage of Promet gave the best results, 38.6% increase over the control, followed by the granular formulation (19% increase) and the low dosage of seed dressing (15.7% increased yield). No difference in either the hectoliter wt (77-80 kg) or thousand wt (45-48.5 g) was observed among the treatments.

Elaborating a nematode control method for low cash crops utilizing an inexpensive means and compromising on radical nematode kill, is a primary goal today in nematology. A breakthrough in this direction was achieved a few years ago in Australia, where ethylene dibromide at a minimal dosage was applied to

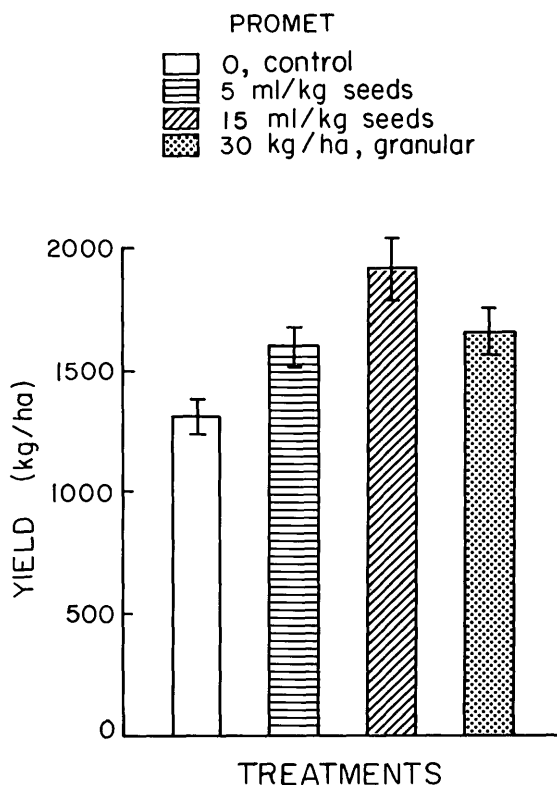


Fig. 2. The wheat grain yield following treatment with Promet at seeding. Bars indicate the S.E. of the means.

the wheat seeding furrow while seeding (1). This application method resulted in partial nematode control only, but the yield increase was considerable. The present work followed this concept. By replacing EDB with a non-volatile systemic insecticide applied as a seed dressing by these means, effective *P. mediterraneus* control was achieved under field conditions. The fact that seed dressing at the high Promet concentration resulted in the highest grain yield, suggests that this application method gave the wheat plants the most favorable growing conditions, probably by protecting the root system from *P. mediterraneus* attack at the critical stage of its development. So far only a few reports on seed treatment with systemic nematicides have been published (3,4,6,7,8). In those works established nematicides were extracted from their commercial formulations and applied to the seeds by a rather primitive seed dressing procedure. Nematicide application by seed dressing has several advantages: (i) The nematicide is

located in a rather high concentration at the very point needed for the protection of the germinating seedling at its most vulnerable stage of development. (ii) The amount of nematicide per unit area is minimal, which is a desirable situation both from the economic and the environmental points of view. (iii) Applying the nematicide while seeding saves the extra labor and implements required for conventional nematicide treatments. If proved practical in further experiments, seed dressing could become a powerful weapon to combat plant parasitic nematodes, especially in low cash crops.

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REFERENCES

1. Brown, R.H. (1984) Cereal cyst nematode and its chemical control in Australia. *Pl. Dis.* 68:922-928.
2. Corbett, D.C.M. (1983) Three new species of *Pratylenchus* with a redescription of *P. andinus* Lordello, Zamith and Boock 1961 (Nematoda: Pratylenchidae). *Nematologica* 29:390-403.
3. Dolmans, N.G.M. and Bunt, J.A. (1980) Control of plant parasitic nematodes in maize by different seed treatments with oxamyl. *Meded. Fac. Landbouwwet. Rijksuniv. Gent* 45:733-737.
4. Escobar, M.A. and Abrego, L. (1972) [Effects of 1410-L (experimental nematicide) by coffee (*Coffea arabica*) seed immersion for prevention of root rot caused by *Pratylenchus coffeae*.] *Nematropica* 2:17 (abstr.). (in Spanish)
5. Orion, D., Amir, J. and Krikun, J. (1984) Field observations on *Pratylenchus thornei* and its effects on wheat under arid conditions. *Rev. Nematol.* 7:341-345.
6. Prasad, U.S.K. and Rao, Y.S. (1976) Chemotherapy of the root-knot nematode (*Meloidogyne graminicola*) in rice. 1. Effects of soaking seeds in nematicide solutions. *Z. PflKrankh. PflSchutz* 83:665-668.
7. Rodriguez-Kabana, R., Hoveland, C.S. and Haaland, R.L. (1977) Evaluation of a seed treatment method with acetone for delivering systemic nematicides with wheat and rye. *J. Nematol.* 9:323-326.
8. Truelove, B., Rodriguez-Kabana, R. and King, P.S. (1977) Seed treatment as a means of preventing nematode damage to crop plants. *J. Nematol.* 9:326-330.