A Possible New Approach to the Chemical Control of Nematodes[1]

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The insecticide diflubenzuron, which apparently inhibits chitin synthetase or activates chitinase (2), was selected from analogs of several derivatives of the herbicide dichlorobenil (4, 5). At certain concentrations it has no apparent effect on adult stable flies *(Stomoxys calcitrans)*, but embryonated eggs of treated flies fail to hatch (6). This ovicidal effect could be important in developing a new approach to nematode control. Since plant-parasitic nematode eggs possess structural chitin, diflubenzuron may affect its deposition.

Herein are preliminary results on the use of diflubenzuron to control the root-knot nematode, *Meloidogyne incognita,* on cotton, *Gossypium hirsutum.*

Cotton 'Deltapine 16' was used throughout this study. Fifteen-cm plastic pots were filled to within 5 cm of the top with sterilized soil, a 1-cm layer of sand infested with approximately 1,000 *M. incognita* larvae was placed on top of the soil, and a 1-cm layer of sterilized soil was placed on top of that layer. Five similarly treated seed (Table 1) were planted in each pot. The pots were placed in a constant soil temperature box and maintained at 27 C. After 5 days, the plants were thinned to three seedlings/pot. Each of the five treatments (Table 1) for each harvest contained 30 plants. The experiment was repeated once.

Seedlings were harvested 21 or 28 days after planting. The root systems were washed and numbers of egg masses/root system were counted. Dimethyl sulfoxide-diflubenzuron treated seed markedly suppressed development of egg masses at 21 days, but not at 28 days. Diflubenzuron degrades rapidly (95% degradation in 2 weeks) in a water-hydrosoil system (1), a factor which may account for its loss in activity at 28 days. Adding diflubenzuron to soil inhibited egg-mass development at both 21 and 28 days. Perhaps, the diflubenzuron added to the soil replenished that lost by degradation.

TABLE 1. The effects of diflubenzuron (Dif) treatments on the number of *Meloidogyne incognita* egg masses on cotton.

Treatment		No. egg masses/ root system[v]		Root Knot[w]
Seed	Soil	21 days	28 days	Indices
None	None	14.2 a	18.6 a	63
DMSO[x]	None	11.3 a	18.3 a	52
DMSO-Dif[y]	None	3.4 b	23.6 a	69
None	Dif[z]	1.2 b	3.4 b	45
DMSO-Dif[y]	Dif[z]	1.5 b	2.9 b	56

[v]The values are the means of two replications of 30 plants each. Means within a column followed by the same letter are not significantly different, according to Duncan's multiple range test.
[w]An estimate of the percentage of the roots galled; measurements taken 15 days after planting.
[x]Seed soaked in dimethyl sulfoxide for 2 h.
[y]Seed soaked in 1% Dif (Tech. grade Dimilin,® obtained from Thompson-Hayward Chemical Co. P. O. Box 2383, Kansas City, Kansas 66110) in dimethyl sulfoxide for 2 h.
[z]Soil treated with 100 ml 1% oil base Dif (Dimilin 2F®, Thompson-Hayward Chemical Co.) at planting and at 7-day intervals until harvest.

Results from the addition of diflubenzuron to the soil suggest that the chemical could be toxic to the nematode or prevent larval penetration into roots. However, the survival of 93% of the larvae incubated for 72 h in the same concentration of diflubenzuron used to treat the soil indicates that this compound is not toxic to larvae. The addition of diflubenzuron to the soil apparently did not reduce the ability of larvae to penetrate roots since the root-knot indices for the various treatments were not markedly different.

It appears that the ovicidal activity of diflubenzuron is similar in nematodes and in insects. The specific inhibition of egg-mass development should reduce nematode populations. For environmental reasons, seed-treatment methods for nematode control would be highly advantageous over the

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conventional methods. However, diflubenzuron seed treatment alone apparently gives good control only for 3 weeks; a longer period would be necessary. A longer effective period of nematode control possibly can be obtained from one of the analogs of diflubenzuron (5). These and other disubstituted-biphenyl-urea compounds should be evaluated as nematicidal seed treatments.

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