

RESEARCH NOTES

The Effect of Diflubenzuron on Egg Formation by the Root-Knot Nematode¹

JOSEPH A. VEECH²

I recently reported that diflubenzuron (*N*-[(4-chlorophenyl)amino]-carbonyl-2,6-difluorobenzamide) (Dimilin; Thompson-Hayward Chemical Co., P. O. Box 2383, Kansas City, Kansas 66110), an insecticide that inhibits chitin synthetase (E.C.2.4.1.16) activity (1), has nematocidal activity also (2, 3). The nematocidal activity was peculiar because the chemical was not toxic to larvae but apparently reduced the fecundity of treated adults. After exposure to a dietary supplement of 10 ppm diflubenzuron for 10 days a population of *Pelodera* sp. was only 5% the size of untreated control (3). Similarly, cotton (*Gossypium hirsutum* L.) roots treated with the chemical had fewer root-knot nematode (*Meloidogyne incognita* Kofoid & White, Chitwood) egg masses/root system than did untreated controls (3 and 18 egg masses/root system) (2). Reports on diflubenzuron effects on *M. incognita* mentioned only the effect on numbers of egg masses. It is possible, although unlikely, that three egg masses could contain as many eggs as 18 egg masses. This note therefore reports the effect of diflubenzuron on the number of *M. incognita* egg masses and eggs recovered/g cotton roots 28 and 72 days after planting.

The materials and methods, reported briefly here, were as reported earlier (2) except that the egg mass and egg counts were based on the fresh weight of the roots, and the egg masses were stained with 0.1% phloxine-B in H₂O to facilitate counting. Cotton plants (Deltapine 16) were exposed to diflubenzuron as either a seed, soil, or seed-and-soil treatment. As a seed treatment, the chemical was infused into the seed with an organic solvent (dimethyl sulfoxide). As a soil treatment, the chem-

ical was applied as an aqueous suspension of an oil-base formulation (Dimilin 2 F) and drenched into the soil in 15-cm pots at weekly intervals. The experiment was replicated three times; each replication consisted of four subsamples of three plants each for each treatment (see Table 1 for treatments).

Table 1 shows the mean (and the standard error of the mean) number of *M. incognita* eggs and egg masses from each treatment at 28 and 72 days after planting. Significantly ($P = 0.05$) fewer eggs and egg masses/g root were recovered from plants in diflubenzuron-treated soil (treatments D and E) than from controls (treatments A and B) or from plants from diflubenzuron-treated seed (treatment C). The egg data at 21 days would be interesting because in the earlier study (2) at that sampling time, treatment C as well as treatments D and E had significantly fewer egg masses than the controls. Unfortunately, in this study I was unable to harvest eggs at 21 days after planting. Small egg masses and gravid females were evident on the roots from all treatments but the eggs could not be extracted by the methods used. However, egg data at 21 days may be inferred from the data reported.

For treatments, the number of egg masses/g root was significantly ($P = 0.05$) correlated with the number of eggs recovered/g root ($r = 0.98$ and 0.93 for plants harvested at 28 and 72 days, respectively). This suggests that a reduction in number of egg masses was accompanied by a reduction in egg numbers. Therefore, it seems that the infusion of diflubenzuron into seeds by organic solvents reduced the number of eggs as well as the number of egg masses formed on plants from treated seeds. This effect did not persist, however. By 28 days after planting, this treatment does not differ from the controls.

Because the root-knot index is essentially the same in treated and untreated plants (2) I assume that equal numbers of nematodes become established in treated and

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¹This paper reports the results of research only. Mention of a pesticide in this paper does not constitute a recommendation by the USDA nor does it imply registration under FIFRA as amended. Also, mention of a commercial product in this paper does not constitute an endorsement of this product by the USDA.

²U.S. Department of Agriculture, Agricultural Research Service, National Cotton Pathology Research Laboratory, P. O. Drawer JF, College Station, Texas 77840.

TABLE 1. The effects of diflubenzuron treatments on the number of *Meloidogyne incognita* eggs and egg masses formed on cotton.

Treatment		Mean number/g root and (S_x) ^a			
		Eggs		Egg masses	
Seed	Soil	28 days	72 days	28 days	72 days
A. None	None	4005(668)a	27970(470)a	13.3(1.6)a	67.7(5.4)a
B. DMSO ^b	None	5854(501)a	33820(3572)a	14.8(1.1)a	81.1(7.9)a
C. DMSO-Dif ^c	None	6644(1247)a	22356(2808)a	17.0(2.2)a	88.8(8.4)a
D. None	Dif ^d	1308(218)b	2374(104)b	3.8(.8)b	9.9(1.5)b
E. DMSO-Dif ^e	Dif ^d	1233(348)b	1811(487)b	2.7(.8)b	6.1(.8)b

^aThe values are the means of three replications of 12 plants each. Means within a column followed by the same letter are not significantly different according to Duncan's multiple-range test. The standard error of the mean is given in parentheses.

^bSeed soaked in dimethyl sulfoxide for 2 h.

^cSeed soaked in 1% Dif (Technical grade Dimilin) in dimethyl sulfoxide for 2 h.

^dSoil treated with 100 ml 1% oil-base Dif (Dimilin 2 F) at planting and at 7-day intervals until harvest.

untreated plants. Since the chemical is apparently nontoxic to larvae (2, 3), equal numbers of females should develop in treated and untreated plants. Because fewer eggs are recovered/g treated root (treatments D and E) than from untreated roots, however, I believe the chemical retards or prevents the females from producing eggs. The observation that the number of eggs/egg mass is essentially the same for the five treatments indicates that some females apparently escape the effects of the chemical.

These and results from other experiments (2, 3) suggest that diflubenzuron may affect nematode egg formation by interfering with chitin deposition in the nematode egg shell. Other chitin synthetase inhibitors are available and should be in-

vestigated for nematicide activity. Perhaps an inhibitor can be found that is more effective against nematode chitin synthesis or is more readily taken up and translocated in host plants than diflubenzuron.

LITERATURE CITED

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