EFFECTS OF TEFLUBENZURON ON LABORATORY COLONIES OF RED IMPORTED FIRE ANTS

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The activity of insect growth regulators against the red imported fire ant, Solenopsis invicta Buren, has been documented in a number of studies (Banks 1986, Banks et al. 1978, 1983, 1988, Phillips et al. 1985, 1989, Vinson and Robeau 1974, Vinson et al. 1974). The juvenile hormone mimics have been most effective against the fire ant and commercial baits have been developed with two of these materials.

Benzoylphenyl urea (BPU) compounds, of which diflubenzuron or dimilin is the best known, have been successfully developed as control agents for a number of insects. These materials, commonly known as chitin inhibitors, interfere with normal endocuticular deposition and molting, and in some cases act as ovicides. Although a few BPUs have been tested against the fire ant, they have generally been relatively inactive because of the virtual insolubility of these compounds in soybean oil or other foods acceptable to the fire ant.

Teflubenzuron (1-(3,5-dichloro-2,4-difluorophenyl)-3-(2,6-difluorobenzoyl)-urea) is one of the newer BPUs and is considerably more toxic to a number of agricultural pests than is

diflubenzuron. It has given excellent control of some insects, such as the diamondback moth, and the red flour beetle, that are highly resistant to other insecticides (Ishaaya & Klein 1990). In early 1988, we were supplied a 5.0% oil dispersible concentrate, and a 10% emulsifiable concentrate of teflubenzuron, by EM Industries (U. S. representative for CelaMerck), for evaluation against the fire ant. We were unable to prepare any type formulation with the oil dispersible concentrate, but did manage to incorporate the emulsifiable concentrate into soybean oil reasonably well. In the initial test at 5 and 10 mg per colony (0.5 ml of 1.0 or 2.0% solution), however, the materials were so repellent to the ants that they buried the micropipets containing the oil solution with detritus within one hour. Naturally they had no effect on the ants and we advised the supplier of the results.

Late in 1988 the supplier advised us that teflubenzuron had shown excellent activity against some Lepidopterous pests at extremely low dosages and requested that we try another test with the material at low concentrations. Accordingly, 0.1% and 0.5% solutions in soybean oil were made with the emulsifiable concentrate and each concentration was tested against three laboratory-reared colonies of Solenopsis invicta. Queenright colonies with 20-25 ml brood and 20,000-40000 workers were given 0.5 ml of the 0.1% solution (0.5 mg/colony AI), and queenright colonies with 30-35 ml brood and 50,000-70,000 workers were given

0.5 ml of the 0.5% solution (2.5 mg/colony AI). Three colonies, comparable to those treated with the 0.5% solution, were each given 0.5 ml of neat soybean oil as untreated controls.

Effectiveness of the treatments was based on comparison of the before and after treatment colony indices. The colony index is derived by multiplication of assigned values for worker numbers and quantity of worker brood (see table below); e.g. a colony with a rating of 5F would have a colony index of 125 (5 x 25).

Estimated number of worker ants			Estimated quantity of worker brood		
	Rating	Value		Rating	Value
<100	1	1	0	A	1
101-5000	2	2	1-5	B	5
5001-20000	3	3	5-10	C	10
20001-35000	4	4	10-20	D	15
35001-50000	5	5	20-30	E	20
>50000	6	6	>30	F	25

Teflubenzuron was very effective against the laboratory colonies of S. invicta (Table 1). Worker brood production ceased very soon after treatment and by four weeks posttreatment two replicates at the 0.5 mg dosage were devoid of brood and only a few pupae remained in the third replicate. All replicates at the 2.5 mg rate were devoid of brood at four weeks. No further brood

production occurred through one year except one replicate at the 0.5 mg rate contained about 0.5 ml at the one year posttreatment evaluation.

The workers did not exhibit any direct effect of treatment, thus, as is typical with most insect growth regulators, colony mortality was very slow and dependent on old-age attrition of the worker force. All three replicates at the 2.5 mg rate were dead by nine months, however, two replicates at the 0.5 mg rate were alive at one year, although neither contained more than 500 workers. No alate production occurred in any of the treated colonies throughout the test. The untreated controls showed no change or an increase in size through 24 weeks posttreatment but began a decline thereafter and all three were devoid of worker brood and reduced in size by one year.

A second test begun in November 1989 to verify results of the previous test is producing the same results (Table 1). Effects of the treatment were not exhibited as quickly. All three replicates at 0.5 mg and two at 2.5 mg still contained some worker brood at four weeks, however, by eight weeks all treated colonies were devoid of worker brood and remain so after 16 weeks. Although only a few (<25) were produced, female alates were present in two replicates at the 2.5 mg rate at 12 weeks posttreatment in this test.

These tests with teflubenzuron have been encouraging and field evaluations are planned for 1990.

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