LIQUID VS. CRYSTAL THIMET FOR FAST INSECT CONTROL IN PINE SEED ORCHARDS

DONOVAN C. FORBES, *Staff Forester*
TVA Division of Forestry Development
Norris, Tenn.

Many pine seed orchard managers in the South regularly use the systemic poison Thimet (0,0diethyl S-methyl phosphorodithioate) for insect control. Usually the chemical is applied in crystal form, either broadcast on the soil or deposited in holes around individual trees.

Either treatment is effective if applied early in the spring and if sufficient soil moisture is available to dissolve the crystals. Depositing the chemical in holes avoids the possibility of surface runoff, carrying the poison away with it.

But, occasionally, the best time for application passes before an orchard manager can get the job done. When this happens, the Nantucket tip moth *(Rhyacionia frustrana)* can do considerable damage before control is effected. Even if DDT foliar sprays are used in the interim between Thimet application and its dispersion into the tree, some moths will escape and reproduce.

Such a situation arose in a young shortleaf pine seed orchard in north Alabama. In this orchard, liquid Thimet was applied early in the season in combination with liquid fertilizer. The correct dosage per tree was prescribed, but the material was spread over the entire orchard area, rather than locally around each tree.

This broadcasting evidently reduced uptake by the trees because soon after flowering began, a mass outbreak of the tip moth occurred. The Thimet had little or no effect. DDT foliar sprays would have been used for temporary control, but spraying equipment was not available. Since the new cone crop was already lost and practically all new growth destroyed, the immediate objective was to quickly and completely rid the orchard of tip moth to insure success of the next cone crop.

The following test was therefore established to test various types of Thimet application for fast uptake and control. It included 15 rows of trees, with 20 trees per row, divided into three replications. The five treatments per replication, randomly assigned, were as follows:

(1) Liquid Thimet with soil scarified under tree crowns.
(2) Liquid Thimet without soil scarification.
(3) Thimet crystals with soil scarification.
(4) No treatment (control).
(5) Thimet crystals in four holes at cardinal points around each tree, no soil scarification.

On all treatments except the control, an equiva-

lent of 4 ounces of crystalline Thimet (10-percent phorate) was applied per tree. The liquid Thimet was applied by a local liquid-fertilizer contractor. He assured accurate delivery to each tree by maintaining 8 pounds of pressure on his 1,000-gallon tank, then limiting flow to a predetermined interval. In this treatment, 1 gallon of liquid was applied in 10 seconds. Liquid was delivered by two open hoses, one man to a hose. When both men were in position, one to a tree, they called to the operator who opened the valve for the proper interval. After cutoff, hoses were trained under the trees until all flow stopped. A call to the operator was the signal to move ahead. Regular checks showed the calibration to be correct.

Soil scarification was included in the test because the orchard had a dense grass cover. Crown shading had not inhibited its growth to any extent.

Holes for treatment No. 5 were dug with a tree planting bar and were approximately 6 inches deep. They were covered and tamped after depositing the crystals.

Phorate, the active ingredient in Thimet, is one of the more toxic insecticides. Consequently, trying to protect those applying this chemical and animals in the area prompted the following precautions:

1. Workers wore protective clothing, including respirators, rubber gloves, goggles, and hats, so that the skin was completely covered.
2. Workers took showers immediately after applying the poison.
3. Thimet crystals applied to the soil surface were mulched to prevent scattering of crystals and to reduce danger of animal contact. Liquid and crystals in holes offered no problem since they were both under the soil surface within a short time.
4. Treatments were applied on a day with little or no wind.

Measurements were taken 1 month and 2 months after treatment. A branch selected at random on each tree was measured, and the total number of new tips and those killed by tip moth were tallied. Dead tips were removed during the first measurement, so only new or previously unaffected tips were measured the second time.

Results

Analyses of variance were run on percent kill transformed to arc sine values (table 1) . Treatment means were then compared, using Tukey's test (with modifications by Snedecor) (table 2).

TABLE 1.—*Percent kill by measurement date, treatment, and replication (not transformed)*

Treatment	Measurement 1 (8/1/68) replication			Measurement 2 (9/11/68) replication		
	1	2	3	1	2	3
1	26.9	27.4	17.4	3.3	2.3	6.3
2	41.2	10.6	12.5	6.4	6.9	9.5
3	63.7	34.0	21.9	17.9	8.7	0.7
4	80.3	67.5	47.0	54.5	44.3	63.6
5	73.0	63.4	58.0	37.9	27.8	33.3

TABLE 2.—*Results of Tukey's "D" test on transformed percent kill mean values by treatment and measurement date with a combined value included*

Measurement 1 (8/1/68)		Measurement 2 (9/11/68)		Combined	
Treatment D = 13.49		Treatment D = 15.01		Treatment D = 11.47	
4	54.06	4	47.40	4	50.73
5	53.69	5	35.02	5	44.35
3	38.84	2	15.94	3	27.25
1	29.15	3	15.66	2	21.24
2	26.54	1	11.20	1	20.18

For each measurement and for the combined analysis, treatments 1, 2, and 3 were significantly better than 4 and 5 at the 5-percent level.

Discussion

Treatment 5, Thimet in holes, was probably poorer because of two factors. First, depositing the poison in holes limits the amount of root surface area exposed to it and, consequently, the amount taken up. Second, this type of application requires relatively heavy soil moisture to dissolve the crystals, and rainfall was very low during the test.

Crystals on scarified soil were more effective than expected considering the low rainfall. The problem with this type of treatment is that it is somewhat hazardous to those applying it even with a light wind. The chemical is also a risk in any livestock area, unless well mulched, because it might be translocated by surface runoff.

Test results showed liquid application to be best with or without soil scarification. This is significant for four reasons: First, hazards are reduced during application of a liquid poison and during the time it is on the soil surface. Second, a liquid application is much faster, simpler, and thus cheaper.

Third, the job can be done by liquid fertilizer contractors. When handled in this manner, the contractor treated the test and the remainder of the 6-acre orchard in less than a day. Fourth, soil scarification is not needed with liquid application.