

EFFECT OF INSECTICIDES UPON EARTHWORM POPULATIONS

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Earthworms are familiar to almost everyone. Some people consider them objectionable when they are apparent in their lawns and in golf courses, particularly on the putting greens, while others consider them beneficial in aerating and pulverizing the soil. For this reason the first group, composed largely of greenkeepers and homeowners, is interested in methods for their control, whereas the second group is interested in control measures which will destroy all of the other soil pests without reducing the earthworm population.

The chemicals recommended for the control of the earthworms have little effect upon the control of white grubs that may be present in the soil. On the other hand it has been generally considered by many people that the insecticides which are applied for the control of grubs will also destroy the earthworms.

This paper presents data which were taken from plots that were used to study the effect of various insecticides upon the control of the Japanese beetle larvae.

In the first experiment, which was established upon sandy soil in Bratenahl, Ohio, the soil was treated with lead arsenate on September 24, 1941, by broadcasting the material by hand without using any diluent. The insecticide was applied at various levels to plots of 10 by 20 feet with each level replicated five times.

TABLE 1

Effect of lead arsenate upon the earthworm population of Bratenahl, Ohio

RATE OF LEAD ARSENATE IN LBS. PER 1000 SQ. FT.	EARTHWORMS PER SQ. FT.			
	May 28, 1942	Percent reduction	May 21, 1943	Percent reduction
5.0.....	24.3	7.6	29.2	4.3
7.5.....	24.3	7.6	24.8	18.7
10.0.....	14.5	44.9	17.8	41.7
12.5.....	17.3	34.2	12.2	60.0
15.0.....	15.0	43.0	16.7	45.3
Untreated.....	26.3	.....	30.5	.....
L.S.D. at 5% level =	12.1	.....	15.2	.....

The rates at which the lead arsenate was applied are shown in table 1. All plots were examined for earthworms in May of 1942 and again in May of 1943 by taking four cores of soil of $\frac{1}{4}$ square foot surface area and to the depth of 8 inches.

In the second experiment which was also established upon sandy soil but in Newburgh Heights, Ohio, lead arsenate and DDT were applied to the soil on October 2, 1945. These materials were mixed with milorganite and distributed by means of a flour sifter. All treatments were replicated five times and each plot consisted of 100 square feet.

The insecticides and the rates at which they were applied are shown in table 2. In these plots the total earthworm count was taken on October 16, 1950, or approximately 5 years after the insecticide applications were made.

TABLE 2

Effect of lead arsenate and DDT upon the earthworm population in October, 1950, when applied October 2, 1945, to soil in Newburgh Heights, Ohio

Toxicant	Rate of technical material per acre in pounds	Earthworms per square foot	Percent reduction
		Oct. 16, 1950	
Lead arsenate.....	500.0	46.8	12.0
DDT.....	12.5	47.4	11.9
DDT.....	25.0	52.0	2.3
DDT.....	37.5	30.2	43.2
Untreated.....	....	53.2	....
L.S.D. at 5% level.....	....	21.5	....

L.S.D. = least significant difference.

RESULTS

In the first experiment, when the plots were examined on May 28, 1942, none of the lead arsenate plots was significantly lower in earthworm population than the untreated plots. When the plots were examined a year later or on May 21, 1943, the 12.5 pound rate seemed to have caused a significant reduction in earthworm population. However, inasmuch as the values obtained for all other treatments were not significantly different from those of the untreated plots the significance indicated for the 12.5 pound level must have been due to error in sampling.

In the second experiment the highest level of DDT used (37.5 pounds per 1000 square feet) resulted in earthworm populations that were significantly lower than those in untreated areas but the margin of significance was slight. In no other treatment did the difference in earthworm population following insecticide treatment approach significance.

The results of these experiments indicate that applications of lead arsenate and DDT to the soil, in the amounts given and for the time intervals noted, had little if any effect on the density of earthworm populations.