

# Effects of Several Rates of Carbofuran, Phorate, Aldicarb, Methomyl, Propoxur, and Disulfoton in the Seed Furrow on Growth and Yield of Soybeans

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**T**HE EFFECTS OF SYSTEMIC INSECTICIDES on soybean growth and yield has aroused interest in the past few years. Wheeler and Bass (3) reported that soybean plants were taller in plots treated with methomyl and carbofuran than plants in untreated plots. Shehane and Bass (2) found that phorate, carbofuran, methomyl, and disulfoton, applied to soybean

plants at 1 pound per acre under various conditions produced no effect on growth or yields. Moody and Bailey (1) tested several systemic insecticides as granular in-furrow treatments at 0.91 and 1.82 pounds of active ingredient per acre to determine soybean plant response. Significant differences in plant height were reported between treatments, and in one test between treatments and the check. In a second test (the following year) no material significantly affected plant height. They reported no significant differences in yields or seed weights

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between treatments and the check. Additional information would be helpful in determining the effects of various insecticides on soybeans, particularly, the effects of high rates of in-furrow treatments. Information on the effects of a wide range of treatment rates of commonly used in-furrow systemic insecticides on soybean growth and yields is reported here.

## METHODS AND MATERIALS

This research was conducted at the Auburn University Gulf Coast Substation near Fairhope, to determine if certain systemic insecticides, when applied as pre-plant granules at various rates, would affect soybean growth (plant height and weight), weight of seeds, and yields. Six systemic insecticides were utilized at four application rates plus an untreated check. The 25 treatments were arranged in four complete randomized blocks. Insect populations were sampled throughout the course of the study and no significant populations of destructive insects occurred.

The insecticides used were: carbofuran 10 percent G, phorate 5 percent G, methomyl 5 percent G, disulfoton 15 percent G, propoxur 10 percent G, and aldicarb 10 percent G. These materials were applied along with the seed in the seed furrow at rates of 1, 2, 4, and 8 pounds of active ingredient per acre.

A total of 100 plots 8½ feet wide (3 rows) and 15 feet long were used, with no alleys or buffer rows between plots. Soybeans of the Bragg variety were planted on June 17, by hand at the rate of 14 seeds per-foot-of-row. The seeds were inoculated with Nitragin® before planting.

Measurements of plant height were made 2, 4, and 6 weeks (July 1, 15, and 29) after the insecticidal applications. These measurements were made by selecting 10 plants at random from the middle 10 feet of the middle row in each plot and measuring the tallest stem of each plant.

Data on plant weight (wet weight) were also taken at 2, 4, and 6 weeks after the treatments had been applied. Ten plants were selected at random from an outside row, removed from the plots and placed in appropriately labelled plastic bags. The bags were sealed to reduce evaporation from the plants. In the laboratory, soil and roots were removed from the plants and the stem and leaves of each plant were weighed.

Yield data were collected by harvesting the middle 10 feet of the middle row in each plot. The soybeans were threshed with a small combine, the beans placed in paper bags and weighed in the laboratory after debris was removed.

Seed weight data were obtained by weighing 100 seeds from each plot. The seeds were relatively dry at the time of weighing, since they had been harvested dry and held in the laboratory (approximately 50 percent RH) for 1 month.

## RESULTS AND DISCUSSION

The analysis of data collected during the first plant-height measurements 2 weeks after planting revealed that plants treated with methomyl at 8 pounds per acre were significantly shorter than plants from untreated plots, see table. Four weeks after planting, plants from plots treated with propoxur at rates of 4 and 8 pounds per acre, and methomyl at 8 pounds per acre were significantly shorter than plants from the check plots. Six weeks after planting, propoxur applied at the rate of 8 pounds per acre and phorate at 4 pounds per acre caused plants to be shorter than plants from the untreated plots.

The analysis of plant-weight data collected 2 weeks after planting revealed that plants from plots treated with propoxur at the rates of 4 and 8 pounds per acre and from plots treated with phorate at the rate of 8 pounds per acre were significantly lighter than untreated check plants, see table. Four weeks after planting, plants from plots treated with propoxur at the rates of 4 and 8 pounds

THE MEAN HEIGHTS AND WEIGHTS OF SOYBEAN PLANTS AT VARIOUS INTERVALS AFTER TREATMENT IN SEED FURROW, MEAN SOYBEAN YIELDS AND MEAN WEIGHTS OF 100 SEEDS\*

Treatment	Rate	Height of plants in inches			Weight per plant in grams			Yield	Weight in
	lb/a	2 weeks	4 weeks	6 weeks	2 weeks	4 weeks	6 weeks	bu/a	grams per 100 seeds
Untreated check	0	4.5ab	13.5ab	25.1abc	2.3ab	13.2ab	70.5abc	48.4a	15.0ab
Carbofuran	1	4.6ab	12.4abcd	25.4ab	2.4a	13.7ab	85.7a	47.6a	15.3ab
Carbofuran	2	4.5abc	12.9abcd	23.8abc	2.0abcde	12.6abc	69.7abc	53.9a	15.7a
Carbofuran	4	4.7a	10.7abcde	23.2abcd	2.0abcde	8.4bcde	50.5abc	44.1a	16.2a
Carbofuran	8	4.4abc	10.2bcde	22.0abcde	1.7bcde	7.2cde	54.3abc	49.8a	16.2a
Phorate	1	4.4abc	12.7abcd	24.3abcd	2.0abcd	11.0abcd	63.4abc	39.9ab	15.4ab
Phorate	2	4.2abc	12.1abcd	25.0abc	2.1abc	12.7abc	61.5abc	44.9ab	13.9ab
Phorate	4	4.1abc	10.1bcde	18.7de	2.0abcde	10.5abcd	56.1abc	45.6ab	14.2ab
Phorate	8	4.2abc	10.1bcde	19.7bcde	1.6de	8.7bcde	61.3abc	49.9a	14.6ab
Aldicarb	1	4.5ab	13.6ab	24.8abc	2.4a	14.6a	74.1abc	53.3a	14.4ab
Aldicarb	2	4.2abc	13.0abcd	25.4ab	2.3a	14.6a	85.0ab	56.7a	15.2ab
Aldicarb	4	4.0bc	12.1abcd	24.5abc	2.3a	13.6ab	71.3abc	46.7ab	14.2ab
Aldicarb	8	4.1abc	10.5abcde	22.8abcd	1.9abcde	11.7abc	78.7abc	45.1ab	15.9a
Methomyl	1	4.2abc	12.7abcd	24.9abc	2.3ab	14.2ab	79.3abc	43.4ab	13.9a
Methomyl	2	4.0bc	12.1abcd	23.7abcd	2.2abc	13.7ab	85.4a	38.8ab	12.8b
Methomyl	4	4.1abc	12.3abcd	25.3ab	2.1abcd	12.1abc	61.8abc	41.7ab	15.1ab
Methomyl	8	3.9c	9.5cde	23.1abcd	1.9abcde	9.3abcde	74.6abc	40.7ab	14.4ab
Propoxur	1	4.6ab	13.4ab	24.4abc	2.2abc	15.1a	74.8abc	48.0a	14.1ab
Propoxur	2	4.2abc	11.6abcd	23.0abcd	2.1abcd	9.8abcde	56.0abc	45.1ab	15.0ab
Propoxur	4	4.2abc	9.4de	20.1abcde	1.7cde	5.6de	42.3bc	37.0ab	14.0ab
Propoxur	8	4.3abc	7.8e	17.3e	1.5e	4.5e	41.3c	23.4b	13.9ab
Disulfoton	1	4.7a	13.3ab	25.7a	2.2abc	12.3abc	78.9abc	48.7a	14.6ab
Disulfoton	2	4.6ab	13.6ab	22.8abcd	2.2abc	11.9abc	74.1abc	48.9a	15.4ab
Disulfoton	4	4.7a	13.2abc	21.3abcde	2.1abcd	11.8abc	71.1abc	44.9ab	14.9ab
Disulfoton	8	4.6ab	10.6abcde	19.4cde	2.2abc	9.5abcde	60.3abc	44.7ab	14.6ab

\* Means in each group designated by the same letter do not differ significantly at the 1 percent level.

per acre and carbofuran at 8 pounds per acre were significantly lighter than plants from the untreated plots. The analysis of the plant-weight data collected 6 weeks after planting also revealed significant differences at the 1 percent level, but none of the treatments were significantly different from the untreated checks. Propoxur treatments at the rate of 8 pounds per acre caused plants to be lighter than carbofuran at 1, methomyl at 2, or aldicarb at 2 pounds per acre.

Statistical analysis of yield data revealed that plants treated with propoxur at 8 pounds per acre had significantly (1 percent level) lower yield than plants from the untreated check plots and several of the treated plots, see table.

Seeds from plots treated with methomyl at 2 pounds per acre weighed less than seeds from several other treated plots, but did not weigh less than seeds from untreated plots, see table. There were no significant differences between

seed weights from treated and untreated plots.

In general only high rates of propoxur (4 and 8 pounds per acre) seemed to have a season long deleterious effect on the soybean plant. Only at the 8 pounds per acre rate was this effect reflected in a decrease in yield.

#### REFERENCES CITED

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