

# Results of Applying Herbicides at Time of Last Cultivation

RONALD C. JOHNSON AND JAY B. LAW<sup>1</sup>

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Weeds that infest sugar beet fields late in the growing season have been a problem for many beet growers. The theory that adequate stands of beets will shade the ground and prevent the germination and growth of weeds late in the season has given little comfort to the grower who had had a weed-free field in July and had an extremely weedy field by harvest time. Better stands may minimize these weed problems, but probably never eliminate them. As long as beet fields are infested with weeds at harvest time there will be problems in harvesting the beets and in delivering clean beets to the factory or receiving station. Some method or program must be adapted to eliminate weeds that grow late in the season.

In 1964 and 1965 the Utah-Idaho Sugar Company conducted several tests to evaluate the effectiveness of various herbicides in controlling late weeds. The herbicides were all applied at the time of the last cultivation, which in these tests were the last few days in July. Equipment was designed so that the beet leaves could be lifted slightly, if desired, and the material applied with divided, double-swivel, drop nozzles with each nozzle spraying at approximately a 45° angle so that all of the soil surface was covered, but the beet leaves were not. Bezerides weeders mixed the herbicide with the top surface of the soil and at the same time killed small weeds that had already started to germinate. Ten-inch winged shovels followed, which made deep furrows and covered the beets so that the petioles were pushed tightly together by the soil. Most, if not all, of the crown tissue was completely covered. This operation helped to mix the herbicide into the soil. There were two checks in these tests, one when the beets and soil were not disturbed and the other when the mechanical operation of the Bezerides weeders and shovels was used but no chemical was applied.

## 1964 Tests

The 1964 tests were conducted on two fields in the West Jordan, Utah area. The plots were six-rows wide and the full

<sup>1</sup>Agricultural Research Manager and Research Agronomist, respectively, Utah-Idaho Sugar Company, Salt Lake City, Utah.

length of the field. There were 12 treatments, including the two checks, and two replications of each treatment in each field. The following herbicides at the indicated rates were applied in both tests:

1. Tillam at 4 pounds per acre
2. Eptam at 2 pounds per acre
3. PCA at 8 pounds per acre
4. H 282 at 4 pounds per acre
5. 4# Tillam plus 2# Eptam per acre
6. 4# Tillam plus 8# PCA per acre
7. 4# Tillam plus 4# H 282 per acre
8. 2# Eptam plus 8# PCA per acre
9. 2# Eptam plus 4# H 282 per acre
10. 8# PCA plus 4# H 282 per acre
11. Machine Check
12. Untreated check

These fields were both fairly clean at harvest time; however, every plot that received an application of an herbicide was free from weeds, except for an occasional large one that had been quite large at the time of application. The untreated check had a low population of large red root pigweeds (*Amaranthus retroflexus*) and lambsquarters (*Chenopodium album*) and the machine check had about one-half as many weeds though most were not as large as the weeds in the untreated check.

The results of the 1964 tests indicated that proper application of any of the herbicides used would keep the beets free of weeds until harvest time. There was no visual damage to beets from any treatment or to any of the large weeds that were not removed by the mechanical operation.

Additional information was gained concerning the tolerance of beets to herbicides when a five-gallon container of Eptam was accidentally spilled during the application of this herbicide. Five gallons of material, or enough for  $\frac{1}{4}$  of an acre at 4# per acre, was spilled on an area about 15 inches wide and 40 inches long by the time the material had soaked into the soil. The area was staked and observed frequently to determine the visual effect on the surrounding beets. There was no visual damage to the beets or to one medium-sized lambsquarter that was growing in this area. This accident would tend to indicate the relative resistance large beets have to Eptam and probably most herbicides.

### 1965 Tests

Encouraged by the 1964 results, four additional trials were conducted in 1965. The herbicides were applied by the same method during the last three days of July. Ten herbicides were

applied plus a regular untreated check and a mechanical check. These herbicides differed some from those used in 1964. The plots were six-rows wide and 75-feet long and there were two replications of each treatment in each field. Observations were made on August 24th, September 24th, and October 14th. On October 14th counts were made of the weeds remaining in each plot. The results are shown in Tables 1 through 4.

Table 1.—Results of herbicide trials applied to sugar beet fields at last cultivation in 1965 to evaluate effectiveness in controlling weeds until harvest time. Average of tests in four locations.

Treatment	Total weed populations in four fields			Total number of weeds	% control
	Red-root pigweed	Lambsquarter	Foxtail		
Tillam 4#	18	20	33	71	79*
Eptam 2#	21	23	23	67	80*
Pyramin 4#	16	22	77	115	66
H 282 4#	18	20	23	61	82*
Tillam 2# plus Eptam 1#	21	22	37	80	76
Tillam 2# plus Pyramin 2#	17	22	31	70	79*
Pyramin 2# plus H 282 2#	27	30	33	90	73
Treflan 1#	34	30	32	96	71
CP45592 4#	34	31	35	100	70
CP31393 4#	35	29	42	106	68
Machine check	75	57	90	222	34
Untreated check	112	85	138	335	—

\* Best control

Table 2.—Effect of herbicides applied at the last cultivation in controlling red-root pigweed.

Treatment	Grower				Total red-root pigweed	% control
	Hutchings	Peterson	Schmidt	Spratling		
Tillam 4#	3	5	5	5	18	84*
Eptam 2#	3	6	7	5	21	81
Pyramin 4#	2	6	3	5	16	86*
H 282 4#	1	9	2	6	18	84*
Tillam 2# plus Eptam 1#	5	3	4	9	21	81
Tillam 2# plus Pyramin 2#	3	5	4	•	17	85*
Pyramin 2# plus H 282 2#	9	8	3	•	27	76
Treflan 1#	4	14	2	14	34	70
CP45592 4#	8	9	6	11	34	70
CP31393 4#	6	12	6	11	35	69
Untreated check	28	37	22	25	112	—
Machine check	11	26	15	23	75	33

\* Best control.

These tests show that the mechanical operation without any herbicide application controlled 34% of all the weeds or 33% of the lambsquarters, 33% of the pigweed, and 35% of the foxtail (*Setaria*). All of these fields had just been hand-hoed in July and were supposedly free of weeds. The advantage of a severe last cultivation, using a Bezzerides weeder and a large winged shovel, can readily be recognized.

Additional benefits were received from the application of any of the herbicides. H 282 at 4 pounds per acre controlled 82% of all the weeds, Eptam at 2 pounds per acre controlled

Table 3.—Effect of herbicides applied at last cultivation in controlling lambsquarter.

Treatment	Grower				Total lambsquarter	% control
	Hutchings	Peterson	Schmidt	Spratling		
Tillam 4#	1	10	6	3	20	76*
Eptam 2#	3	11	4	5	23	73
Pyramin 4#	4	12	4	2	22	74
H 282 4#	4	7	4	5	20	76*
Tillam 2# plus Eptam 1#	8	7	2	5	22	74
Tillam 2# plus Pyramin 2#	4	10	5	3	22	74
Pyramin 2# plus H 282 2#	6	11	8	5	30	65
Treflan 1#	5	12	3	10	30	65
CP45592 4#	5	12	5	9	31	64
CP31393 4#	3	13	6	7	29	66
Untreated check	13	35	15	22	85	
Machine check	8	21	13	15	57	33

\* Best control.

Table 4.—Effect of herbicides applied at last cultivation in controlling foxtail (*Setaria*).

Treatment	Grower				Total foxtail	% control
	Hutchings	Peterson	Schmidt	Spratling		
Tillam 4#	5	6	13	9	33	76
Eptam 2#	1	2	12	8	23	83*
Pyramin 4#	14	26	15	22	77	44
H 282 4#	1	7	6	9	23	86*
Tillam 2# plus Eptam 1#	4	9	10	14	37	73
Tillam 2# plus Pyramin 2#	1	8	14	8	31	78
Pyramin 2# plus H 282 2#	2	9	11	11	33	76
Treflan 1#	1	5	15	11	32	77
CP45592 4#	6	11	5	13	35	75
CP31393 4#	3	18	17	9	42	70
Untreated check	22	54	24	38	138	
Machine check	11	33	17	29	90	35

\* Best control.

80%, and Tillam at 4# and Tillam at 2# plus Pyramin at 2# controlled 79%. Other treatments gave slightly less control. It must be assumed that 34% of this amount was the result of the mechanical operation.

Pyramin at 4 pounds per acre controlled 86% of the red root pigweed. Tillam at 2 pounds plus Pyramin at 2 pounds controlled 85%; Tillam at 4 pounds and H 282 at 4 pounds each controlled 84%. The machine check gave 33% control, hence the herbicide benefit would be the percentage indicated less the 33% of the machine check.

Tillam at 4 pounds and H 282 at 4 pounds per acre gave 76% control of the lambsquarters. Most of the other herbicides performed almost as well. The machine check controlled 33% of these weeds.

H 282 at 4 pounds and Eptam at 2 pounds per acre controlled 86% and 83% of the foxtail, respectively. Most of the other treatments, except Pyramin, gave fair control of foxtail. The machine check eliminated 34% of these weeds. There was no visual damage to the sugar beets.

#### Summary

Fields that have been kept free of weeds until late summer by mechanical weeding or by early application of herbicides are frequently very weedy by harvest time. Lay-by applications of herbicides can keep fields that would otherwise be weedy, fairly free of weeds until harvest time without any adverse effect upon the beets. Most of the herbicides used in these tests, if properly applied and incorporated into the soil, will give good weed control until the beets are harvested.

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