Further Studies on the Control of Weeds in Sugar Beets with Herbicides

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Promising herbicides from last year's experiments, in addition to several new herbicides, were tested on sugar beets during 1959 in preplanting soil incorporated and pre-emergence soil surface experiments at the Ontario Agricultural College (1)[2]. Both experiments included the same treatments in a 6 x 6 simple lattice design with two replications allowing for 36 treatments. Two check plots were included in each replication. Plot size was 9 x 20 feet, each plot containing four rows of sugar beets.

The pre-emergence plots were planted May 11, 1959, and treatments for both experiments were applied to the soil surface on May 12. In the preplant experiment, incorporation of the herbicides into the soil was carried out by means of a double disk, followed by a spike-tooth harrow and packer, on the evening of May 12 with sugar beets being planted the following morning. Both experiments were conducted on Burford loam soil with monogerm sugar beet seed[3] being used.

All liquid herbicides were mixed with water and applied with an Oxford precision sprayer at the rate of 30 gallons per acre. The granular herbicides were applied with a Gandy seeder. At the time of treatment the soil was moist and continued moist for some time. Weed counts and ratings were made on June 9 and 10. No yields were taken.

Weeds present were mainly lamb's-quarters (*Chenopodium album* L.) and redroot pigweed (*Amaranthus retroflexus* L.) with few annual grasses.

The data presented in Tables 1 and 2 show that the liquid formulation of EPTC had little effect on broadleaf weeds. This was to be expected in the case of the pre-emergence surface application but not in the incorporation trial. Since there was an eight hour delay between surface application and incorporation, the chemical may have escaped by volatilization from the moist soil surface. Granular EPTC gave poor weed control when applied pre-emergence to the soil surface but excellent weed

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[2] Numbers in parentheses refer to literature cited.

[3] Monogerm seed was a blend of UI58-K114 and SL117MSxSP5714-0 and SL117MSxSP5481-0.

Table 1.—Effect of Pre-Emergence Herbicides on Weeds and Sugar Beets.

Treatment	Rate[1]	Weeds/Sq. Ft.[2] Mean	Weeds/Sq. Ft.[2] % of Check	Injury Ratings % of Check Beets	Injury Ratings % of Check Weeds	Herbicidal[3] Rating
EPTC liquid	2	8.00	96.2	100	100	38
	4	10.36	100.	100	100	0
	6	10.29	100.	100	100	0
EPTC granular	2	9.82	100.	100	100	0
	4	6.02	72.4	100	100	276
	6	3.33	40.	95	90	640
Monuron	½	1.07	12.9	83	55	929
	¾	.66	7.9	63	40	968
	1	0	0	55		1000
Diuron	½	.72	8.6	63	47	960
	¾	1.10	13.2	38	5	993
	1	0	0	5		1000
Endothal	4	5.25	63.1	100	100	369
	6	5.15	61.9	100	100	381
	8	2.57	30.9	100	87	731
Endothal Oil Susp.	4	2.76	33.2	100	100	668
	6	6.40	76.9	100	100	231
Endothal granular	4	5.65	67.9	100	100	321
	6	3.84	46.2	100	77	644
	8	4.20	50.5	96	73	631
GC 2603[4]	1	1.05	12.6	83	45	943
	2	0	0	22		1000
	3	.25	3.0	25	5	999
CP 6936[5]	4	2.39	28.7	100	73	790
	6	3.00	36.	100	67	759
	8	1.28	15.4	93	35	946
Niagara 5996	½	7.12	85.6	100	100	144
	1	5.25	63.1	78	100	369
	1½	2.42	29.1	35	83	758
CDEC	4	4.76	57.2	100	67	617
	6	1.92	23.1	100	53	878
	8	3.16	37.9	100	43	837
CIPC + CDEC	2,1	1.59	19.1	83	67	872
	3,4	.17	2.0	45	45	991
Check		8.32	100.	100	100	0

[1] All rates are pounds of active material per acre.

[2] Average of 8, one square foot samples (4 per plot in each replicate).

[3] Herbicidal rating $= 1000 - \left[\frac{\text{Weed injury (\% of check)} \times \text{weed control (\% of check)}}{10}\right]$

[4] GC 2603 = 3-phenyl-1, 1-dimethylurea trichloroacetate.

[5] CP 6936 = alpha-chloro-N-ethyl-N-phenylcarbamate.

Table 2.—Effect of Pre-Planting Incorporated Herbicides on Weeds and Sugar Beets.

Treatment	Rate[1]	Weeds/Sq. Ft.[2]		Injury Ratings % of Check		Herbicidal[3] Rating
		Mean	% of Check	Beets	Weeds	
EPTC liquid	2	7.35	82.2	100	100	178
	4	8.67	97.	100	100	30
	6	4.90	54.8	87	97	468
EPTC granular	2	1.43	16.	73	73	883
	4	.28	3.1	40	13	996
	6	.19	2.1	14	13	997
Monuron	½	1.86	20.81	56	63	869
	¾	.64	7.2	43	45	968
	1	.08	.9	44	45	996
Diuron	½	4.81	53.8	100	75	596
	¾	2.09	23.4	63	63	853
	1	1.69	18.9	59	43	919
Endothal	4	4.66	52.1	100	100	479
	6	1.37	15.3	100	55	916
	8	6.29	70.4	100	83	416
Endothal Oil Susp.	4	8.67	97.	100	100	30
	6	8.73	97.7	100	100	23
Endothal granular	4	3.33	37.3	100	70	739
	6	3.49	39.1	94	67	738
	8	1.86	20.8	97	57	881
GC 2603[4]	1	2.61	29.2	66	53	845
	2	.61	6.8	46	27	982
	3	.85	9.5	13	15	986
CP 6936[5]	4	6.08	68.	100	93	368
	6	5.10	57.1	100	93	469
	8	2.24	25.1	100	75	812
Niagara 5996	½	6.67	74.6	100	100	254
	1	6.13	68.6	81	97	335
	1½	3.12	34.9	28	37	871
CDEC	4	4.15	46.4	100	95	559
	6	5.70	63.8	100	70	553
	8	6.40	71.6	100	95	320
CIPC + CDEC	2,4	3.75	41.9	83	77	677
	3,4	1.66	18.6	65	40	879
Check		8.94	100.	100	0	

[1] All rates are pounds of active material per acre.

[2] Average of 8, one square foot samples (4 per plot in each replicate).

[3] Herbicidal rating $= 1000 - \left[\frac{\text{Weed injury (\% of check)} \times \text{weed control (\% of check)}}{10}\right]$

[4] GC 2603 = 3-phenyl-1, 1-dimethylurea trichloroacetate.

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control was obtained even at the two-pound rate when it was incorporated before planting. This would indicate a greater stability in the granular formulation than in the liquid.

Monuron and Diuron gave excellent weed control at all rates. Both were slightly better when applied pre-emergence to the soil surface than when incorporated. However, both injured the beets considerably and would appear to be too toxic to be used in this crop.

Both the water soluble and emulsifiable formulations of endothal gave erractic weed control. Granular endothal seemed to give better weed control, especially when incorporated, with slight beet stunting. GC 2603 gave excellent weed control in both trials with fairly severe beet injury at the two-and three-pounds rate. CP 6936 gave consistently good results under the pre-emergence application with no beet injury, but seemed to cause more beet injury with less weed control when incorporated. Niagara 5996 gave satisfactory weed control but severe beet injury at the rate of 1.5 pounds per acre. CDEC gave satisfactory weed control at six pounds per acre applied pre-emergence to the soil surface. There was no beet injury caused by this chemical in any treatment. A mixture of CIPC at two pounds and CDEC at four pounds per acre applied as a pre-emergence surface application gave satisfactory weed control with slight beet injury.

Summary

Several herbicides that had been shown to be promising for the control of weeds in sugar beets, and two new materials, were tested in preplanting soil incorporated and pre-emergence soil surface applications during 1959. Granular EPTC at 2 pounds per acre was the most satisfactory preplanting soil incorporated treatment. Granular endothal with similar application was also good. CDEC and CP 6936 were the best pre-emergence soil surface treatments as they gave good weed control and no beet injury. Liquid EPTC and both the water soluble and emulsifiable forms of endothal were not satisfactory under either method of application. Monuron, Diuron and GC 2603 gave good weed control but damaged the crop extensively.

Literature Cited

(1) BANDEEN, J. D., SWITZER, C. M. and JONES, G. E. 1959. Effects of various pre-emergence herbicides on weeds and sugar beets. Proc. Amer. Soc. Sugar Beet Tech., Eastern U. S. and Canada 10: 36-40.