

## Trials with Herbicides for Weed Control in Sugar Beets

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The development of new chemicals and extended uses of some of the older chemicals has given impetus to the search for selective chemical weeding of sugar beets. The results from one year to the next and from one location to another have been erratic. Yet, among the various chemicals tried, there are those which affect some weeds more harshly than they affect beets. Some of the new herbicides show little or no contact injury but act effectively on growing plants and germinating seeds through the soil medium.

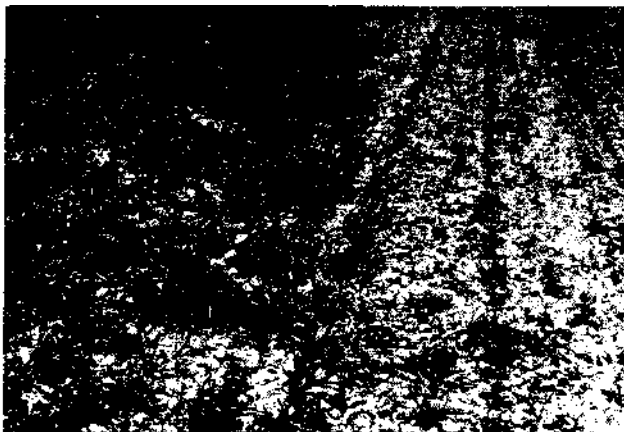


Figure 1.—Left, no IPC. Right, IPC at three pounds per acre, applied as a pre-planting spray and worked into soil with field cultivator and disc. Figures 1, 2 and 3 depict control of foul growth of volunteer barley and wild oats in a sugar beet field near Fort Lupton, Colorado. Application of isopropyl-N-phenyl carbamate was made April 11, 1952, and results photographed May 29.

Since the action of some chemicals is slow, it becomes necessary to observe the chronic effects of herbicidal applications as well as the acute effect. Thus, vigor of crop and weeds after treatment becomes an important criterion in evaluating treatments. Some investigators have used for numerical evaluation of a herbicide the following factors:

$$\text{Tolerance rating of crop} = \frac{\text{stand} \times \text{vigor (in \% of check)}}{10}$$

$$\text{Herbicidal rating on weeds} = 1,000 - \left[ \frac{\text{stand} \times \text{vigor (in \% of check)}}{10} \right]$$

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The above ratings which may range from zero to 1,000 are helpful in comparing the effects of different treatments. The ideal treatment would be one which gave a tolerance rating of 1,000 and a herbicidal rating of 1,000.

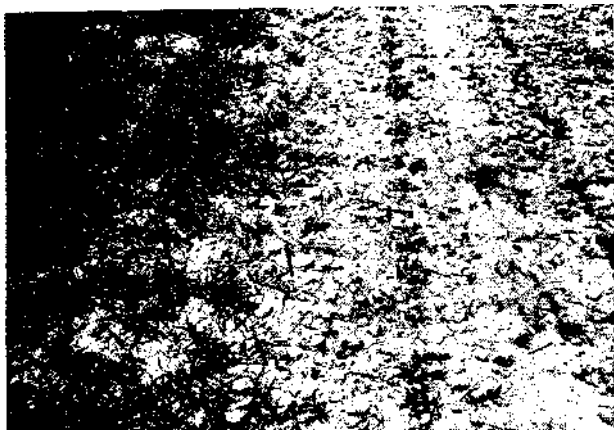


Figure 2.—Closeup view of treated and untreated area. Left, no IPC. Right, IPC at six pounds per acre, applied as a pre-planting spray and worked into soil with field cultivator and disc.

Herbicides tested on small plots in 1951, as pre-emergence and post-emergence spray applications, and rates per acre follow. All sprayable materials were applied in water at a rate of 40 gallons per acre. The herbicides used and range of applications in rates per acre were:

E.H. 5722 at 4-16 pounds; IPC and Chloro-IPC at 4-16 pounds; M.E. 3003 and Niagrathal (Endothal formulations) at 2-8 pounds; TCA, Na salt and TCA, Ca salt at 5-15 pounds; Dichloral urea at 1.5-30 pounds; CMU at 1/4-3 pounds; Xanthogen disulfide at 7.5-30 pounds; Chlorosol-A at 50 pounds; 6Q8 (phthalamic derivative) at 2-8 pounds; E. C. 3890 at 4-8 pounds; and Na isopropylzanthate at 15 pounds.

A summarization of the results of the above trials showed (1) aid in controlling weeds, without serious injury to beets, was obtained in certain cases with the salts of TCA, dichloral urea, IPC, Chloro-IPC, and Endothal;

(2) pre-emergence applications gave better weed control than post-emergence applications; (3) the weeds controlled were for the most part small seeded annual grasses.

Pre-emergence and post-emergence herbicidal applications have not given consistent results in northern Colorado. Consequently trials were started in which the herbicide was applied and worked into the soil as a pre-planting treatment. The limited trials completed to date using this method have given good results with a high degree of consistency. Further,



Figure 3.—General view of treated and untreated area. Left, no IPC. Right, IPC at six pounds per acre, applied as a pre-planting spray and worked into soil with field cultivator and disc.

such large seeded grasses as wild oats and volunteer oats and barley have succumbed to this treatment.

Three trials were made during the spring and summer of 1951 using IPC (emulsifiable) and dichloral urea (E. H. 2). In the first trial, IPC was used at 20 pounds per acre and E. H. 2 (73 percent dichloral urea) at 40 pounds per acre. Barley and sugar beets were planted immediately after the chemicals had been applied and hoed into the soil to a depth of four inches, April 4. No barley emerged on the treated plots. The beets did not emerge on the IPC plot and emergence was somewhat retarded on the E. H. 2 plot. Barley and sugar beets were replanted on both plots April 26. Following this planting the beets emerged normally on the plots which had been treated April 4, with IPC and E. H. 2. Again the barley failed to emerge on either treated plot.

Trial two employing preplanting application included IPC at 4, 8, and 16 pounds per acre and E. H. 2 (73 percent dichloral urea) at 2, 4, 8, 24, and 40 pounds per acre. After application the herbicides were worked into

the soil to a depth of three-four inches by hoeing. Previous to the applications of herbicides a 1-1-1 mix of Trebi barley, Clinton oats, and wild oats was broadcast and worked into the soil. Immediately after the application of the herbicide commercial segmented sugar beet seed was planted with a Milton planter, April 28. Sugar beets emerged acceptably on all plots. Grain and wild oat control on the IPC-treated plots was excellent. Some grain emerged on all E. H. 2 treated plots but marked suppression in rate of growth of the grain started at the eight pound rate.

Trial three, employing preplanting application of herbicide, was a demonstration made on 22 x 50-foot plots. For this trial Chloro-IPC, TCA and Endothal were added to IPC and E. H. 2 herbicides used in Trials 1 and 2. In this case the land was (1) partially prepared for beets so that there was no gross unevenness of the surface; (2) the barren soil surface was sprayed with herbicides at rates as listed below in 40 gallons of water per acre; (3) immediately after spraying the soil was disced to incorporate the herbicides with the surface four inches of soil; (4) to simulate foul grain growth a 1-1-1 mixture of oats, barley, and wild oats was drilled deep and shallow with a grain drill; (5) seedbed was completed and commercial segmented seed planted with a Milton drill, and (6) irrigation was made with overhead sprinkler system. The operations were performed July 16 and 17.

Treatments used in trial three in rates per acre were: IPC at three and six pounds; dichloral urea at 7.5 and 15 pounds; Chloro-IPC at three and six pounds; TCA at 15 pounds, and Endothal at 7.6 pounds.

Again volunteer grain and wild oat growth was stopped or markedly suppressed on the treated as compared to the untreated areas. Emulsifiable IPC at three and six pounds per acre gave fair and excellent control, and dichloral urea at 7.5 and 15 pounds per acre gave poor and good control, respectively. Control with TCA at 15 pounds per acre was good and comparable in effectiveness with dichloral urea at equal rate. Endothal gave very good control of the wild oats and grain but at the rate used (7.6 pounds per acre) some retardation was noted in the rate of growth of beets. As in observations on post-emergence sprays with Endothal, the injury was temporary. In other tests, beets have survived contact injury from rates of six pounds Endothal per acre applied as a post-emergence spray to beets and weeds. The Chloro-IPC gave much the same result as standard IPC at the six-pound rate, but appeared inferior at the three-pound rate.

In general soil incorporation of the herbicides found to be tolerated by beets gives better weed control than later application. A possible exception to this is Endothal which has also performed well in post-emergence spray trials made on grasses and certain broadleaf weeds.

### Summary

Of fourteen herbicides tested IPC, Chloro-IPC, E. H. 2 (dichloral urea), Endothal and TCA gave some weed control without serious injury to beets. Grass control was improved when herbicides were applied and disced into the soil prior to planting sugar beets. Oats, barley and wild oats were all controlled when above herbicides were incorporated with the soil at the

approximate time of seed germination. IPC (emulsifiable) at three and six pounds per acre gave fair and excellent control, respectively, and appeared slightly more effective than Chloro-IPC. Dichloral urea and TCA gave marked suppression of volunteer small grain growth, and wild oats at 15 pounds per acre. Endothal at 7.6 pounds per acre gave very good control with slight injury to beets. Endothal shows promise also, as a post-emergence spray, on grasses and some broadleaves. Beets survived contact injury of six pounds Endothal per acre.