

Simultaneous Fumigating and Planting of Sugarbeets

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Soil fumigants have proven to be an effective means of controlling sugarbeet nematode, (*Heterodera schachtii*). They have not been used as extensively as they could be for two reasons: 1. the cost of the material; and 2. a delay in planting of from 10 days to 2 weeks was required. The object of the experiments reported in this paper was to evaluate the possibility of eliminating the waiting period that was required between when the fumigant was applied and the beets planted.

Methods

All experiments were conducted in commercial sugarbeet fields. Four tests were conducted in 1966 of which three were in Utah and one was in Washington. One test was conducted in 1967 to further evaluate some of the results obtained in the 1966 tests.

The tests were primarily conducted to determine if Telone² could be applied to soil and beets planted at the same time and the other fumigants were included as checks. Previously conducted tests had already proven that Telone was an effective fumigant and these tests were designed to determine the extent on stand of simultaneous fumigating and planting (2, 4)³.

The fumigants, in all experiments, were applied with a chisel applicator at a depth of 6 to 8 inches. The beets were planted just as soon as the fumigation was completed or the fumigant was sidedressed shortly after the beets were planted. There was never a delay of more than half a day between the time the fumigant was applied and the beets planted.

1966 Utah Tests

There were three tests conducted in Utah in 1966. In all of these tests the fumigants were applied 6- to 9-inches deep. In the first field Telone was applied at 20 gallons per acre and Vidden D⁴ at 25 gallons per acre. The fumigants were applied

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² Telone - the trademark of the Dow Chemical Company's 1-3 dichloropropene soil fumigant.

³ Numbers in parentheses refer to literature cited.

⁴ Vidden D - Another trademark of Dow Chemical Company's 1-3 dichloropropene soil fumigant.

Table 1.—The effect on stands of simultaneous applying 20 gallons of Telone per acre and planting sugarbeets. Utah 1966.

Location	Description	Beets per 100 feet of row	
		Untreated	Telone
Field No. 1	Same direction as beet row*	104	101
Field No. 2	Diagonal to planted row	103	107
Field No. 3	Sidedressed along side of row after beets were planted	97	94

*Beets planted as soon as fumigation completed.

in the same direction the beets were planted and the chisels were 11 inches apart. The soil was a sandy loam.

In this test the Vidden D killed all of the beets either before or shortly after emergence. There were no visual adverse effects on stand from the Telone and there were only slight differences in stand between the Telone treatment and the untreated area as shown in Table 1.

The Vidden D treatment was not made in the other two fields because of the disastrous effect in this field and similar but less severe results in commercial fields where there was insufficient time between fumigating and planting.

The second field had 20 gallons of Telone applied diagonal to the direction the beets were planted and on the third field the fumigant was applied as a sidedressing after the beets were planted. These are shown as fields 2 and 3 respectively in Table 1. Field No. 2 was a sandy loam and number 3 was a clay loam. There was no apparent adverse effect from the Telone in either of these fields and the final thinned stands were as good in the treated as untreated areas.

The portions of beet row just above the chisel marks were examined carefully and no adverse effect could be determined. The concentration of fumigant should have been highest in these areas and still the beets showed no visual damage (1).

To further evaluate the value of the fumigation and the effect on yield and sucrose of the sugarbeets, harvest data were taken on the field that had been treated after the beets were planted. Table 2 indicates nearly a 3-ton increase in yield but a decrease in sucrose percentage from applying the fumigant. There was a net increase of 739 pounds of sugar per acre.

Table 2.—The effect on yield and sucrose of applying 20 gallons of Telone immediately after planting beets. West Jordan, Utah, 1966.

Treatment	Tons per acre	Percent sucrose	Lbs of sugar per acre
Untreated	18.29	16.2	5.927
Telone, 20 gal. per acre	21.09	15.8	6.663

1966 Washington Tests

In the 1966 test in Washington, a comparison was made between Telone and Vorlex². The fumigants were applied in the same direction as the beet rows and were applied immediately before the beets were planted, or side-dressed shortly after planting. The chisels were spaced either 11 or 22 inches apart for the treatments applied before planting and 11 inches apart for the treatment applied after the beets were planted. The field was a sandy loam and the lightest soil in any of the tests reported.

Table 3 indicates that all of the Telone treatments gave good yield increase and that on this light soil, the 15 gallon rate was equal to the 25 gallon treatment. The Telone treatment made after planting yielded as high as the pre-plant treatments. There was some difference in stands but other factors may have caused some of this difference. Satisfactorily thinned stands resulted from all of the Telone treatments. The large decrease in sucrose percentage in the after planting treatment is unexplainable.

Table 3.—Soil Fumigation test conducted in Washington in 1966 to evaluate two fumigants and the possibility of simultaneous fumigation and planting.

Treatment	Tons per acre	Percent sucrose	Pounds of sugar per acre	Beet stands	Cyst count after harvest
Untreated	24.27	14.6	7,087	good	20
25 gal. Telone 11" shank space	27.87	14.5	8,082	fair	12
15 gal. Telone 11" shank space	31.96	15.0	9,588	fair	16
25 gal. Telone after planting	30.58	13.7	8,379	good	13
4 gal. Vorlex 22" shank space	22.55	14.8	6,675	fair	15
7 gal. Vorlex 22" shank space	25.05	14.6	7,315	fair	24
6 gal. Vorlex 11" shank space	25.60	14.7	7,526	poor*	24

*Eighty percent of stand lost. Replanted April 20.

Vorlex was applied at 4 and 7 gallons per acre with the chisels 22 inches apart, and at 6 gallons per acre with an 11-inch spacing between the chisels. The 6 gallon treatment with 11-inch spacing between the chisels caused a reduction of approximately 80% of the original stand and had to be replanted. The other two did some injury to the stand but satisfactorily thinned stands were obtained. None of the Vorlex treatments gave sufficient increases to justify their use.

²Vorlex - The trademark of a soil fumigant of the Morton Chemical Company.

Table 3 shows that there were only small differences in the cyst count after harvest of any of the treatments. Fumigation does not kill all of the nematodes and those that survive seem to increase more rapidly on beets that grow well and produce high tonnages. The population of nematodes in a treated field generally increases so that a second year of beets without fumigation is not profitable (3).

This test would indicate that Telone can be applied just before or after the beets are planted and that large increases in yield and gross sugar can be obtained. It also shows that Vorlex did not show enough beneficial effects to be recommended as a treatment at or near the time the beets are planted.

1967 Tests

The 1966 tests had indicated that Telone could be applied simultaneously with planting without seriously damaging the beets. In 1967 a test was conducted to determine the effect on the beets if conditions were favorable for beet damage. In this test 26 gallons of Telone were applied per acre at a depth of 7 to 8 inches and with the chisels spaced 11 inches apart. A harrow followed immediately behind the fumigator and the seed drill behind the harrow. The beets were planted less than 5 minutes after the fumigant was applied. The field received 0.6 of an inch of moisture starting approximately 2 hours after the planting was completed.

These conditions should have made the Telone as toxic as possible to the beets. Table 4 indicates that there was an increase in tons of beets and gross sugar from the Telone application. It also indicates that the thinned stand was fairly consistent in the untreated check with a variation in counts of 92 to 103 per 100 feet of row. The Telone treated area varied from 58 to 104 with the low counts coming from areas where the chisel mark or application furrow was directly below the planted row. In some areas where one was exactly on top of the other, there was frequently 6 to 7 feet of row where there were no beets. The fact that the beet row was planted at a slight angle to the direction the fumigant was applied kept these areas from possibly being longer and more numerous.

Table 4.—The effect on yield, sucrose and stand of applying Telone the same time as planting beets and making conditions favorable for fumigation damage.

	Tons per acre	Percent sucrose	Lbs of sugar per acre	Thinned stand of beets per 100 feet
Untreated	27.13	16.0	8,682	92-103
Telone*	30.27	16.1	9,747	58-104

*26 gallons per acre.

Discussion

The 1966 tests indicated that Telone can be applied at the same time the beets are planted. They also indicated that Vidden D and Vorlex should not be used without a waiting period between application of the fumigant and planting the beets. The Washington test indicated that for sandy soils the 15 gallon rate was as effective as the 25 gallon application.

The 1967 test indicated that under some conditions the application of Telone could be detrimental to the stand of beets and that a grower should use caution in the practice of simultaneous fumigating and planting.

The direction of application as oriented with the direction of the planted row showed little effect in the 1966 tests. However, the 1967 tests indicated that under some conditions there are disadvantages in having the planted row exactly over the fumigated furrow. Observations of these plots would indicate an advantage of having the fumigant applied diagonal to the planted row.

Summary

From the results of these tests the following recommendations are made:

1. Telone can be applied simultaneous with the planting of beets.
2. Fifteen to 20 gallons of Telone is sufficient for light to medium soils.
3. It is probably best to apply the fumigant diagonal to the direction the beets will be planted.
4. A few hours delay can definitely be a safety factor, especially if moisture is expected.
5. Irrigation should not be applied immediately after simultaneous fumigating and planting.

Literature Cited

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