



# CONTROL OF EARLY DYING OF POTATOES BY SOIL FUMIGATION

By

**C. E. Dallimore**

Asst. Plant Pathologist

**Jay G. Garner**

Fremont County Agent

**R. E. Ohms**

Extension Potato Specialist

One of the most common and universal diseases of potatoes in Idaho is **early dying** or **Verticillium wilt**. (See U. of I. Agricultural Bulletin 350 for a description of the disease.) Verticillium wilt is caused by a fungus in the soil. It infects several weeds and crops besides potatoes. For this reason the only practical means of control has been crop rotation and clean cultivation to reduce host weeds. This disease is particularly severe on light sandy soils, but may be reduced considerably and profitably in these soils by soil fumigation in the fall or spring before planting.

## Soil Fumigation

Fumigation of the soil consists of placing a liquid chemical below the surface of the soil where it volatilizes to a lethal gas that penetrates through the soil mass in the area where the potatoes will be growing. Very specific conditions must be met for adequate soil fumigation (see U. of I. Agricultural Bulletins 337 and 380). Only

lighter soils relatively free of debris and plant material, and whose temperature is above 45°F should be fumigated for control of early dying of potatoes. The soil moisture at this time should be adequate for good tillage.

## Fumigant

Telone\* at the rate of 15-20 gallons per acre significantly reduced verticillium wilt in potatoes on the Egin Bench in Fremont County. The liquid chemical is applied 8 to 10 inches below the surface in continuous lines or streams 10 to 12 inches apart by means of either a chisel or plow sole applicator (U. of I. Agricultural Bulletin 337). Immediately afterwards the surface of the soil must be rolled with a cultipacker to compact the soil particles thus preventing escape of the fumigating gas so lethal concentrations can be obtained.

\* Telone (1,3-Dichloropropene and related Chlorinated C<sub>3</sub> Hydrocarbons) is a trademark name. Use of trademarks implies no endorsement by the University of Idaho.

A minimum of 10 days should elapse between fumigating and other tillage operations. Under no condition should planting be done sooner than two weeks after fumigation, as all the gas must escape from the soil before the potato crop is planted.

### Fertilization

Normal fertilizer practices should be followed; however, barnyard manure should not be applied prior to fumigation. Manure may be plowed under 10 days or more after fumigation when the seed-bed is prepared. Dry fertilizers may also be applied at this time or side-dressed at time of planting.

### Plants Remain Green Longer

Potato plants growing in soil fumigated with Telone for control of early dying do not exhibit the symptoms of this disease as soon as those growing on unfumigated land. The plants remain green 10 days or more after those plants growing in non-fumigated soils have died. This longer plant life gives an increase in total yield and U.S. No. 1 potatoes.

### Yield and Quantity

The effect of fumigation on yield and quality of U.S. No. 1's is shown by the data presented in Table 1. The crops were grown in Fremont County in the sandy soil of Egin Bench under sub-irrigation.

The 1965 experiment was placed on land which produced a potato crop in 1964 without soil fumigation. In 1966 this experimental area was planted to potatoes for the third consecutive year to determine if the beneficial effects of fumigation lasted more than one year. Although yields were higher in the fumigated plot than in the non-fumigated plots, the differences were not great enough to be statistically significant. It is concluded, therefore, that under the conditions of the Egin Bench, fumigation must be performed preceding each potato crop. The 1966 experiment was conducted on land which had grown two consecutive potato crops without soil fumigation. The value of soil fumigation is even more apparent, although the practice of growing three consecutive crops of potatoes is not recommended.

### Time to Fumigate

At another location on the Egin Bench, fall fumigation was compared with spring fumigation for the second consecutive crop of potatoes. The yields in cwt. per acre are given in Table 2. Somewhat higher yields were obtained with the fall fumigation at 15 and 20 gallons per acre. Therefore, if the soil temperature is high enough and other conditions, mentioned above, necessary for fumigation are right, fall fumigation is preferable to spring fumigation. By fumigating in the fall there will be no delay in planting potatoes in the spring and there is less apt to be any injury to the young potato plants that would decrease yields.

Table 1. Yields of potatoes in cwt. per acre when fumigated with Telone for control of early dying.

	Rates of Telone in Gallons Per Acre							
	1965				1966			
	0	15	20	25	0	15	20	25
Total yield	230	255	260	270	145	179	201	207
Total U.S. No. 1's	165	198	206	203	74	87	131	138
Percent U.S. No. 1's	72	74	79	75	49	60	65	66
Percent U.S. No. 1's over 10 ounces	16	25	18	20	6	9	11	15

Table 2. Yields of potatoes in cwt. per acre when land is fumigated with Telone at indicated rates in the fall as compared with spring fumigation.

	Rates of Telone in Gallons Per Acre							
	0		15		20		25	
	Fall	Spring	Fall	Spring	Fall	Spring	Fall	Spring
Total yield	233	220	265	246	261	179	196	266
Total U.S. No. 1's	163	140	206	179	266	100	171	191
Percent U.S. No. 1's	69	68	78	73	75	56	71	72
Percent U.S. No. 1's over 10 ounces	21	17	29	25	26	19	22	28

## Value

With Telone costing \$1.85 per gallon it would cost \$37.00 an acre to fumigate using 20 gallons per acre. With the 40 cwt. increase in U.S. No. 1's in 1965, there would be a profit of more than \$70.00 per acre if U.S. No. 1's were sold for \$2.50 per cwt. The increase in the third consecutive crop was 57 cwt. bringing a net profit of more than one hundred dollars. With the fall fumigation there was more than a 100 cwt. increase in yield which would bring a net profit of \$250.00 per acre.

## Warning

Because fumigation is expensive and somewhat different results have been obtained on heavier soils, it would be advisable to try fumigating only a few acres until you have determined its value under your conditions. Experiment to determine the rate most suitable for your soil. Be sure all the requirements for a satisfactory job are met because it costs no more to do a good job of fumigating than to do a poor job.

Before fumigating consult your local county agent or potato specialist to learn where assist-

ance may be obtained from someone experienced in this technique. A few custom applicators are available for hire. **READ THE LABEL** before opening the drum of chemical. Follow the directions and advice given. This chemical can cause serious flesh burns, particularly if the gas becomes confined, such as under rings, gloves, or clothing. **Always have soap and water available.**

**NEVER WORK ALONE.**

## Additional Advantages

At the rates mentioned, Telone will also control nematodes (eelworms) and wireworms. Some weed control has also been observed at higher rates.

**HANDLE FUMIGANTS WITH CARE**

—

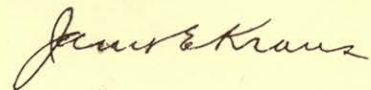
**Follow Recommendations Carefully**

—

**READ THE LABELS**

---

PUBLISHED AND DISTRIBUTED IN FURTHERANCE OF THE ACTS OF MAY 8 AND JUNE 30, 1914,  
BY THE UNIVERSITY OF IDAHO AGRICULTURAL EXTENSION SERVICE, JAMES E. KRAUS,  
DIRECTOR; AND THE U.S. DEPARTMENT OF AGRICULTURE, COOPERATING.



JAMES E. KRAUS, Director