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# Reducing Vert and Increasing Yield Of Potatoes in the Treasure Valley

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## The Problem

Whenever potatoes are regularly part of a crop rotation in the Treasure Valley, Early Dying disease becomes an important source of production losses. As few as three potato crops on a field can raise the disease level to the point where losses as high as 100 cwt per acre can be shown. I estimate a 50 cwt per acre loss commonly occurs on half the potato acreage in Treasure Valley. In 1975 this would have amounted to 50 cwt times 25,000 acres, or 1,250,000 cwt in lost production. Besides loss of production, Early Dying results in lower specific gravity of potatoes. This in turn results in a lower recovery from raw product in processing. Current studies show that a disease severity causing 20% loss in production also reduces solid content in the raw product by 1%, which is equivalent to a 5% difference in output of french fries.

## The Cause

The main cause of Early Dying disease of potato is infection by a soil-inhabiting fungus called *Verticillium*. The disease is also known as *Verticillium* Wilt, and both the fungus and the disease it causes are popularly referred to as "Vert." Vert seems to occur naturally in almost all agricultural soils and can carry over or live on a variety of crops and weeds. The wilting and early dying that it causes become more severe with each crop of potatoes grown. Both Russet Burbank and Norgold Russet varieties are affected by Vert. Norgold is earlier in maturity and is considered more susceptible.

## Factors Affecting Early Dying

Practices devised to minimize Vert losses have met with varying degrees of acceptance by growers. Unless a control practice is highly effective, growers may not recognize its value. Many controls do little more than delay the onset of Early Dying and the benefits, though tangible, may be difficult to measure. Control practices must also be compatible with the normal cropping practices used by the grower to produce potatoes or the interim rotation crops.

Since most potato growers use a relatively short rotation of potatoes, Early Dying will assume increasing importance as a limiting factor in Treasure Valley potato production. Thus each grower must use the best methods available to minimize production loss from *Verticillium* Wilt.

## Crop Rotation

In Idaho, Vert is known to persist in the soil for as long as 7 years after Russets were grown. Potato growers aren't likely to space potato crops that far apart, but they can lower the Vert inoculum level by burning or removing vines. If neither burning nor removing vines is possible, then avoid covering or burying the plant refuse. Weathering on the soil surface also can reduce the Vert content of the vines.

## Seed

Always use certified seed, preferably seed grown at higher elevations. High elevations generally restrict the length of the growing season and this lessens the likelihood of infected seed. Seed should also be clean and as dirt-free as possible to lessen the likelihood of surface contamination.

## Seed Size

Larger seed usually results in quicker emergence, a more uniform stand and larger, huskier plants which will out-produce potatoes grown from smaller seed. Although the University of Idaho has recommended that 1½-to 2-ounce sized seed be used, ongoing research at the Research and Extension Center at Parma is showing that 3-ounce seed produces substantial yield advantages over 2-ounce seed when coupled with soil fumigation treatment. Conversely, small seed produce poor stands and a lower plant population, which may limit the potential yield benefits from fumigation (Table 1). Seed smaller than 2 ounces will not produce maximum yields under these conditions. However, results of a 1975 test at the Research Center gave evidence that narrowing the row will improve production from smaller-sized seed. This test must be repeated to verify the preliminary results.

**Table 1. Average yield of potatoes produced from 2- and 3-ounce seed, with and without fumigation, at Parma Research and Extension Center, 1974-75.**

Seed size	Cwt per acre	
	No fumigation	Fumigation
2-ounce	(check) 260	320
3-ounce	295	370

### Planting Date

The effect of planting date on Early Dying development in Treasure Valley has not been studied. However, since you have a choice, begin planting on "new" potato ground first, leaving until last those fields with known or suspected high levels of disease inoculum. Potatoes in the infected fields would thus be less mature at the advent of hot weather and less susceptible to the undesirable effects of high temperatures.

### Crop Vigor

Eliminating weed competition, minimizing harmful insects and nematodes, maintaining adequate soil moisture and fertilizer elements will encourage vigorous, continuous growth of the crop. This in turn will delay the onset of Vert and restrict its development.

**Weed Control:** Removing weed competition will favor the development of vigorous, disease-tolerant potato plants. Since Vert can develop on several species of nightshade and lambsquarter, good weed control between potato crops in a rotation will also help reduce the disease.

**Fertilization:** Good soil nutrients can delay or prohibit the development of Vert. However, excessive nitrogen fertilization can induce undesirable side effects such as low solids and a high incidence of jelly-end and sugar-end. The amount of fertilizers applied should not exceed the recommended rates.

**Pest Control:** Nematodes and insect pests may be controlled by soil fumigation, broadcast or furrow application of insecticides or by foliar sprays. Good pest control can sometimes materially delay Early Dying.

### Moisture

Maintaining adequate soil moisture is one of the most important measures a grower can take to delay Early Dying. The trend toward combining small fields to make larger fields more amenable to large equipment operations has resulted in water runs that are too long for uniform rill irrigation. Supplemental watering by sprinklers or gated pipe may be necessary to maintain adequate soil moisture at the lower end of these fields. Soil moisture must be at a level

to minimize stress and wilting of potatoes during the hot weather that usually occurs from late June and through July.

### Fumigation

Preplant soil fumigation by broadcast injection can significantly delay Early Dying and increase yields if the job is done properly. The following points may be useful as guidelines for fumigating properly:

(a) The dosage level of fumigant adequate for nematode control may be inadequate for economical Vert control.

(b) Acceptable Vert control on medium heavy soil (Greenleaf silt loam) has been obtained through the application of 22 gpa of dichloropropenes. This is the equivalent of 40 gpa of D-D, or 30 gpa of Telone.

(c) Fumigation of preformed hill rows has not been an effective control for Vert.

(d) The value of effective fumigation lies not only in increased yields, but also in the higher processing quality of the crop. A 2- to 3-week delay of Early Dying, attributable to soil fumigation, invariably results in a percentage point higher solid content. This can mean a 5 percent increase in recovery from raw product during processing.

### General Considerations

Most practices that a potato grower can follow to slow the buildup of *Verticillium* in the soil are cumulative in effect. The same is true of practices to maximize production where Vert is already a problem. The significance of this is that one specific practice will not take the place of another, and as many measures as possible should be used to obtain maximum benefits. This is not as burdensome as it may first seem, since each additive effect enhances the response to the others. As an example, larger seed size and fumigation each will increase production. But the two practices together will increase yield above either practice alone. Hence, with each beneficial practice there is an additive improvement in yield and quality of the crop.

Field experiments clearly stress the advantages of using 3-ounce seed with soil fumigation to boost production in the Treasure Valley of Idaho. Since a large proportion of potato seed planted is smaller than 1½ ounces, merely increasing the proportion of 2-ounce seed would represent a substantial improvement over the past.

The best technique for obtaining the larger size seed has not been investigated, and each grower would have to decide for himself whether the extra effort should be made, and how. One easy approach would be to simply grade out all seed up to 3-3½ ounces and set the cutter to cut larger tubers into 2½ - 3½ ounce pieces. A more uniform lot would result if 3½ - 7 ounce potatoes could be sorted out and cut into two pieces.

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