



University of Idaho
College of Agriculture

Cooperative Extension System
Agricultural Experiment Station

Current Information Series No. 864

LIBRARY

OCT 24 1990

UNIVERSITY OF IDAHO

Herbicide Carryover to Potatoes

Charlotte V. Eberlein and William C. Schaffers

Herbicide carryover, or persistence from one growing season to the next, is a potential problem with several herbicides used in crops grown before planting potatoes. Whether herbicide carryover will be a problem depends on several factors. Certain herbicides are more likely than others to carry over because of their chemical characteristics. Soil characteristics such as texture, organic matter and pH also may affect carryover potential. In addition, environmental factors and cultural practices that affect the rate of herbicide breakdown in the soil are important in herbicide carryover.

Soil Characteristics

In general, carryover problems are more likely to occur in coarse-textured (sandy) soils and soils low in organic matter than they are in clay soils and soils high in organic matter. The reason is that a portion of the herbicide that persists in the soil adsorbs (adheres) to soil particles and is not readily available for plant uptake. The remaining herbicide is in the soil solution where it is readily available for uptake and can injure susceptible plants. The relative amounts of adsorbed herbicide and herbicide in the soil solution depend on several factors, including soil texture — the relative proportion of sand, silt and clay in the soil.

Clay particles are very small, silt particles slightly larger and sand particles largest. A given volume of clay contains more particles than the same volume of sand and also has a greater total surface area. When surface area increases, there are more sites for herbicide adsorption. As a result, the higher the proportion of clay in the soil, the greater the soil's capacity to adsorb herbicides, which lessens the amount available for uptake by plants.

Like clay, organic matter particles have a large total sur-

face area and abundant sites for herbicide adsorption. As a result, soils high in organic matter will adsorb more herbicide than soils low in organic matter, making carryover problems less likely.

Soil pH may affect herbicide persistence and availability for plant uptake. Many herbicides tend to break down more slowly when the soil pH is alkaline (greater than 7) than when it is acidic (less than 7). Some herbicides, such as the sulfonylureas, not only persist longer at high than at low pH but are also adsorbed less and are therefore more available for plant uptake.

Environmental Factors

Certain environmental factors may have a major effect on herbicide carryover potential. Herbicides usually are broken down to inactive compounds by chemical or microbial processes, and breakdown is most rapid in warm, moist soil. Herbicides persist longer in cool, dry soils because soil microbial and chemical activity is reduced. Herbicides are also more likely to carry over if they are applied at higher rates or late in the season when they have less time to break down before cold weather slows the breakdown process.

Tillage Practices

Carryover may be affected by tillage practices. Reduced tillage practices, such as disking or chisel plowing instead of moldboard plowing, concentrate herbicides near the soil surface. Moldboard plowing, on the other hand, distributes the herbicide throughout the plow layer, diluting its concentration. Moldboard plowing a field containing a persistent herbicide will often decrease the potential for carryover problems.

Table 1. Foliar injury symptoms caused by herbicide carryover to potatoes.

Herbicide	Foliar injury symptoms on potatoes
Benzoic acids Banvel	Leaf cupping and puckering, parallel venation, fiddlenecking, petiole elongation and curling.
Imidazolinones Assert	Yellowing of new growth, stunting, leaf cupping, boat-shaped appearance of leaf tip. In severe cases, leaves fuse and appear strap-shaped.
Picolinic acids Curtail, Curtail M, Stinger Tordon	Leaf cupping and puckering, parallel venation, fiddlenecking, petiole elongation and curling.
Sulfonylureas Ally Finesse Glean	Yellowing of new growth followed by leaf necrosis (death) in severe cases, stunting of growth. May cause purple stems. May delay emergence.
Triazines Atrazine Velpar	Yellowing of older leaves followed by leaf necrosis (death). New leaves may be affected later.
Ureas Karmex	Yellowing of older leaves first. Similar to triazine injury.

Herbicides

Herbicides that may cause carryover problems in potatoes in southern Idaho are listed in Table 1 along with their injury symptoms. The more commonly used herbicides in Table 1 are discussed below.

Assert, a relatively new herbicide used for wild oat control in some small grains, has some potential to carry over and cause potato injury. Foliar symptoms of Assert damage include yellowing and stunting of the new growth and an upward cupping of the leaves. The tips of the leaves often develop a characteristic "boat-shaped" appearance. Tuber symptoms include knobiness, shallow to deep longitudinal cracks, and misshapen tubers such as dumbbells and curved or folded tubers. When Assert is used, care must be taken to apply no more than the labeled rates and to avoid spray overlaps. Land treated with Assert should be plowed deeply before planting potatoes. A recent revision of the Assert label also requires a minimum of 12 inches of rainfall or irrigation water from the time of Assert application in small grains to the end of October that year in order to grow potatoes the following year. Tillage after small grain harvest is also recommended to provide conditions conducive to Assert breakdown.

Curtail, Curtail M and Stinger are new herbicides that contain the active ingredient clopyralid. Curtail and Cur-

tail M are registered for use in some small grains, and Stinger is used in sugarbeets. Because of the carryover potential of Curtail, Curtail M and Stinger, potatoes cannot be planted for at least 18 months after application of these herbicides. Typical carryover symptoms include curling of leaves of the new growth and in more severe cases a "fiddleneck" appearance to the leaves. Tuber yields also may be greatly reduced.

Banvel applied at rates of $\frac{1}{16}$ to $\frac{1}{8}$ pound/acre in small grains or $\frac{1}{4}$ to $\frac{1}{2}$ pound/acre in corn will not carry over to injure potatoes. However, Banvel may cause potato injury if it is applied at higher rates for perennial weed control the fall before planting potatoes. Foliar symptoms include fiddlenecking or a folded, hooded appearance to the leaf. Petiole and leaf curling may also appear along with leaf puckering. Yield loss may occur, but tubers have few abnormalities.

Ally is used for weed control in some small grains in certain areas of Idaho where the soil pH is 7.9 or lower and where cropping practices can allow 2 or more years between Ally use and planting sensitive crops such as potatoes. Ally persists in the soil for a relatively long time, and sensitive crops cannot be planted for more than 2 years after Ally use. A bioassay (either field or laboratory) must be done before rotating to potatoes. Ally carryover symptoms in potatoes include delayed emergence, yellowing of the new growth followed by leaf death in severe cases, and stunted plant growth. Tuber yield and quality may be reduced by soil residues of Ally even when foliar injury symptoms are not apparent. Typical tuber symptoms include shallow to deep cracks, misshapen tubers, knobiness and undersized tubers.

The potential for carryover problems may be reduced by closely following all herbicide label directions. The label should indicate what rates to use based on soil type, organic matter content and pH. Follow these instructions carefully. The label should also provide information on susceptible crops and time restrictions before certain crops can be planted after herbicide application. Do not plant potatoes before the appropriate recropping interval has passed.

The Authors — Charlotte V. Eberlein is associate professor of agronomy and weed science at the University of Idaho Research and Extension Center at Aberdeen. William C. Schaffers is research associate in potato weed science, also at Aberdeen.