What You’ll Learn...

- Residual herbicides are an integral part of weed management.
- Herbicide rate, soil moisture, soil temperature, and soil properties can influence herbicide carryover potential.
- Soil microorganisms are a primary method of herbicide degradation and are most active in warm, moist soils.
- Cool, dry conditions can contribute to carryover of some residual herbicides.

Factors that Influence Herbicide Carryover

The amount of rainfall received during the first few weeks following residual herbicide application is an important factor that will influence potential herbicide carryover. When adequate rainfall is not received during this time, the chemical and microbial processes needed to degrade herbicides in the soil will be reduced. Rainfall occurring later in the season will have much less effect on herbicide degradation than if it had occurred near the time of herbicide application.

Soils with high amounts of organic matter (OM) and clay have a higher potential for herbicide persistence or carryover. Some herbicides are adsorbed to the surface of organic matter and clay, making them temporarily unavailable for plant uptake, downward movement through the soil profile, or microbial degradation. Dry soil conditions cause herbicides to be adsorbed or bound more tightly to soil colloids. Always refer to herbicide labels as several herbicides have limitations relating to the minimum amounts of rainfall received throughout the season and plantback restrictions of specific crops.

Soil pH can influence the breakdown of some herbicides by a process known as chemical hydrolysis. Hydrolysis is slowed under high pH (basic) soil conditions. The rate of hydrolysis is also slowed during dry and cold soil conditions. Triazine and sulfonylurea herbicides are degraded by hydrolysis. Herbicide labels define soil properties to avoid application where potential carryover is high due to soil characteristics.

Herbicide Breakdown by Soil Microbes

Soil microorganisms represent the primary method of breakdown for many herbicides. These microorganisms include various species of fungi, bacteria, actinomycetes, and algae. The majority of herbicide degradation resulting from microbial activity occurs during the summer and early fall after herbicide application. Soil temperature and soil moisture are two factors that greatly influence soil microorganism activity. Herbicide degradation by microbes is usually rapid when there is adequate soil moisture and warm temperatures. Under extremely dry conditions the rate of herbicide degradation by soil microbes can be slow enough to allow herbicides to persist into the next season. Minimal microbial activity occurs when soil temperatures are less than 40°F.

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DRY, COOL SOILS CAN INCREASE THE RISK OF HERBICIDE CARRYOVER

Microbes become more active as soils warm in the spring, but spring herbicide degradation may be limited prior to planting.

Dry Conditions and Herbicide Carryover
Dry soil conditions and low rainfall limit microbial and chemical activity for herbicide degradation, increases the potential risk of herbicide carryover. Other factors that may contribute to the potential of herbicide carryover include chemical half-life, rate of herbicide applied, application date, soil characteristics, rainfall, rotational crop sensitivity, and spring growing conditions. Cool, dry conditions in the spring can reduce crop vigor and tolerance for herbicide residues in the soil.

Herbicide Carryover Symptoms
Fomesafen (Reflex®, Flexstar®) carryover symptoms on corn include veinal leaf chlorosis or necrosis, which results in a striping effect on corn leaves (Figure 1). In some instances the leaf can appear translucent. Generally there are no symptoms on corn roots. Reflex® and Flexstar® have a 10 month rotational crop restriction to plant corn.

Imazaquin and chlorimuron carryover symptoms on corn include stunting, interveinal yellowing or purpling of leaves (Figure 2). Corn seedlings often exhibit inhibited root growth or “bottle-brush” roots (Figure 3). Emerging leaves may not unfurl properly from the whorl. See individual product labels for crop rotational restrictions.

Atrazine carryover symptoms on soybean usually occur after the cotyledon and unifoliolate leaves emerge. Initial injury symptoms include chlorosis (yellowing) of the leaf margins or tips (Figure 4). Older and larger leaves are affected first. Injured leaf tissue will eventually turn brown and die. Injury symptoms can be more pronounced on soils with greater than 7.2 pH.