

Lecture

Factors Affecting Foliar Absorption of Herbicides

1. Biotic factors affecting foliar absorption of herbicide

- Cuticle thickness (waxiness of leaf surface)

the thicker the cuticle the slower the diffusion of the herbicide; this can result in reduced herbicide activity

plants grown in the greenhouse often have thinner cuticle when compared with field grown plants. This can explain why herbicides often perform better under greenhouse conditions

- Presence of trichomes or leaf hairs

trichomes can reduce the amount of surface area of the leaf in intimate contact with the herbicide

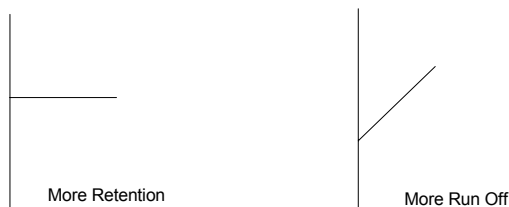
trichomes originate from epidermal cells. Ectodesmata are present in epidermal cells surrounding trichomes and can be important sites of herbicide absorption.

Blazer® provided excellent control of morningglories after it was first labeled in soybeans. After 4-5 years, however, control was not as good.

This is thought to be due to natural selection from the smooth leaf species to more fuzzy leaf morningglory species (those with more trichomes)

- Damage to leaf surface (cracks in cuticle) - cracks in the cuticle caused by wind damage can provide direct pathways for herbicide movement. This can enhance herbicide activity.
- Physiological state of plant - if a plant is in good condition, then absorption will be favored; this is why herbicides should not be applied when plants are under stress from drought

- Orientation of the plant surfaces to the spray - will affect retention and runoff from the leaf surface



- Age of leaf or plant - younger leaves absorb more herbicide than older leaves related to cuticle thickness

2. Nonbiotic factors affecting foliar absorption of herbicide

- Foliar retention - wettability of leaf surface - the amount of herbicide that remains on the leaf surface after application is influenced by water solubility of leaf surface (hairs on the leaf surface would be a factor)
- Light - light enhances photosynthesis and activity of the plant, thus increasing absorption
- Temperature - good growing conditions favors absorption; with low temperature, plants would be less active and absorption would be expected to decrease; moderate temperature (70-90F) would be best
- Humidity

low humidity - stomates closed, thicker cuticle, plants under stress

Under the low humidity conditions in the West, rapid evaporation of water from spray droplets with aerial applications can lead to crystallization of the herbicide on the leaf surface before adsorption occurs. It is possible with a dew period at night that the herbicide could be resolubilized and absorbed.

high humidity - stomates open, cuticle not so thick, plants not under stress

Herbicide remains in solution longer and absorption is favored. Higher humidity will hydrate the cuticle which will lead to enhanced movement of water soluble herbicides through the cuticle.

- Precipitation - rainfastness

Herbicides that are rapidly absorbed into a leaf will not be negatively affected by rainfall shortly after application. Herbicides that are slow to be absorbed by the plant are more susceptible to being washed off by rainfall.

Rainfastness of a herbicide can be used as “selling point” especially in South Louisiana when in most years afternoon showers are quite common. Cobra (lactofen) herbicide is considered to be very rainfast (our research has shown weed control to be excellent when rain was received 15 minutes after application)

Good “rule of thumb” for rainfastness of most herbicides: 3-4 hours.

Our research has shown Asulox (asulam) to require a rain free period of 8-20 hours. This herbicide is very inconsistent in providing weed control.

- Wind - enhances evaporation of water from the herbicide – water spray droplet - this can reduce absorption.

constant wind can result in thicker cuticle and less absorption; wind may also injure the plant causing cracks in the cuticle, which can enhance uptake

- Plant moisture status - turgid, nonstressed plants absorb herbicides more readily than moisture-stressed plants