The Effects of Herbicide Formulation and Environment on Weed Control

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Weed control continues to be one of the most important of turfgrass maintenance. Understanding some of the factors that affect herbicide performance will make it easier to do an effective job of weed control. The purpose of this article is to present information on how herbicide formulation and environmental conditions influence herbicide activity.

The death of a target weed is preceeded by a chain of events that starts with the application of the herbicide. After herbicide application, the herbicide must be absorbed by the plant, move through the plant to the site of action and then disrupt the metabolism of the plant. Herbicide formulation and environmental conditions can influence any or all of these events. For our discussion, we will assume that the correct amount of herbicide has been applied to the turf and that spray drift, volatilization, leaching, and photodecomposition of the herbicide were minimal resulting in an adequate level of herbicide to kill the weed. Furthermore, the discussion will concentrate on post-emergence broadleaf weed control. Preemergence herbicides must be applied prior to weed germination so environmental conditions at the time of application are less of a concern.

Herbicide absorbtion, the first step necessary for weed control, can occur through both the leaves and roots. Herbicides such as 2,4-D and MCPP are absorbed through leaves while preemergence herbicides such as bensulide and benefin are absorbed by the roots. The mechanism by which the herbicide is absorbed or diffuses through the foliage depends on the nature of the herbicide molecule and formulation. Some herbicides enter through the cuticle of the plant while other herbicides enter through the stomata of the plant. The cuticle is made up of waxes which are nonpolar, meaning that it is resistant to the penetration of polar substances such as water. Ester formulations are more effective in controling certain types of weeds that have a very thick covering of wax like wild onion or garlic because esters are nonpolar and can penetrate the wax.

All herbicide formulations contain wetting agents and surfactants that help reduce the surface tension of the spray droplet on the leaf so that the droplet can spread out and the herbicide is exposed to a larger surface area through which it can diffuse. It is generally not necessary to add additional surfactant or wetting agent to herbicide formulations since the manufacturer has done extensive tests to determine which surfactant is best and has added this to the formulation. Mowing the turf at the correct height maximizes the surface area that is able to intercept the herbicide spray and also gives more surface area for diffusion to occur. Hairs on the leaf surface can either increase or decrease herbicide entry into the plant. If the hairs prevent the droplet from contacting the cuticle, then uptake is reduced; if the hairs help intercept and retain more droplets on the surface of the plant, they can increase herbicide penetration.

Air and soil temperature will affect the rate at which the herbicide can diffuse through the cuticle or the root surface. Temperatures that are optimum for growth of the plant will be optimum for the diffusion process. Under very high temperatures, the herbicide droplet can dry before the active ingredient has had a chance to enter the plant. High humidity

can aid herbicide diffusion because the droplet dries at a slower rate. Plants under water stress close their stomata and thus diffusion through the stomata is slowed. Of course, rainfall immediately herbicide treatment will wash the material off the leaf surface and reduce plant uptake.

Once the herbicide is absorbed, then it must move to the site of action within the plant. The translocation of herbicide molecules depends on the movement of food through the plant since the herbicide is carried in the phloem or food conducting cells. Food production, or photosynthesis, occurs in the presence of adequate light and moisture. Thus, herbicide translocation will be slowed if the plant is shaded or under high water stress. Also, if the leaves of the plant have been severely damaged, then photosynthesis will not occur and herbicide translocation will suffer. It is important to apply the proper rate of herbicide so that the leaves are not "burned off."

Finally, the herbicide reaches the site in the plant where it disrupts metabolism and causes the death of the plant. Plant metabolism is highest when the plant is actively growing and thus, herbicide activity will be highest during this period also. Young, actively growing weeds will be easier to control since they have a high level of metabolism and, because they are small, will require less herbicide to be killed. Once some weeds reach a certain level of maturity, metabolism and growth has slowed so that they are difficult to kill.

In summary, the best weed control will occur when the weeds are actively growing since absorbtion, translocation, and activity of the herbicide will be greatest. It is necessary for each turfgrass manager to make field observations as to when the weeds are actively growing in his area. Absorption of the herbicide can be increased by using an ester formulation, however, because esters are more volatile than amines, the danger to ornamentals is also increased. Proper rates of application and technique are critical to successful weed control.

Illinois Lawn Wins Award

Illinois Lawn Equipment, Inc. broke a company record by receiving six awards at the recent GCSAA Show held in San Francisco, California.

Illinois Lawn was named one of five annual Distributors of the Year by Jacobsen Division of Textron. Any distributor receiving six of these awards becomes eligible for the Jacobsen Golden Reel Club. Having previously won five times between 1963 and 1985, Illinois Lawn was therefore inducted into the Jacobsen Golden Reel Club. Only eleven Jacobsen distributors in the world are members of this club. Illinois Lawn was also a recipient of the Jacobsen Turf Distinguished Service awards. Salesman **Wayne Trometer** was awarded one of the Salesman of the Year awards and was presented with a special watch as well as a gift certificate.

In addition, Illinois Lawn Equipment received Cushman Turf Quota Buster and Ryan Quota Buster awards.