

A HERBICIDE PRIMER

Everything you always wanted to know about herbicides is presented on this and the following pages by a long-time expert on weed control.

by W. Powell Anderson, Ph.D.

Herbicides are chemicals that kill plants. About 30 herbicides are registered for use in turfgrass. Their value lies in their ability to selectively kill weeds with little or no injury to the turfgrass.

To use these chemicals effectively, you need to know the turfgrass species involved, to correctly identify the targeted weed species, and to know the characteristics of the herbicides available for use in turfgrass. From a practical viewpoint, you should know the answers to the following questions about a turfgrass herbicide before purchasing and applying:

1. Is it safe to use on your turfgrass species or cultivar?
2. Will it control your problem weeds?
3. When must it be applied relative to weed and turf growth?
4. Is it a contact or systemic herbicide?
5. Does it volatilize—and if so, do the vapors pose a problem?
6. Is the product applied as an aqueous spray mixture or as dry granules or pellets?

7. What effect does rainfall or irrigation have on its activity?

Answers to these questions are found on the product label.

Pertinent herbicide characteristics include the following: (1) selective or non-selective, (2) pre-emergence or post-emergence, (3) contact or systemic, (4) volatile or non-volatile, (5) product formulation, and (6) effect of rainfall or irrigation following application.

Selective or not?

Selective herbicides kill some species of plants, but not others. The particular herbicide chosen for use in turf should not cause significant injury to the turfgrass species, but, at the same time, it

must provide adequate control of the problem weeds.

Thus, herbicides used for weed control in turfgrass are selective herbicides, killing problem weeds with little or no injury to the turfgrass. Examples of selective turfgrass herbicides include the phenoxy herbicides (2,4-D, MCPA, dichlorprop and mecoprop); the dinitroaniline herbicides (benefin, oryzalin, pendimethalin, profluralin and trifluralin); and others such as bensulide, bentazon, bromoxynil, DCPA, dicamba, ethofumesate, fenoxaprop-ethyl, MSMA, oxadiazon, pronamide and siduron.

Some of these herbicides control young broadleaf (dicot) weeds, but not grass weeds. Some control grass weeds, but not broadleaf weeds. Others control certain species of

both broadleaf and grass weeds. Most turfgrass herbicides control young annual weeds, while a few are effective against both seedling and established annual and perennial weeds. Some of the turfgrass herbicides will kill one kind of turfgrass but not another.

Non-selective herbicides kill all, or almost all, actively growing plants, weeds and turfgrass. Non-selective herbicides may be used in turf renovation and at time of seedbed preparation. Some non-selective herbicides may be used selectively in dormant warm-season turf, such as Bermudagrass, to control winter weeds.

Examples of non-selective herbicides are cacodylic acid, glyphosate, metham, methyl bromide, metribuzin and paraquat.

Herbicides are usually applied after weeds have emerged to established stands of turfgrass and to warm-season species when dormant, with no green vegetation showing aboveground. Some may be applied before weed emergence (siduron) or after the weeds emerge (bromoxynil) in new seedlings of turfgrass.

Pre- or post-?

Turfgrass herbicides are applied before or after weeds emerge, depending on the particular herbicide used. Some herbicides are effective only as pre-emergents, others only as post-emergents, and some are effective both ways.

Pre-emergence herbicides kill the weeds in the seedling state; that is, as the seeds germinate, as the seedlings push their way upward through the soil toward the soil surface, or shortly after emergence from the soil.

Advantages of pre-

TURFGRASS HERBICIDES

Common Names	Trade Names
AMA	Super Crab-E-Rad, Super Dal-E-Rad, Super Methar
asulam	Asulox
benefin	Balan
bensulide	Betamec, Betasan
bentazon	Basagran
bromoxynil	ME4 Brominal, Buctril, Nu-Lawn Weeder
cacodylic acid	Phytor 560
DCPA	Dacthal
dicamba	Banvel
dichlorprop or 2,4-DP	in Super Trimec products and in Weedone DPC products
endothal	Endothal Turf Herbicide
2,4-D amine	Dacamine, DMA-4, Weedar Emulsamine, Weedar 64, others
2,4-D LV ester	Esterone 99 Concentrate, Salvo, Weedone LV4, others
DSMA	Drexel DSMA, Helena DSMA, Vertac DSMA, others
ethofumesate	Progress
fenoxaprop-ethyl	Acclaim (registration expected in 1987)
glyphosate	Roundup
mecoprop or MCPP	Chipco Turf Herbicide, Mecomec, Weedone MCPP, others
metham	Vapam
MCPA	Chiptox 2E
MSMA	Bueno 6, Daconate 6, Dal-E-Rad 120, Drexel MSMA, others
napropamide	Devrinol
oryzalin	Surflan
oxadiazon	Ronstar
paraquat	Gramoxone
profluralin	Blockade (registration expected in 1988)
pronamide	Kerb
siduron	Tupersan
simazine	Princep
trifluralin	in Team

emergence herbicides include early weed control and control of certain weed species not susceptible to post-emergence herbicides.

Pre-emergence turfgrass herbicides have limitations: they usually have little or no post-emergence activity; they do not control established perennial weed species; their residues from applications to control winter annual grass weeds in dormant Bermudagrass turf may be phytotoxic to overseeded cool-season turfgrass species; they must be leached downward in the soil to the weed seed germination zone, usually within the upper one-half inch soil layer. Sometimes, pre-emergence herbicides are lost in the turf thatch and unavailable for weed control.

Examples of pre-emergence herbicides include benefin, bensulide, DCPA, ethofumesate, napropamide, oxadiazon, oryzalin, pendimethalin, prodiamine, siduron and trifluralin.

Post-emergence herbicides are applied directly to the aboveground shoot of actively growing weeds, with the leaves the primary target. During application, post-emergence herbicides are also, unavoidably, applied to the turfgrass foliage, except when applied over dormant warm-season species such as Bermudagrass. Thus to avoid turfgrass injury, the turfgrass itself must be tolerant to the applied herbicide.

Examples of post-emergence herbicides include bentazon, bromoxynil, dicamba, DSMA, fenoxaprop-ethyl, MSMA, paraquat and the phenoxy herbicides 2,4-D, dichlorprop, MCPA and mecoprop.

Contact or systemic?

Post-emergence herbicides are either contact or systemic. Contact herbicides are those that undergo little or no translocation in plants. They are most effective in the control of seedling weeds (broadleaf and/or grass) less than two inches tall.

Advantages of contact herbicides are their relatively quick kill (within hours to a few days), less damage to desired plants in the event of slight spray drift onto these plants during application and no persistent herbicidal soil residues. Characteristics that may be considered disadvantages are the lack of soil persistence (thus, failure to control later emerging weeds) and, since they do not translocate in plants, poor control of established perennial weeds and large established annuals.

Examples of contact turfgrass herbicides are bentazon, bromoxynil and paraquat (for dormant

Bermudagrass).

Systemic herbicides translocate (move) within plants from their sites of absorption to their sites of phytotoxicity. Foliar-applied systemic herbicides are transported from the leaves, along with the sugars manufactured during photosynthesis, to other parts of the shoot and to underground plant parts.

The principal advantage of systemic herbicides is that they will move within plants to their sites of phytotoxicity. Thus, complete coverage of the targeted weeds is not as important with systemic herbicides as it is with contact herbicides. Systemic herbicides are used to control seedling and established annual and perennial weeds.

A disadvantage of systemic herbicides is that care must be taken during application to avoid contact of the herbicides with susceptible desired plants, as they will also translocate within these plants from sites of contact and absorption to sites of phytotoxicity. A soil-applied systemic herbicide may be root absorbed and transported upward into the shoot. This can pose a problem when a selective post-emergence systemic herbicide is leached into the soil and subsequently root absorbed and transported to sites of phytotoxicity in aboveground parts of susceptible desired plants. Problems have arisen in this manner following applications of 2,4-D and dicamba.

Examples of systemic turfgrass herbicides are dicamba, DSMA, glyphosate, MSMA and the phenoxy herbicides 2,4-D, dichlorprop, MCPA and mecoprop.

Volatility

From a practical viewpoint, turfgrass herbicides are non-volatile, with a few exceptions.

Ester forms of 2,4-D are volatile, and their vapors pose a potential hazard to nearby susceptible ornamentals. The high volatile esters (methyl, ethyl, propyl, isopropyl and butyl) of 2,4-D volatilize at temperatures above 65° F. and, to avoid injury to desired plants via vapor drift, they should not be used in turfgrass.

The low volatile esters (butoxyethyl, isooctyl and others) of 2,4-D volatilize at temperatures above 95° F.. Their vapors pose a hazard to susceptible ornamentals and this hazard should be considered prior to their use in turf areas.

A few pre-emergence herbicides volatilize, but their vapors rarely have post-emergence activity, and they pose little or no threat to established ornamentals. However, unless

leached into the soil soon after application by rainfall or irrigation, such herbicides may be lost from soil and turf surfaces, with a corresponding loss in weed control.

Formulations

Herbicides are sold to the consumer as formulated products. Thus, the product in the paper, plastic or glass container is a formulation, with the herbicide as its active ingredient.

Turfgrass herbicide formulations are of two basic types: (1) granules or pellets that are applied directly (not mixed with water) to the turf, and (2) those designed to be pre-mixed (diluted) with water and applied in aqueous sprays.

Granular or pelleted formulations contain pre-emergence herbicides; they are not intended for foliar absorption. Pre-emergence herbicides are also formulated to be applied in aqueous sprays. All post-emergence turfgrass herbicides are formulated to be pre-mixed with water and applied in aqueous sprays.

Water-diluted formulations include emulsifiable concentrates, wettable powders, liquid and dry flowables, and those that contain water-soluble herbicides, such as DSMA, MSMA, glyphosate and salt forms of the phenoxy herbicides.

Water

Rainfall and irrigation can influence the effectiveness of turfgrass herbicides. Water encourages weed seed germination and seedling emergence. Water enhances the activity of pre-emergence herbicides, moving the herbicides into the zone of weed seed germination and seedling emergence.

In general, weed control is enhanced by one-half inch of rainfall or irrigation following soon after application of pre-emergence herbicides. Too much water may leach the herbicides too deeply in the soil, resulting in poor weed control.

Foliar-applied herbicides are often so quickly absorbed that they are not adversely affected by rainfall occurring 30 minutes or so after application. A few foliar-applied herbicides, especially water-soluble ones, may be partially washed from foliage by rainfall occurring soon after application, resulting in reduced phytotoxicity. **LM**

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