Use The Right Chemical Tool For Weed Control In Lawns

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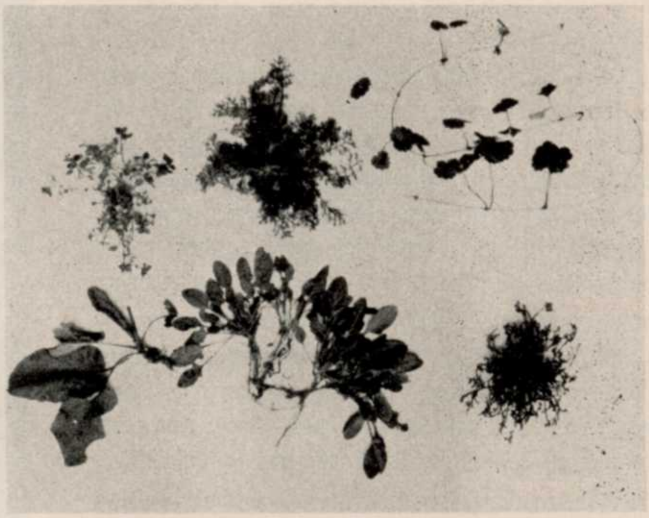
Representative broadleaved lawn weeds controlled with 2,4-D. Upper (left to right): broadleaf plaintain, dandelion, spotted knapweed. Lower (left to right): buckhorn plantain, cress, chicory. Use either spot treatment or treat with wax bar.



Representative broadleaved lawn weeds not readily controlled by 2,4-D (requiring dicamba, silvex or other comparable product). Upper (left to right): common chickweed, yarrow, ground ivy. Lower (left to right): curly dock, red sorrel, prostrate knotweed.

GOOD LAWN and turf areas add beauty and protect soil from erosion. However, they don't just happen. They are carefully planned and maintained throughout the years. Selection of adapted grass species, preplant fertilization, seedbed preparation, proper seeding, irrigation, mulching, and weed control are initial steps. Later maintenance involves clipping at proper height, topdressing, watering, and control of diseases, insects, and weeds.

Weeds have long been a problem in lawn and turf areas. One of the best forms of weed control is proper grass establishment and maintenance. Improper management leads to weakening the stand of turf and to poor vigor; poor vigor and open stands lead to more weeds.

Only in recent years have good chemical weed controls been developed. There are still situations (such as scattered individual weeds in small home lawns) when hand pulling or digging weeds remains the most effective method. In larger turf areas and with general or mixed weed infestations, however, control is now best achieved by use of chemical weedkillers.

A guide for selecting herbicides for weed control in lawns and turf is included along with this article for your files.

Preplant Weed Control Is Costly, But Often Justified

Establishment of new lawns or seedbeds, or rebuilding of old lawn or turf areas may be facilitated by preseeding treatments with soil fumigants. (See Table 1.) These chemicals (such as methyl bromide and SMDC) should be properly regarded as nonselective temporary soil sterilants that will kill all growing plants. Therefore, they should not be applied where they may contact roots of valuable plants.

These compounds kill weed seeds, rhizomes, and bulbs, and then become decomposed in the soil, allowing planting of the lawn or turf area at a later date (usually a few days to a few weeks). Test plantings on a small area are advised before seeding the entire area to determine whether the herbicide has yet been dissipated to a nontoxic level, making it safe to plant the grass species. Time required for breakdown in the soil depends primarily on temperature and soil microbiological activity.

Preplant soil fumigation for weed control is usually quite a bit more expensive than recommended practices for established lawns and turf. However, the nature of certain weeds, particularly perennial grasses like bermudagrass, quackgrass, fescue, orchardgrass, and nutsedge—requires this approach since there are currently no satisfactory control measures to be recommended for established lawns.

The greater expense of soil fumigants and the objectionable waiting period before seeding are therefore justified. Other beneficial results from soil fumigation include control of nematodes, fungus diseases, and insect pests. These also tend to offset and justify the initial cost of treatment.

Weed Control In New Turf

Chemical control of weeds usually is not advisable in newly planted lawns and turf. Chemicals act through the soil to some extent and affect the susceptible germinating seeds or young seedlings of most lawn and turf grasses. After the established grass has been clipped two or three times, it can safely be treated. Many common field weeds in young lawns can be controlled by the competition of vigorously growing grasses and by subsequent mowing.

Grass Should Be Vigorous Before Chemicals Are Used

Control of most broad-leaved weeds and annual grasses in established lawns and turf is relatively simple with the wide array of new "chemical tools of the trade" now available, providing certain rules are observed

Before any chemicals are applied, grass should have reached a state of vigorous growth. This can be accomplished by good watering and fertilizing. Good vigor will insure rapid coverage by established grasses after weeds are killed or suppressed.

Plants are readily classified into two large groups, grasses and broad-leaved species. This classification is helpful, but it is not enough to make a good herbicide selection. For instance, crabgrass is an annual plant that reproduces by seed and is readily controlled with appropriate herbicides before it emerges from the soil. On the other hand, bermudagrass is a perennial species that reproduces by vegetative means as well as by seed and requires an herbicide that will control a large, growing, more mature plant.

If in doubt about what weed species are present, consult local extension service personnel, commercial representatives, or appropriate literature for positive weed identification before adopting a particular chemical weed control practice.

Herbicides Must Be Carefully Selected

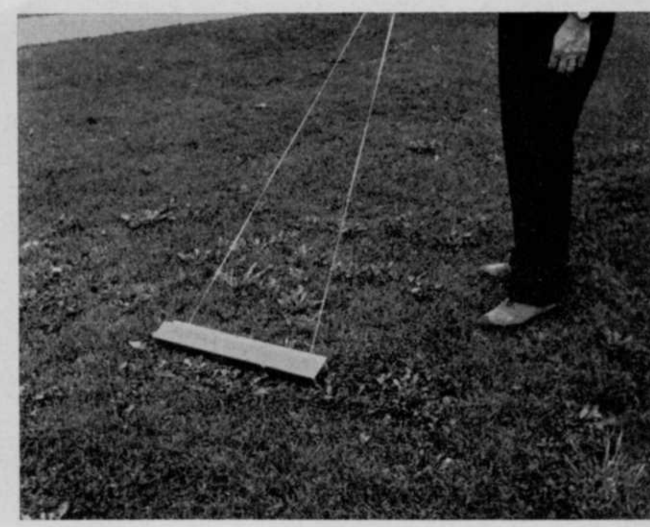
Since we are dealing with "selective" herbicides in lawn and turf weed control, it is necessary to understand something of the nature of chemical compounds involved and the principles of herbicidal selectivity.

A given compound may be toxic or nontoxic to a particular plant population, a single plant, a plant part, or individual cells, depending upon several conditions. Thus herbicidal selectivity is relative, not absolute—a good point to keep in mind.

A *selective herbicide* may be defined as one which, under specified conditions of use, is more toxic to one species of plant (the weed) than to another (in this instance, the lawn or turf grass). Some selective herbicides, such as bensulide, DCPA, and dichlobenil, work best through the soil; whereas others, 2,4-D, dalapon, and amitrole, for example, are most effective when applied to foliage. With still others, dicamba for example, activity through both root and foliar uptake is apparently important.

Among materials applied to

Spot treatment in lawn using plastic detergent jar.



Treating broadleaved weeds in lawn with wax bar 2,4-D.

Table 1. Preplant Chemicals Guide

Herbicide*	Rate: lb/1000 sq. ft.	Remarks
Methyl bromide	10 lb.	Prepare area for seeding and use airtight cover. Expose soil to chemical for at least 24 hrs. and aerate for 24 hrs. Temperature must be above 55°F.
SMDC	10 qt. 5 qt. (with good tarp or airtight cover)	Drench chemical into soil using about 100 gals. of water. Use lower rate if cover can be installed immediately after application of SMDC.

*Caution: Do not breathe gases or allow skin to come in contact with these herbicides. Use only with extreme caution.

foliage, some may kill by contact (as DSMA and PMA), and others may be translocated to exert a toxic response in some other part of the plant (as 2,4-D, dicamba, and dalapon).

In practice, the responses of two dissimilar intact plants to herbicides may not be clearly related to any one selective mechanism, such as differential wetting. The principal factors known or believed to contribute to herbicidal selectivity are outlined below. These processes are not considered to be mutually exclusive, however. The choice of herbicides for a certain weed situation is often determined by several factors:

Principles Influencing Selective Use of Herbicides

Avoidance of contact between desirable plants or sensitive plant parts and toxic amounts of herbicide:

1. Directed or shielded spraying (as herbicides used along sidewalks, borders, etc.).
2. Placement of preemergence chemicals relative to position of grass and weed seeds, or roots of established plants.
3. Postemergence use of pellets or granules.
4. Delaying planting of grass crop until preplant herbicides (soil fumigants) are dissipated.

Morphological differences (observable features) that primarily influence *retention, penetration,* and *translocation* of herbicides to site(s) of action. *Retention* refers to the amount of herbicide still held by the plant after treatment.

***Penetration,* broadly defined, is the passage of substances into the plant leaves, roots, etc., and their entry into the various tissues, including vascular elements. *Translocation,* defined here, refers to long distance transport within the plant, presumably in association with vascular tissues.**

1. Location of growing points.
2. Differences in growth habit (root systems, dormancy, aquatic as opposed to land plants, etc.).
3. Arrangement and angle of leaves.
4. Differential wetting due to waxiness, pubescence, corrugations, etc.
5. Nature of cuticle (except in roots).
6. Number, distribution, and degree of opening of stomata, insect punctures, and other perforations.
7. Differential interactions among plant surfaces, herbicides, carriers, and additives (such as surfactants, co-solvents, etc.)
8. Differential restriction of herbicide movement while enroute, as a result of absorption, accumulation, chemical complexing, phase distribution effects, etc.
9. Differential loss of translocated herbicides by leakage.

Biophysical-biochemical differences at the cellular level (inherent in constitution of the species and presumably involving enzyme systems).

1. Differential inactivation among species by absorption of herbicides.
2. Cytoplasmic membrane differences among species (sensitivity of membranes).
3. Interference with normal enzymatic processes in some species and not in others.

A Guide for Selecting Herbici

Weed[1]	Herbicide[2]	Rate of Application For Small Areas[3] Tbsp. per 1000 sq. ft.	Preferred Time of Application
Barnyardgrass	See crabgrass		
Bermudagrass	dalapon	10 tbsp. to 1 gal. of water	Spot treat when grasses are actively growing. Wet foliage thoroughly and repeat at 7 to 10-day intervals.
Bindweed	2,4-D	2-2/3	May & June
Bittercress	2,4-D	1-1/3	Oct. & Nov.
Black medic	dicamba	2/3	April & May
	or silvex	2-2/3	April & May
Buttercup	2,4-D	2	Oct. & Nov.
Catsear (false dandelion)	2,4-D	2	Oct. & Nov.
Chickweed common	dicamba[4]	2/3	Oct. & Nov.
mouseear	or silvex	2	Oct. & Nov.
Chicory	2,4-D	1-1/3	Oct. & Nov.
Clover, hop	silvex	2	April & May
Clover, white	dicamba[4]	2/3	Oct. & Nov.
	or MCPP[4]	5	Oct. & Nov.
	or silvex	1-1/3	Oct. & Nov.
Crabgrass Pre-emergence	Bandane	9.2 lbs. of 7.5% gran.	March
	or bensulide	5 lbs. of 7% gran.	Nov. to April 1. Late winter to early spring.
	or DCPA (Dacthal)	1/4 lb. (Active ingredient)	Nov. to April 1.
	or DMPA (Zytron)	1/3 lb. (Active ingredient)	Nov. to April 1.
	or siduron (Tupersan)	4.4 lbs. to 8.8 lbs. of 2.34% granules	March
Crabgrass Post-emergence	CMA (Calcium acid methanearsonate)*	16-32 tbsp. (10%)	When crabgrass is less than 1" height, repeat at 7-10 day intervals. Avoid treating during hot weather (above 90° F)
	or DSMA (Disodium acid methanearsonate)*	1½-3 oz. (70%)	
	or MAMA (Monoammonium methanearsonate)*	2¾-4½ oz. (20%)	
	or PMA (Phenyl mercuric acetate)*	2-4 tbsp. (10%)	
	or MAA (Methanearsonic acid)*	10-20 tbsp. (16%)	June
Carolina geranium (cranesbill)	2,4-D	2	Oct. & Nov.
Dallisgrass	DSMA* (see crabgrass post-emergence)		
Dandelion	2,4-D	2	Oct. & Nov.
Dock curly broadleaf	dicamba	2/3	Feb. to April
Foxtail	see crabgrass		
Goosegrass	see crabgrass		
Ground ivy	dicamba	1	April & May
Hawkweed	2,4-D	2-2/3	Aug. & Sept.
	or dicamba	2/3	Aug. & Sept.
Kentucky 31 fescue	see Bermudagrass		
Knapweed, spotted	2,4-D	2-2/3	Oct. & Nov.
	or silvex	2	Oct. & Nov.
Knawel	dicamba	1/2	Oct. & Nov.
	or silvex	2	Oct. & Nov.

Use in Established Turf †

Weed[1]	Herbicide[2]	Rate of Application For Small Areas[3] Tbsp. per 1000 sq. ft.	Preferred Time of Application
Knotweed	dicamba	2/3	March to May
Lambsquarter	2,4-D	1-1/2	April & May
Lespedeza	silvex	2	April & May
Mosses	ammonium sulfate	10 lbs.	Apply when actively growing. Expect temporary control until poorly drained soil conditions are corrected.
Mugwort	dichlobenil	74 oz. of 2% granular	Late fall or early winter
Mustards	2,4-D	2	Oct. & Nov.
Nimblewill	DMPA (Zytron)	1 pt. (3 lb./gal. A.E.)	June, repeat one month later. Wet actively growing foliage.
Nutsedge	2,4-D	2-2/3 tbsp.	When actively growing. Repeat each time new growth occurs.
Oxalis	silvex	2	April & May
Pennycress	2,4-D	2	Oct. & Nov.
Pepperweed	2,4-D	2	Oct. & Nov.
Pigweed	2,4-D	1-1/3	April & May
Plantain broadleaf buckhorn	2,4-D	2	Oct. & Nov.
Annual bluegrass	bensulide	5 lbs. (7%)	August & Sept.
Poison ivy or oak	amitrole or amitrole T	4 tbsp/gal. water 12 tbsp/gal water	June Wet actively growing foliage.
Pony foot	2,4-D	2	Oct. & Nov.
Prostrate spurge	dicamba	2/3	April & May
Quackgrass	See Bermudagrass		
Red sorrel	dicamba	2/3	Oct. & Nov. or April & May
Shepherdspurse	2,4-D	1-1/3	Oct. & Nov.
Speedwell	silvex	2	April
Wild carrot	2,4-D	2-2/3	Oct. & Nov.
Wild garlic	2,4-D (wax bar or LVE)		Fall and Spring Drag wax bar over wild garlic shoots and repeat at 6-month intervals.
Wild strawberry	dicamba	1	Oct. & Nov.
Yarrow	dicamba	1	Oct. & Nov.
Black medic, chickweed, henbit, or white clover with 2,4-D susceptible weeds	dicamba plus 2,4-D or silvex plus 2,4-D	1/3 + 1-1/3 2/3 + 1-1/3	Oct. & Nov. Oct. & Nov.
Knotweed, red sorrel, or dock with 2,4-D susceptible weeds	dicamba plus 2,4-D	2/3 + 1-1/3	Oct. & Nov.

†Ed. Note: Guidelines offered here pertain, of course, most directly to Virginia conditions. Applicators around the country, however, will find helpful suggestions among the author's recommendations.

[1]For mixed weed populations, mixtures of herbicides are suggested at the end of this list.

[2]Caution: Chemicals or pesticides followed by this designation (*) are extremely poisonous. Read the container label and heed warnings. In case of sickness while or after using, call your physician immediately.

[3]All rates of application for small areas based on 4 lbs. per gal. acid equivalent for 2,4-D, silvex, and dicamba and 2½ lbs. per gal. acid equivalent for MCPP.

[4]MCPP and reduced rates (not more than 1/3 lb. per acre) of dicamba may be used on bentgrasses for white clover and chickweed.

Author's Note: Trade and brand names are used only for the purpose of information and the Virginia Agricultural Experiment Station does not guarantee nor warrant the standard of the product, nor does it imply approval of the product to the exclusion of others which may also be suitable.

4. Differential rates of metabolic degradation or detoxification of the herbicide within the plants.
5. Differential rates of metabolic activation or toxification of an herbicide within plant tissues.

Finally, fluctuations in environmental factors such as temperature, relative humidity, light, and nutritional status are known to influence the response of plants to herbicides. Conceivably, such changes could also induce differential responses among species.

Although not discussed specifically for each recommendation to follow, these factors do bear on practical herbicide use in lawns and turf, and the influence of such factors is reflected in the selection of herbicides shown in the guide at the end of this article. Two factors, stage of weed growth and influence of environment, deserve additional comment in relation to lawn and turf weed control.

Stage of Weed Growth Influences Control

Small weeds respond more effectively to chemical treatments than tougher, more mature plants. Germinating seeds or very young seedlings are most sensitive. Early treatment is particularly important in the case of grassy weeds, even though postemergence herbicides are also available. Where previous crabgrass problems have existed, preemergence herbicides give control without turf discoloration that is characteristic of all available postemergence forms.

With most broad-leaved weeds, a postemergence treatment is used. Chemical treatments are suggested during periods of active vegetative growth. When a plant slows down or stops vegetative growth, because of flowering or because of adverse environmental conditions such as dry weather, control is usually more difficult. Fall-germinating plants that spread by seed and establish rosettes before winter are best treated in October and November. These plants reduce vegetative growth in spring and begin to flower. They are more easily controlled in the rosette stage, and the lawn or turf area is maintained with a better appearance over longer periods of time.

Peak periods of weed seed germination occur in fall and spring. Then, herbicides are applied just prior to emergence (preemergence herbicides) or soon after seedlings begin to develop foliar treatments).

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will ultimately be suitable for insects that feed on phloem tissue, since these are inaccessible to broadcast spray treatments. Considering the importance of sapsucking and bark feeding insects on shade trees and in forests, systemics almost certainly will be used widely as soon as the technological picture is complete.

Chemical Management From Seed to Maturity

To summarize the picture, it is obvious from the few examples cited that a great many problems of tree culture may be solved with chemicals. Nurserymen, foresters, and shade tree specialists have, until now, been growing trees partly or entirely by hand or machine. The discoveries of the past few years have made many hand methods archaic because of their cost and the quality of results.

Safe, effective herbicides are now in use in many nurseries, bringing great savings in weeding labor. Fumigants have been used to solve nursery soil problems that had all but eliminated production of high-quality trees. Site preparation and sustained weed control in outplanting areas have improved survival immensely and have contributed to uniformly vigorous growth and fine appearance of saplings at considerable savings in cost per unit of growth or return. The excellent condition of trees grown under sustained weed control renders them much more resistant to disease and insects, reduces opportunities for animal damage, and lessens the risk that has been such a factor in production of trees.

Cost of removing undesirable trees has dropped to a few cents per tree, or less, for chemicals, and equipment is available that permits application to large numbers of trees at minimum labor cost and with negligible toxic hazard. The same equipment is useful for systemic insecticides, permitting low-cost control of insects that have been previously inaccessible.

There has been, without question, a chemical revolution in the woods. There are few problems of a biological nature that cannot be solved more economically, and in many cases more safely, with chemicals than with existing nonchemical methods. Opportunities for application of this technology are almost limitless, and the values enormous. Jobs will be created, rather than lost, because many jobs can now be done economically that have been left undone in the past.

Chemical industries can and should enter into research and development with an understanding of the objectives of tree growers. Once the liaison is established, the industries can do for tree growers as much or more than has been done in agriculture. On this scale, cooperation (or perhaps it should be called symbiosis) will make the growing of trees a far more attractive enterprise than has ever before been possible.

Use Right Chemical Tool For Weed Control

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Many herbicides require an actively growing plant to absorb and translocate the chemical to a remote site of action. Underground stems, or rhizomes, of certain plants cannot receive direct treatment with herbicides. Summers are usually dry and hot; winters usually wet and cold. Under these conditions, vegetative growth is reduced and the situation is not ideal for application of herbicides.

A high degree of selectivity in a herbicide may, in some situations, be a mixed blessing. Despite its remarkable potency against certain weeds and its favorable margin of safety in lawn grasses, a particular herbicide simply may not be effective against all weed species in a mixed infestation.

In such situations, a combination of two or more herbicides, applied either sequentially during the season or mixed for application, may be indicated. In areas infested with crabgrass and mixed broad-leaved weeds, for example, crabgrass may be best controlled with a preemergence herbicide, but early post-

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Uniform granular herbicide or fertilizer application is said possible with the Evergreen spreader introduced by Evergreen Helicopters Inc., McMinnville, Oregon.

Helicopter Device Makes Dry Aerial Spreading Possible

Fast, uniform, and economical applications of granulars by air is possible for the first time with its newly patented spreading device, Evergreen Helicopters Inc., McMinnville, Ore., claims.

Dry chemicals and fertilizers for the first time can be broadcast from the air with uniform material flow at rates ranging from 10 to 1,000 lbs. per acre, according to Delford M. Smith, president of the pioneer commercial helicopter-operating firm.

"Although the need for such a device by helicopter operators has been long standing, because certain conditions demand dry rather than wet chemicals, the only efficient systems marketed to date are for spraying liquids," Smith said.

The new device is said to handle up to 800 lbs. per minute. Helicopters can spread full payloads of fertilizer in 60 seconds covering ground with a maximum 120-foot swath.

Inherent characteristics of the Evergreen spreader include: forward broadcast so the pilot has visual control; immediate response to on-off control; and no caking problems because of a method of chemical transfer to slinger, the firm reports.

For brush control, Evergreen has found the device provides customers with a total service package.

More information about the helicopter spreading system is available at Evergreen Helicopters, Inc., P.O. Box 382, Municipal Airport, McMinnville, Ore.

Use Right Chemical Tool For Weed Control

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emergence treatment for broadleaf weed control would still be required.

Another example: if a lawn or turf area contains mixed stands of dandelion, plantain, sheep sorrel, and common chickweed, the standard 2,4-D treatment would not be satisfactory because of the presence of two 2,4-D-tolerant species. A dicamba-2,4-D combination would be a better choice. Again, if prostrate knotweed were present beyond the seedling stage, the inclusion of dicamba or comparable material would become essential.