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4-1-1946

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South Dakota Agricultural Experiment Station

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Recommended Citation
South Dakota Agricultural Experiment Station, "Killing Weeds with 2, 4-D" (1946). *Agricultural Experiment Station Agronomy Pamphlets*. 9.
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Agronomy Pamphlet No. 9 April, 1946

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Killing Weeds WITH 2, 4-D

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The information in this pamphlet is based on the results of the cooperative tests in South Dakota and from summarized results of tests in other areas, and was prepared by E. L. Erickson, Assistant Agronomist, South Dakota Agricultural Experiment Station, and L. M. Stahler, Associate Agronomist, Bureau of Plant Industry, Soils and Agricultural Engineering, United States Department of Agriculture.

What is 2, 4-D?

The new herbicide, 2, 4-D, is 2, 4-Dichlorophenoxyacetic acid, a white powder which is not easily soluble in water but which can be brought into solution or suitable suspension when mixed with other substances that do not effect its herbicidal qualities. It is one of a group of chemicals that have been used as plant growth regulators. Original research work leading to the development of use of this new herbicide has been conducted by Dr. Kraus of the University of Chicago, the Bureau of Plant Industry, Soils and Agricultural Engineering and other individuals.

Tests in South Dakota

Experiments have been conducted during the past year by the South Dakota Agricultural Experiment Station cooperating with the United States Department

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of Agriculture. Twenty experimental plots were established to learn how effective the 2, 4-D sprays are as weed killers. 2, 4-D was tested in comparison with the proven chemical weed killers, sodium chlorate, Atlacide and borax. Creeping jenny, leafy spurge, perennial sow thistle, Canada thistle, and other weeds were included in the tests.

2, 4-D Not Yet Proven Effective on Deep-Rooted Noxious Weeds

The final effect of 2, 4-D sprayed on creeping jenny, leafy spurge, perennial sow thistle, Canada thistle and other deep-rooted perennial noxious weeds has not been definitely determined. Results have varied considerably and in no case has a complete kill of noxious weeds been observed following one application of 2, 4-D. The tops have been killed and in some instances portions of the root have been killed or markedly affected. It will be necessary to make further observations on these test plots before final appraisals of this year's plots can be made. 2, 4-D preparations are recommended for control of some broad-leaved lawn weeds such as dandelion, plantain, and chick weed. 2, 4-D preparations are not as yet recommended for the control of deep-rooted noxious weeds. New information will be sent as it becomes available. 2, 4-D and related chemicals offer promise as weed eradicators and much research is underway in this field.

General Recommendations

It is not known exactly how 2, 4-D reacts in the plant body or in the soil, and research is being conducted to more fully determine the usefulness of this new tool for weed control. Until more facts are obtained, the user of 2, 4-D is cautioned to proceed on an experimental basis, except where enough experience is already available to justify recommendations in use on certain weeds.

The following list of weeds and statement of facts is a compilation provided by the Research Committee of the North Cenrtal States Weed Control Conference.

"List of annual weeds, winter annual weeds, and a few perennial lawn weeds, classified as 'generally susceptible,' 'intermediate,' or 'resistant' to 2, 4-D.

"Obviously no clear line can be drawn between these different classes. Among many other factors, the age and condition of the plant are important. Many of the weeds in the 'susceptible' list below are moderately resistant to 2, 4-D at the bloom or older stages. There are also discordant reports concerning many plants, so that this is to be considered a temporary progress report, not a final placing of the weeds listed. We know far too little as yet about the variations in susceptibility within and between species and the reasons for these variations. Also obviously, the lists are in no sense complete."

Generally Susceptible to 2, 4-D

Ball mustard
Beggar's-ticks
Bitter wintercress
Black medic or Yellow trefoil
Buckhorn
Burdock
Cocklebur
Dandelion
False Flax
Frenchweed
Ground Ivy
Hare's ear mustard
Henbit
Indian Mustard
Kochia
Mallow
Marsh Elder
Mouse-eared chickweed
Peppergrasses
Prostrate amaranth
Prostrate Vervain
Puncture Vine
Ragweed
Rough Pigweed
Shepherd's purse
Speedwells
Spotted spurge
Sunflower
Sweetclovers
Tansy mustard
Tumbling mustard
Wild mustard
Wild Rape
Rough cinquefoil and other Five-fingers
Wormseed mustard

Intermediate

Common-chickweed	Lamb's quarter	Oak-leaved goose-foot
Common Plaintain	Marestail	Prickly lettuce
Goatsbeard	Mayweed	Wild lettuce
Knotweed		

Resistant to 2, 4-D

Barnyard grass	Goose-grass	Smartweeds
Black nightshade	Mullein	Wild barley
Buffalo bur	Night-blooming catchfly	Tartary buckwheat
Corn cockle	Nimblewill	Violet
Cow cockle	Red Sorrel	White cockle
Crabgrass	Russian thistle	Wild buckwheat
Dock (Rumex sp.)	Sandburs	Yarrow
Foxtails		

What Will 2-4-D Do to Grasses, Crops and Ornamentals?

No plant is immune to the herbicidal action of 2, 4-D. At recommended rates of application Kentucky bluegrass shows little injurious effects, but at excessive rates of application definite injury has been recorded. Other grasses such as Buffalo grass and Bent grass can be severely injured by heavy applications of 2, 4-D. The white clover in lawns is generally injured by applications of 2, 4-D with injury being greater for spring applications than for summer or fall treatments. Grain crops, oats, wheat, barley or rye have in many cases been injured and yields reduced by 2, 4-D treatment. Corn reacts in varying degrees to moderate applications. Most vegetable crops, carrots, radishes, beans, lettuce, peas, beets, spinach, etc., are easily killed by moderate applications of 2, 4-D. Tomatoes are highly sensitive. Sugar beets, field peas, soybeans, and the legumes are readily eliminated by this new herbicide. Ornamental flowers and shrubs have shown a great variation in sensitivity to 2, 4-D and extreme caution should be exercised in treating lawns as drift of spray can easily injure or eliminate ornamental plants. Moderate to heavy applications of 2, 4-D to the soil has resulted in severe injury to sensitive crops planted at a later date in experiments.

Using 2, 4-D

The 2, 4-D compounds are generally most effective in the late spring or early fall when the plants are growing actively. Areas which have been freed of dandelions and other broad-leaved weeds may be expected to remain free of such weeds for several months, depending upon the effectiveness and accuracy in making the application. It may be necessary to make repeated applications to destroy the young plants which have developed from the seeds after the first application. In an area where dandelion seed is particularly abundant, small areas may need to be retreated at intervals to eliminate the seedling plants.

How Much 2, 4-D Should Be Used?

Many commercial preparations containing 2, 4-D are now on the market as herbicides. These include preparations made up as the sodium or ammonium salts of 2, 4-D, several esters of 2, 4-D, finely powdered 2, 4-D dust in an inorganic carrier, and Carbowax or other oil-like bases with 2, 4-D. The concentration of 2, 4-D as the active ingredient varies with each product and therefore the recommendations of the manufacturer should be followed closely. Enough spray or dust at the desired concentration should be used to thoroughly cover the foliage of the treated plants. On lawns, in general, one gallon of solution is sufficient for good coverage of one square rod of area; on tall-growing weeds, one and one-half gallons of spray

material per square rod of area is more satisfactory. Sprayer nozzles giving a fan shaped spray give better coverage with a minimum of material than nozzles cone shaped delivering a cone shaped spray. Use low pressure and a nozzle that gives a finely divided spray. Follow the direction of the manufacturer when using prepared materials.

How Much Does It Cost?

The cost of the several commercial 2, 4-D preparations will naturally vary with the concentration of 2, 4-D in the preparation and also with the type of solvent or carrier with which they are compounded. At present retail price quotations, cost of the chemical will vary from $4.00 to $10.00 per acre for treatment of lawn weeds and from $6.00 to $12.00 per acre for treating large field weeds requiring higher rates of application. To this must be added the cost of application. Cost of small quantities of these chemicals will naturally reflect the greater packaging and handling costs.

Some Characteristics of 2, 4-D

This material is noncorrosive and presents no fire hazard.

2, 4-D has so far proven harmless to humans and animals.

2, 4-D is noninjurious to the soil when used at the recommended rate and when the foliage of weeds is sprayed.

Precautions in Using 2, 4-D

If 2, 4-D is applied to the soil there may be some temporary harmful effects to plants growing there.

White clover will be killed or severely injured by 2, 4-D. This may re-establish from seed in the soil or it may be reseeded if desired.

Spray equipment which has been used for applying 2, 4-D should not be used for spraying valuable plants for control of insects or plant diseases. Most garden plants and ornamentals are susceptible.

Avoid "drifting" of the spray to valuable plants by spraying on quiet days and have spray outlets as close to ground as practicable.

When Should 2, 4-D Be Used?

On lawns or other turf, for the control of dandelions, chickweed and other annual or biennial weeds, treat in late spring just before the dandelions bloom and when grasses are growing vigorously, or in early fall. Lawns or turf on which dandelions, etc., have been eliminated with 2, 4-D treatment may become reinfested from seed each season, necessitating a planned program of treatment.

On farm weeds treatment should be made on annuals or biennials in late spring. This date of treatment will prevent seed formation and in general, plants are more susceptible to 2, 4-D treatments when the foliage is young. Not enough information is yet available to indicate a most effective date of treatment of deep-rooted perennial weeds such as bindweed, Canadian thistle, etc.

Where Can One Buy 2, 4-D?

Commercial preparations are being offered under various trade names in drug stores, seed stores, and department stores.

In purchasing 2, 4-D preparations consider carefully the per cent of 2, 4-D present. The true worth of any preparation is in direct proportion to the 2, 4-D it contains in relation to its cost.

The cost of materials needed per acre or per thousand square feet is the only fair way to compare costs.