WEED CONTROL
In SMALL GRAINS

Circular 658
UNIVERSITY OF ILLINOIS
COLLEGE OF AGRICULTURE
Extension Service in Agriculture
and Home Economics
PRECAUTIONS AND REMINDERS

Use recommended rates of 2,4-D to avoid crop injury or to keep it at a minimum.

It is best to apply 2,4-D when the small grains are fully tillered and before the stems begin to joint.

Do not spray 2,4-D on a small grain seeded to a legume unless you can accept some reduction in legume stand.

Do not spray fall-planted small grains in the fall.

Do not spray 2,4-D on a windy day. Susceptible crops like soybeans, clovers, and tomatoes are injured by drift.

To remove 2,4-D from a sprayer, leave a 2-percent solution of household ammonia in the tank and boom overnight. This should be done if the sprayer is to be used for other chemicals and on crops that will be injured by 2,4-D.

Before using any chemicals, read labels carefully for information on rates, toxicity, inflammability, and corrosiveness.

Do not let dinitros get on the skin.

Keep dinitros from being taken internally by either man or animals.

Thoroughly clean sprayer after it has been used for any of the dinitros.

Urbana, Illinois

May, 1950

Cooperative Extension Work in Agriculture and Home Economics: University of Illinois, College of Agriculture, and the United States Department of Agriculture cooperating.

ILLINOIS FARMERS grow about 6 million acres of small grain each year. And each year weeds take a share of this grain by depriving the crop plants of moisture, light, and food nutrients.

The use of weed-free seed, good rotations, and proper cultivation are still the standard basic methods of controlling weeds. In addition, a number of new chemicals show promise of helping to reduce losses from weeds. Chemicals are not a substitute for the standard methods, but are, rather, a supplement. Established practices, combined with the careful use of chemicals, can mean higher grain yields and eventually weed-free grain fields.

SELECTIVE CHEMICALS

Selective chemicals are those which can be used in certain crops to kill or control weeds without injuring these crops. The most common are 2,4-D and the selective dinitro sprays.

2,4-D

This chemical has many features of an ideal weed killer. It is not poisonous to man or animals; nor does it injure the soil or soil microorganisms. When properly used it causes little or no injury to corn, oats, wheat, barley, rye, and grass pastures. It is soluble in water, does not corrode equipment, and is relatively cheap.

The chief disadvantages of 2,4-D are that it does not seriously affect grass weeds; it will not control all the important broad-leaved weeds; the drift of the spray and vapor can cause serious injury to sensitive crops; and the 2,4-D can injure corn and small grains if applied at the wrong time or at rates heavier than recommended.

Recommended rates. 2,4-D is not sold as a pure acid but is available in the form of esters, amine salts, and sodium salts. When used at
equal rates, esters have proved more effective against weeds than the other two forms. The usual recommendation, therefore, is to use ¼ pound of acid per acre in the ester form or ½ pound per acre in the amine or sodium salt form. These rates are strong enough to kill most annual weeds in their rapid-growth stage (see below) and will have little or no effect on the yield of small grain if applied at the proper time.

For some perennial weeds, such as Canada thistle or sow thistle, and a few annual or biennial weeds, the rate should be ½ pound of ester acid or 1 pound of acid in one of the salt forms. These amounts, however, may cause some reduction in yield of grain. Also perennial weeds will have to be treated again when they start new growth later in the season. Wild onion and wild garlic should be treated with at least 1½ pounds of 2,4-D acid in the ester form (page 5).

Manufacturers of 2,4-D in its various forms usually tell on the container how much of their preparation is needed to equal the recommended amounts of 2,4-D acid. The label will also show the percent of 2,4-D in the material or the pounds of 2,4-D acid in a gallon.

**Reaction of some common weeds to 2,4-D.** Annual weeds are most easily controlled when they are young and growing rapidly. Less chemical is required then than when they are older, and better results are usually obtained. This is particularly true of the weeds in Group 1 (below). The perennial weeds in Group 2 should be sprayed in the bud stage and treated again later in the season when they begin to grow again.

The common Illinois weeds have been classified below according to the amounts of 2,4-D needed to kill or to control them. A stands for annual weeds; B, for biennials; P, for perennials; and WA, for winter annuals (these weeds either germinate in the fall, living through the winter and growing again in the spring; or else they germinate in the spring).

**Group 1 — Can be killed with ¼ to ½ pound of 2,4-D per acre**

\[\text{¾ pound for esters, \(\frac{1}{2}\) pound for amines and sodium salts}\]

- Mustards (WA)
- Frenchweed (WA)
- Cocklebur (A)
- Ragweeds (A)
- Pigweeds (A)
- Wild sunflowers (A)
- Chicory (P)
- Hedge bindweed (P)
- Artichoke (P)
- Smartweed (A)
- Velvetweed (A)
- Peppergrass (WA)
- Morning glories (A)
- Wild radish (WA)
- Flower-of-an-hour (A)
Group 2—Controlled with 1/2 to 1 pound of 2,4-D per acre

(1/2 pound for esters, 1 pound for amines and sodium salts. Perennials need repeated treatments for eradication.)

- Canada thistle (P)
- Perennial sow thistle (P)
- Field bindweed (P)
- Dodders (A)
- Lambsquarters (A)
- Wild sweet potato (P)
- Horsetail (P)
- Wild buckwheat (A)
- Wild carrot (B)

Group 3—Weeds that are not usually affected by 2,4-D

- Devil's shoe-strings (P)
- Milkweeds (P)
- Corn cockle (WA)
- Wild garlic (P)
- Wild onion (P)
- Horse nettle (P)
- Ox-eye daisy (P)
- Grasses (A, P)
- Cheat (WA)
- Yellow sorrel (P)
- Red sorrel (P)
- Ground cherry (P)
- Leafy spurge (P)
- White cockle (P)

Special measures for wild garlic and onion. Although wild garlic and wild onion in their mature stages are not affected by 2,4-D, they can be controlled with heavy applications of this chemical while they are young and growing rapidly. This is of particular importance in southern Illinois, where these weeds have caused thousands of dollars of loss in winter wheat.

Applications of 1 1/2 to 2 pounds of 2,4-D acid in the ester form in November will kill most of the wild garlic and onion plants which have germinated in the fall. The 2,4-D can be applied in pastures not containing legumes, in stubble fields, on roadsides, and in other areas not sown to fall-seeded small grains. Fall applications of 2,4-D are not recommended in winter wheat, winter rye, winter barley, or winter oats, as the chemical greatly reduces yields if applied at this time.

New plants may come up in treated areas by spring, because bulblets in the soil are not affected by the 2,4-D. Treatments may be made in the spring, although wild garlic and wild onion are harder to control with 2,4-D at this season. The best time to make a spring application is in late March or early April. One and one-half to 3 pounds of 2,4-D acid in the ester form is needed for control, but if these rates are used in grain fields, some reduction in yield can be expected.

One-half pound of 2,4-D acid will not reduce wheat yields if it is applied when the wheat is at its most resistant stage (see page 6 and back cover). This rate will keep many of the wild onion and garlic plants from forming aerial bulblets. Plants that do form aerial bulblets may be deformed enough in growth to be missed by the combine at harvest. While this practice is new, the results are usually satisfac-
tory enough to warrant spraying wheat fields that are badly infested with garlic or onions.

**When to treat small grains with 2,4-D.** Small grains are most resistant to 2,4-D sprays when they are fully tillered and before the stem begins to joint (see back cover). One-fourth to \( \frac{1}{2} \) pound of 2,4-D acid applied at this time should have no effect on grain yield. Fall-planted small grains are not fully tillered until early spring and therefore should not be sprayed in the fall (Fig. 1).

If weeds are serious, spring-planted grains can be sprayed before they are fully tillered, and also between the jointing stage and the boot stage. One-fourth to \( \frac{1}{2} \) pound of 2,4-D acid should be used. Some reduction in grain yield may occur when 2,4-D is applied at these stages, but the losses will usually be less than those caused by the weeds. *Small grains should not be sprayed in the boot stage under any conditions.*

**Effects of spraying winter wheat with 2,4-D in the fall are shown by the plants in the bottom row. Wheat in the top row was not sprayed.** (Fig. 1)
After the grains are past the milk stage they may be sprayed with \( \frac{1}{2} \) to 1 pound of 2,4-D to control perennial weeds. Hand sprayers should be used because larger spraying equipment would knock down considerable grain.

In western wheat regions large areas of wheat are treated several days before harvest to knock down green weeds that would otherwise interfere with harvest. Most of this preharvest spraying is done by plane because the fields are large and there is little danger of drift to susceptible crops. Most Illinois fields are too small for plane spraying to be used without danger to other crops.

Spraying should not be done on a windy day, as the spray may drift to susceptible crops like soybeans, clover, and tomatoes.

**Spraying 2,4-D on small grains seeded to legumes.** Legume seedlings vary in their reaction to 2,4-D. Alfalfa and sweet clover are more sensitive than red, alsike, white, and Ladino clovers, but all legume seedlings will be killed or the stand reduced if they are covered with 2,4-D. If the small grain has made large growth, or if the weeds are thick enough to cover the legume seedlings, then the reduction in stand may not be very great.

When weeds are so thick that they will seriously affect the yield of small grain and will either smother out or greatly reduce the legume stand, then spraying with 2,4-D is advisable. An amine or sodium salt of 2,4-D should be used in preference to an ester. The rate should not be greater than \( \frac{1}{4} \) pound of acid per acre.

Spray machines should be operated at not more than 30 to 35 pounds pressure. Greater pressures may force the 2,4-D down through the weeds and small grains to the legume seedlings. Some success has been obtained by turning the spray boom so that the nozzles direct the spray at an angle of 45° from the vertical, not straight down. This will keep part of the spray from penetrating the foliage and reaching the legume seedlings.

**Selective Dinitro Sprays**

Selective dinitro sprays should not be confused with contact dinitro materials, which kill all vegetation. Results from the use of selective dinitros have been more variable than with 2,4-D. In grain fields not seeded to legumes, therefore, 2,4-D is recommended in preference to the dinitros.

The chief value of the dinitros is that, when properly used, they do not injure some of the crops which are sensitive to 2,4-D. These include field peas, canning peas, flax, and legumes. Selective dinitros can be
used in small-grain fields in which a legume has been seeded. If applied at the right time and in the right amounts they will not injure either the small grain or the legume. *They should not be used until the legume seedlings have at least three or four leaves.*

Selective dinitro sprays are effective against the annual weeds listed in Group 1 on page 4, but only when these weeds are in the very early stages of growth (with three to seven leaves, Fig. 2). Perennial weeds like Canada thistle and field bindweed are little affected by these sprays.

Several different types of selective dinitro materials are on the market. Since each contains a different amount of the active ingredient, the rate recommended by the manufacturer should be followed carefully. An overdose of dinitro may result in some leaf burn of the crop, although this should not affect yields unless it is severe.

Selective dinitros should be applied in not less than 75 gallons of water per acre. One hundred gallons is better. *Applications made with less than 75 gallons may cause severe leaf burn.*

When working with selective dinitros, be sure to follow these precautions:

1. Keep them from getting on your skin, as they will cause severe burning.
2. Guard against their getting on food or otherwise being taken internally. They are poisonous to both man and animals.
3. Thoroughly clean equipment after it has been used to spray any of the dinitros. Left in the equipment, they will corrode it.

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Mustard in a flax field before and after being sprayed with a selective dinitro. When sprayed, the mustard plants had four or five leaves *(left).* Treatment at this stage destroyed most of the mustard *(right).*  
*(Fig. 2)*
OTHER WEED-CONTROL METHODS

Many weeds cannot be controlled by the selective chemical sprays. Other methods, therefore, should be used for eradication.

Smother Crops

Certain crops if seeded closely at heavy rates will crowd out or reduce the stand of harmful weeds. Alfalfa, soybeans, and Sudan grass are especially effective for this purpose. Fertilizer may have to be applied in order to produce the fast, dense growth necessary for the crop to compete successfully with the weeds.

The advantage of smother crops is that they can be grazed or used for hay or green manure.

Fallowing

Cultivating about every two weeks during the growing season for two years will eradicate the toughest perennial weeds. Other perennials may succumb to one season's work. The field cultivator is especially effective against quack grass.

This way of controlling weeds is very good for patches of noxious weeds, but of course cannot be used for large areas unless one is willing to give up the use of the land for one or two seasons.

Nonselective Chemicals

Many nonselective chemicals are suitable for eradicating patches of perennial weeds. These materials kill all vegetation and may sterilize the soil for one to several years, depending upon the quantities used. Most nonselective chemicals are expensive and may cost as much as 50 to 100 dollars an acre to apply. Where the aim is to eradicate a destructive weed before it spreads to other areas, this cost is not too high.

Labels of commercial preparations should be read carefully for recommended rates and for toxicity, inflammability, and corrosiveness of the material.

TCA (Trichloroacetic acid). This new chemical is effective against perennial grasses and will control established stands of quack and Johnson grass. Both grasses should be treated when they are growing rapidly. Treatments have been most successful in the spring or early summer.
TCA enters quack grass through the roots. Mowing the plants close to the ground before applying the chemical will therefore make the treatment more effective. If this is done 75 to 100 pounds of TCA should be used to the acre. Still better results can be obtained by cultivating first, so that the roots are exposed. Rates as low as 50 pounds an acre will then give good control. From 100 to 125 pounds are needed if quack grass is sprayed without first being mowed or cultivated.

Johnson grass is affected through the foliage and not through the roots. Therefore it does not need to be mowed or cultivated before being treated. Recommended rates for Johnson grass are 100 to 125 pounds of TCA per acre.

TCA decomposes in the soil and its toxic effect on the soil is usually gone by the following season. It is not poisonous to people or livestock. Equipment should be thoroughly rinsed since TCA is slightly corrosive.

**Sodium chlorate.** Sodium chlorate and Atlacide, which is a commercial product containing calcium and sodium chlorate, are similar in action. Both have been used extensively for controlling patches of noxious weeds such as Canada thistle, field bindweed, and quack grass. Retreatments are often necessary the following year.

The disadvantages of these materials are that they are relatively expensive; they will sterilize the soil for one to several years when applied at rates necessary to kill perennial weeds; they are poisonous to livestock; and they are inflammable under certain conditions. (Atlacide is not so inflammable as sodium chlorate.)

**Borax.** Borax and boraseu (a borate ore from which borax is made) will kill many perennial weeds when used at the rate of 15 to 20 pounds per square rod. These chemicals are neither inflammable nor corrosive, and they are not likely to poison people or animals unless consumed in considerable quantity. They will sterilize the soil for two or more years, depending on the quantity used.

**Ammate (ammonium sulfamate).** An excellent killer of woody plants, this material can be used to kill perennial weeds. It is expensive and will corrode equipment unless thoroughly rinsed out, but it usually does not stay in the soil for more than a year.
POSTHARVEST WEED CONTROL

A good opportunity to control weeds comes after the grain crop has been harvested. Many annual weeds that have germinated during the summer will begin to grow now that the grain crop is no longer competing with them. Unless these weeds are checked by some means, they are likely to produce seed before frost. If weeds susceptible to 2,4-D predominate and if there are no legumes growing, these fields can be sprayed with 2,4-D.

Mowing may be better than chemical weed control because it could coincide with a clover-clipping program and because it will hold back all types of weeds. Mowing programs should be carried out with the idea of getting rid of the weeds rather than simply cutting down undesirable vegetation. This means that the weeds should be mowed before they bloom and that a second mowing may be necessary in the fall to keep late weeds from producing seed. Two correctly timed mowings are far more valuable than one mowing in late summer after the weeds have gone to seed.
GUIDE FOR SPRAYING SMALL GRAINS WITH 2,4-D

The best time to spray is after the plants are fully tillered but before the stems begin to joint. However, if weeds are serious, small grains can be sprayed at the jointing stage and at early tillering.

DO NOT SPRAY

1/2 to 1 lb.

SEEDLING

SPRAY CAUTIOUSLY

1/4 to 1/2 lb.

EARLY TILLERING

8-10 inches

COMpletely TILLERED

Jointing Stage

1/4 to 1/2 lb.

Node

Boot Stage

DO NOT SPRAY

Mature