



# Cooperative Extension Service

CIRCULAR  
W-253

NORTH DAKOTA STATE UNIVERSITY - FARGO, NORTH DAKOTA 58102  
UNITED STATES DEPARTMENT OF AGRICULTURE COOPERATING

NORTH DAKOTA STATE UNIVERSITY  
SERIALS DEPT.  
LIBRARY  
JAN 29 1975

DECEMBER 1974

## 1975 CHEMICAL WEED CONTROL GUIDE for Field Crops and Perennial Weeds

LARRY W. MITICH Agronomist Extension Service	ALAN G. DEXTER Agronomist Extension Service	JOHN D. NALEWAJA Professor Agricultural Experiment Station	CALVIN G. MESSERSMITH Assistant Professor Agricultural Experiment Station	EDWIN PLISSEY Area Potato Agent Extension Service
--	---	--	---	---

THE WEED CONTROL SUGGESTIONS are based on Federal label clearances and on information obtained from the North Dakota Agricultural Experiment Station and the Research Committee of the North Central Weed Control Conference.

### CAUTION:

The weed control suggestions in this circular are based on the assumption that all herbicides mentioned in this guide will continue to have a registered label with the Environmental Protection Agency.

### USE CHEMICALS ONLY AS RECOMMENDED ON THE LABEL.

APPLICATION RATES are broadcast rates and are based on active ingredient or acid equivalent rather than the amount of commercial product. Commercial formulations of the same herbicide may vary in their amount of active ingredient. For example, a pint of 4 pound acid equivalent per gallon 2,4-D contains 1/2 pound acid equivalent, a pint of 3.3 pound acid equivalent per gallon contains 2/5 pound, and a pint of 6 pound acid equivalent per gallon contains 3/4 pound. Three pounds of atrazine (AAtrax 80W) powder contains 2.4 pounds active ingredient, or 3 pounds active ingredient is 3 3/4 pounds of product ( $3 \div 0.80 = 3.75$ ).

trolling weeds. However, selective herbicides can be an effective supplement. Timely applications of selective chemicals at the recommended rate will control many annual weeds satisfactorily without damaging the crop in which the weeds are growing.

PERENNIAL WEEDS in crops such as field bindweed, leafy spurge, Canada thistle and perennial sowthistle also can be controlled. MCPA is as effective as 2,4-D on Canada thistle, but 2,4-D gives slightly better control of sowthistle. Use MCPA to suppress thistles in oats and flax. However, these crops do not tolerate rates of MCPA necessary to give adequate thistle control.

When controlling field bindweed and thistle in small grains except oats, apply the maximum rate of 2,4-D or MCPA the crop will tolerate: 3/4 pound per acre of 2,4-D or MCPA amine and 2/3 pound per acre of 2,4-D low volatile ester or MCPA ester. If such herbicides are planned for controlling hard-to-kill annuals or perennial weeds in crops, grow the more tolerant cereals—rye, wheat and barley.

CONSIDER BOTH the crop tolerance and kind of weeds present in determining the rate of herbicide to apply. A range of rates is given for most of the herbicides in this circular. Use the lowest recommended rate of postemergence herbicides under favorable growing conditions when weeds are small and actively growing. Under adverse conditions of drouth or prolonged cool weather, or for well

WEED COMPETITION reduces crop yields severely, unless weeds are removed when small. Good cultural practices are one of the many methods of con-

CASE  
544.3  
N9  
A8X  
No. 253



established weeds, use the highest recommended rate, except for barban (Carbyne). (See Wild Oat Section for discussion of barban use.)

**IDEAL TEMPERATURES** for applying most post-emergence herbicides are between 65 degrees and 85 degrees F. Below 60 degrees, weeds are killed very slowly or not at all; above 85 degrees there is danger of herbicide injury to the crop. Avoid applying volatile herbicides such as 2,4-D ester, MCPA ester and dicamba (Banvel) during hot weather, especially near sensitive broadleaf crops, shelterbelts or farmsteads.

Some of the so-called high volatile esters of 2,4-D vaporize at temperatures as low as 70 degrees F. and most vaporize readily at temperatures above 85 degrees F. The temperature at ground level always is several degrees warmer than that at chest height. Consequently, vaporization from the high volatile esters could occur at temperature readings as low as 60 degrees F. Vapor drift may be avoided by using the 2,4-D amines. However, spray drift (droplets) can occur even with non-volatile herbicides and cause injury to susceptible plants.

**DO NOT SPRAY** when there is danger of spray or vapor drift, or when the wind is blowing toward a neighboring crop or planting more susceptible than the crop being sprayed. The amines of 2,4-D and MCPA are not volatile and eliminate the danger of vapor injury.

**PREEMERGENCE HERBICIDES:** Soil type, weather conditions and the weeds to be controlled determine the rate of preemergence herbicides to apply. Generally heavy clay soils high in organic matter require higher rates of such herbicides than lighter soils or those lower in organic matter.

Good weed control with preemergence herbicides depends on many factors, including rainfall after application, soil moisture, soil temperature and soil type. For these reasons, preemergence chemicals applied on the soil surface sometimes fail to give satisfactory weed control. Herbicides which are incorporated into the soil surface usually depend less upon rainfall after application for effective weed control than unincorporated herbicides. If weeds are emerging through a preemergence herbicide treatment, the field may be rotary hoed without reducing the effect of the herbicide.

**HERBICIDE COMBINATIONS:** The effect of post-emergence herbicides often is increased when applied to areas already treated with a preemergence or pre-plant herbicide. Combinations of certain postemer-

gence herbicides or preemergence herbicides may give better weed control than from the use of the individual herbicide alone. However, loss of weed control or increased crop damage may sometimes result from the use of certain other herbicides in combination.

Use herbicide combinations with caution until experience or research has shown that the combination is effective and safe. See the discussion on individual crops for more specific information.

All agricultural pesticides which are tank mixed should be registered for use as a mixture by the Environmental Protection Agency. However, agricultural pesticides may be tank mixed if all pesticides in the mixture are registered by the Environmental Protection Agency on the crop being treated. Users must assume liability for any possible crop injury, inadequate weed control and illegal residues.

**PERENNIAL WEEDS IN PASTURES:** Picloram (Tordon 22K) has a state registration for the control of broadleaf perennial weeds such as leafy spurge, field bindweed, Canada thistle, and Russian knapweed on rangelands and permanent grass pastures. Rates of 1 to 2 pounds per acre give excellent control of these weeds and are economical for spot treatment. During a single growing season do not use more than 10 gallons of picloram for any 100-acre area and do not treat more than 20 acres of any 100-acre area. To suppress the growth of perennial broadleaf weeds in large areas, use 1/4 to 1/2 pound per acre and apply as a single broadcast spray during any one growing season. Retreatment at the same rate may be necessary the following year.

Picloram is a highly potent herbicide. Do not allow spray drift of picloram, as tiny amounts may cause damage to sensitive plants. Especially susceptible to picloram are soybeans, potatoes, safflower, sunflowers and sugar beets. Picloram is highly water soluble and moves in the soil; consequently, do not apply in areas with a high water table. Do not apply near shelterbelts or shrubs or trees. Do not treat or allow picloram spray drift to fall onto the inner banks or bottoms of irrigation and drainage ditches.

Do not graze picloram treated areas with dairy animals. Do not transfer beef cattle directly from areas treated in any one growing season onto broad-leaved crop areas without allowing 7 days on untreated grass pastures, as urine may contain enough picloram to cause crop injury.



## WEED CONTROL IN FIELD CROPS

**FLAX:** MCPA at 1/4 pound per acre controls most broadleaf weeds in flax when it is 2 to 6 inches tall. Avoid spraying flax during the period between bud stage and when 90 per cent of the bolls have formed, as serious crop injury likely would occur. In addition, applying MCPA between full bloom and the stage when flax seeds are colored may reduce germination of the seed. Rates of MCPA amine higher than 1/4 pound per acre or MCPA ester should be used in flax only for the more resistant weeds.

Postemergence weed control in flax is most effective when the herbicide is applied as soon as most of the weeds have emerged. While an application of MCPA may reduce the yield of both seed and straw, weed competition generally is reduced sufficiently to compensate for any herbicide injury.

**EPTC (Eptam)** at 2 to 3 pounds per acre controls annual grass weeds, including wild oats, and some broadleaf weeds in flax. Incorporate EPTC immediately (within minutes) and thoroughly after application. Double disk twice in opposite directions or use any other method which will thoroughly mix the chemical with the top 3 inches of soil.

Flax tolerance to EPTC is marginal. EPTC is more injurious to flax on coarse textured and low organic matter soils. In experiments at North Dakota State University it has not caused flax injury on fine textured, high organic matter soils. A limited reduction in the flax stand from EPTC will not reduce yields since weed competition is decreased and there is an increased branching of the remaining plants.

**Dalapon (Dowpon)** will control green and yellow foxtail (pigeongrass) in young flax. Apply dalapon when the flax is over 2 inches tall and the weeds less than 2 inches for best results. Caution: Spraying must be completed prior to the early bud stage. Generally dalapon is applied in a mixture with MCPA amine to control both the susceptible grassy and broadleaf weeds with one application.

Flax is a poorer competitor with weeds than are small grains. Consequently, grow flax on relatively weed-free fields. Early after-harvest tillage of small grain stubble will prevent weed seed production, control perennial weeds and encourage annual weed seed germination prior to freeze-up.

Use flax in the rotation following corn, soybeans or other cultivated row crops. If good weed control practices were employed in the previous year's crop, flax would require only shallow tillage. One

or more crops of wild oats frequently are destroyed by spring tillage before flax is sown. However, delayed planting sometimes reduces crop yields. Plant early maturing varieties with late seeding.

**SMALL GRAINS-SPRING WHEAT (INCLUDING DURUM), BARLEY AND OATS:** All small grains are sensitive to 2,4-D during the seedling stage but can be treated safely with MCPA from the time of emergence until the early boot stage. Wheat and barley, when treated from the fifth leaf to the early boot stage, are more tolerant than oats to 2,4-D applications. Oats is more resistant to MCPA than to 2,4-D, but injury to oats is possible with either chemical at any growth stage. Oats in the five-leaf stage of growth is especially susceptible to injury from 2,4-D. Use 2,4-D on oats only for such hard-to-kill weeds as Russian thistle, kochia, common ragweed and redroot pigweed. While some injury to the oats can be expected, the better control of these weeds with 2,4-D usually will compensate for any yield loss caused by the chemical. Do not treat small grains in the boot stage. Oat varieties vary in their tolerance to 2,4-D but there is little or no difference in such tolerance among the wheat and barley varieties.

Rates of 2,4-D or MCPA required to control most broadleaf weeds cannot be applied in small grain crops underseeded to sweetclover, alfalfa or other legumes without seriously injuring or killing the legumes.

**Dicamba (Banvel)** controls wild buckwheat, smartweed and certain other broadleaf weeds in wheat and oats. It can be applied alone or in a mixture with MCPA to increase control of wild mustard. Dicamba alone usually gives unsatisfactory control of wild mustard. Oats is more tolerant to dicamba than wheat. Both crops must be treated at the second through fourth leaf stage. Barley is more susceptible to injury from dicamba than wheat or oats.

**Bromoxynil (Buctril, Brominal)** controls wild buckwheat, fumitory and most annual broadleaf weeds in wheat and barley from the third leaf stage of the crop to early boot. Mixtures of bromoxynil plus MCPA ester (Bronate and Brominal Plus) are applied for better wild mustard control.

**NOTE:** Wild oat control in small grains is discussed in the wild oat section of this circular.

**CORN:** A combination of cultural practices and herbicide applications is necessary for weed control in corn.



Destroy early germinating weeds by cultivation before planting if conventional tillage is used for controlling weeds. Leave the space between the rows rough to reduce weed germination. Cultivate after the weed seeds have germinated or as soon as the weeds appear above the soil surface. Use a rotary hoe as soon as weeds appear.

Atrazine (AAtrex) applied preemergence at 2 to 4 pounds per acre gives good control of annual weeds without crop injury. Fine textured soils and those high in organic matter require a 4-pound per acre application. Atrazine residues injurious to susceptible crops may remain in certain soils longer than one growing season. Residues are more likely to persist with low soil temperatures or low moisture conditions.

Crops vary in their tolerance to atrazine. Corn and millet are tolerant. General ranking of other crops in order of least to most tolerant is: sugar beets, sunflowers, oats, wheat, barley, soybeans and flax. Minimize residues by applying the lowest rate of chemical consistent with good weed control, using band instead of broadcast applications, and plowing the field prior to planting the next crop.

Propachlor (Ramrod) applied preemergence at 4 to 5 pounds per acre controls annual grasses and some broadleaf weeds, but is ineffective against wild mustard or perennial weeds. Propachlor often is used in mixtures with atrazine, cyanazine (Bladex) or linuron (Lorox) to enhance broadleaf weed control.

Alachlor (Lasso) is used preemergence at 2 1/2 pounds per acre for control of annual grasses and certain broadleaf weeds such as redroot pigweed, common lambsquarters and common ragweed. Propachlor in North Dakota State experiments has given superior weed control to alachlor except when alachlor was incorporated.

Early postemergence weed control must be done at the proper time for satisfactory results. Atrazine effectively controls most annual weeds in corn and control of broadleaf weeds is excellent. Apply 1 to 2 pounds per acre of atrazine within three weeks of planting while the weeds are less than 1 1/2 inches tall. Adding 1 to 2 gallons per acre of crop (petroleum) oil with an emulsifier increases the effectiveness of the treatment. Substituting 1 to 1 1/2 quarts per acre of emulsifiable vegetable oil (Bio-Veg, a linseed oil) gives results similar to petroleum oil applied at 1 to 2 gallons per acre.

When corn is 3 to 8 inches tall, an overall broadcast application of 2,4-D amine at 1/4 to 1/2 pound per

acre can be made to control broadleaf weeds. Use the 1/4 pound rate for susceptible weeds like wild mustard. The 1/2 pound rate is satisfactory for controlling the more resistant weeds, but corn may be injured. Do not use MCPA, as it is more injurious to corn than 2,4-D. When corn is over 8 inches tall, use drop nozzles to avoid getting the 2,4-D on the upper leaves and leaf whorl of the crop. This reduces the danger of 2,4-D injury.

Corn sprayed with 2,4-D may show signs of injury. Brittleness, followed by bending or breaking of the stalks, sometimes occurs. A severe stand loss may result when applications of 2,4-D are followed by a storm or careless cultivation.

Dicamba (Banvel) at 1/8 to 1/4 pound per acre, either alone or in a mixture with 2,4-D amine at 1/4 to 1/2 pound per acre, can be applied postemergence in corn. It gives better control of Canada thistle, smartweed and wild buckwheat than 2,4-D with less effect on the corn. Make dicamba applications until corn is 3 feet tall or until 15 days before tassel emergence, whichever comes first. Use drop nozzles after corn is 8 inches tall if dicamba is applied with 2,4-D.

EPTC + R-25788 (Eradicane) is registered for use on field and silage corn. R-25788 increases the tolerance of corn to EPTC. Apply 4 pounds per acre in 10 to 50 gallons of water per acre using a properly calibrated, low-pressure sprayer having good agitation. Be sure the soil is well worked and dry enough to permit immediate and thorough soil incorporation. This chemical controls a large number of annual broadleaf and grass weeds as well as giving some quackgrass control.

1,8-naphthalic anhydride (Protect) is a seed treatment product for field, silage and sweet corn that permits the use of EPTC at 4 pounds per acre. Use only 2 ounce package of Protect for each 1/2 bushel of corn to be treated. Protect must be thoroughly mixed with the seed so each kernel is completely coated. After treatment, the corn may be stored until planting time or transferred directly to the planter box. Just before the corn is planted, apply and incorporate EPTC according to its label.

Emergency control of broadleaf and grassy weeds in corn can be obtained with directed applications of ametryne (Evik) or linuron (Lorox). Apply ametryne to 2 to 2.5 pounds per acre or linuron at 0.6 to 1.5 pounds per acre as a directed spray to the weeds. Keep the chemicals off the leaves of corn. Application over the top of corn will cause severe injury and contact with the leaves will cause burning.



Do not apply ametryne before corn is 12 inches high and linuron before corn is 15 inches high. The weeds should not be more than 6 inches high.

**SUGAR BEETS:** Herbicides may be used in sugar beets to supplement conventional cultivation practices. Hand labor, mostly hoeing, is still needed but can be reduced by timely cultivations and herbicide applications. The uses of preplant, preemergence and early postemergence herbicides in sugar beets are discussed in the table.

Late germinating weeds can become a problem in sugar beets with early seeding or when good moisture conditions prevail well into the season. Trifluralin (Treflan) is cleared at 3/4 lb/A and EPTC (Eptam) is cleared at 3 lb/A for use on sugar beets after thinning for annual grass and broadleaf control. Broadcast apply and incorporate the chemicals immediately with cultivators or tillers adjusted to mix them thoroughly with soil in the row without damaging the sugar beets. The crop should be clean cultivated before application since established weeds are not controlled. Cover exposed sugar beet roots with soil prior to trifluralin application to reduce possibility of girdling.

EPTC sometimes will cause a sugar beet stand reduction and temporary stunting, however, if enough sugar beets remain to obtain an adequate plant population after thinning, no yield reduction will result. EPTC is less phytotoxic on fine textured, high organic matter soils so rates must be increased on these soils and decreased on coarse-textured, low organic matter soils. Use EPTC with extreme caution on sugar beets grown in sandy loam or lighter soils with low organic matter levels because it is difficult to predict a safe rate on such soils.

To avoid possible sugar beet injury from desmedipham (Betanal-475) and phenmedipham (Betanal), observe several precautions. The sugar beets should have at least four true leaves before treatment. Do not apply if the highest temperature on the day of application exceeds 85 degrees F. Use no more than 1 pound per acre following EPTC or TCA. Start application late in the afternoon or early in the evening so cool temperatures follow application. Set the proper band width near the top of the sugar beets so that the beets rather than the ground receive the proper rate. Calibrate the sprayer very carefully.

**SOYBEANS:** Preemergence herbicides in soybeans are easily banded to reduce costs whereas preplant herbicides must be incorporated, making band ap-

plication difficult. Soybeans are poor competitors with weeds when cool soil temperatures slow germination and growth. They are good competitors in warm soils, however, because germination and growth are rapid. Management practices such as thorough seedbed preparation, adequate soil fertility, choice of a well-adapted variety, and use of good quality seed all contribute to a soybean crop that will compete with weeds. Soybean production requires good cultural practices. Prepare the seedbed immediately prior to planting the crop to kill germinating weeds. After planting but before the soybeans emerge, kill weeds by using a rotary hoe, spike-tooth harrow or weeder. However, do not cultivate by these means when the soybeans are just emerging. Once the soybeans have emerged and are standing erect (beyond the crook stage), the crop can be harrowed.

The rotary hoe is an effective and economical weed killer in soybeans. For best results use it when the ground is not trashy, lumpy or wet and when weeds are just emerging, and not more than 1/4 inch tall. A rotary hoe, light harrow or weeder can be used in soybeans 3 to 8 inches tall to kill weed seedlings effectively with little damage to the crop. Cultivation is most effective when the soybeans are slightly wilted during the warm part of the day, because the crop is less susceptible to breakage and the weeds will wilt and die most quickly.

Trifluralin (Treflan) applied 3/4 to 1 pound per acre preplanting and thoroughly incorporated gives good control of annual grasses and broadleaf weeds except wild mustard. Proper incorporation is essential. Incorporate thoroughly in two directions 3 to 4 inches deep. Properly incorporate trifluralin by double disking twice in opposite directions or by other methods which thoroughly mix the chemical with the top 3 inches of soil. Incorporate as soon as possible after application for best results. Incorporation may be delayed up to eight hours on cool, dry soils.

Dinitramine (Cobex) is a preplant herbicide that must be thoroughly and shallowly incorporated into the top 1 1/2 to 2 inches of soil. Apply at 1/3 to 2/3 pounds per acre depending on soil type. Completely incorporate within 24 hours of application. The herbicide effectively controls many annual grasses and broadleaf weeds as they germinate, but does not control cocklebur or sunflower. Wild mustard control is not adequate.

Alachlor (Lasso) at 2 1/2 pounds per acre gives good preemergence control of annual grasses and some



broadleaf weeds, including redroot pigweed and common lambsquarters. It is ineffective against wild mustard. Soybeans have good tolerance to alachlor.

Chloramben (Amiben) at 2 to 3 pounds per acre is applied preemergence to control most grassy and broadleaf weeds, including wild mustard. At least one-half inch of rain is necessary within 10 days after application to activate the herbicide. If rain falls later than this, the degree of weed control will be reduced. Excessive rainfall on light soils may leach chloramben below the level of germinating weed seeds resulting in poor weed control and/or crop injury.

Linuron (Lorox) is a preemergence herbicide for controlling most annual broadleaf weeds and grasses. Rates of application are 1/2 to 2 1/2 pounds per acre. Weed control and crop injury with linuron are greatly influenced by soil texture and organic matter. Linuron works best on medium textured soils with less than 4 per cent organic matter. Crop injury occurs occasionally on sandy soils. Use rates recommended on the label for various soil types.

Fluorodifen (Peforan) is used for broadleaf and grassy weed control, including wild mustard in most instances. Apply it preemergence at 4 1/2 pounds per acre. Fluorodifen appears to be more effective on light than heavy soils.

Metribuzin (Sencor) is a new preemergence herbicide for soybeans. It controls many kinds of broadleaf weeds, including wild mustard, and certain grass weeds. The rate is critical. Consult the label for the proper dosage based on soil type and per cent organic matter. Do not apply to sandy soils. Seed soybeans at least 1 1/2 inches below the soil surface to reduce possible soybean injury. Metribuzin may be used in a tank-mix combination with alachlor (Lasso) as a preemergence broadcast or band application to soybeans. Also it may be applied as a preplant, incorporated treatment with trifluralin (Treflan) or as a preemergence broadcast or band overlay application following a preplant incorporated treatment of trifluralin. Alachlor and trifluralin do not give adequate wild mustard control but good control is possible when used in combination with metribuzin. Also these combinations permit a lower rate of metribuzin to be used thus reducing the risk of soybean injury.

**SUNFLOWERS:** Weeds usually are a problem in sunflowers as the crop does not develop ground cover rapidly enough to prevent weeds from becoming established.

Since weeds generally emerge before the sunflowers, cultivating with a spiketooth or coil spring harrow about one week after sowing but prior to germination of the crop will kill many weeds. After sunflowers reach the four to six leaf stage, kill weeds in the row by using a weeder, coil spring or spiketooth harrow or rotary hoe. Cultivate to control weeds between the rows.

Trifluralin (Treflan) and EPTC (Eptam) are herbicides that are applied preplant and incorporated into the soil. See the preceding soybean discussion concerning the incorporation of trifluralin. Apply trifluralin on sandy soil at 3/4 pound per acre and increase the rate to 1 pound per acre on clay soil. Apply EPTC at 3 pounds per acre and incorporate immediately (within minutes) and thoroughly. Properly incorporate EPTC by double disking twice in opposite directions or by other methods which thoroughly mix the chemical with the top 3 inches of soil. Trifluralin and EPTC control grasses and some broadleaf weeds.

Chloramben (Amiben) at 2 to 3 pounds per acre is applied preemergence to control most grassy and broadleaf weeds, including wild mustard. At least 1/2 inch of rain is necessary within 10 days after application to activate the herbicide. If rain falls later than this, the degree of weed control will be reduced. Excessive rainfall on light soils may leach chloramben below the level of germinating weed seeds, resulting in poor weed control and/or crop injury.

**LEGUME ESTABLISHMENT:** Seedling legumes usually are poor competitors with weeds. Good management practices in preceding crops are recommended such as clean cultivation of row crops and after harvest tillage to reduce the amount of weed seeds in the soil. Mowing seedling legumes (except sweetclover) when sown alone, or the stubble of companion crops, and mowing patches of perennial weeds also aid in weed control.

When alfalfa, sweetclover, alsike clover or birdsfoot trefoil are sown without a companion crop or a grass in a mixture, EPTC (Eptam) at 2 to 3 pounds per acre preplant and incorporated, effectively controls annual grass and broadleaf weeds except wild mustard.

### SPECIAL WEED PROBLEMS

**WILD OATS** is difficult to control because the plants shatter their seeds before crops are harvested and because of seed dormancy which results in delayed germination. Wild oat seeds are abundant in in-



fested soils. Wild oats is a cool season plant and seeds germinate in the spring and fall when favorable temperature and moisture conditions exist.

Apply barban (Carbyne) for postemergence control of wild oats when the majority of the weeds are in the 1 1/2 leaf stage, which generally occurs from 4 to 9 days after emergence. Rates of 4 to 6 ounces per acre are applied to wheat, barley, flax, soybeans, sunflowers and mustard. Thick, vigorous stands of crop plants help suppress wild oats and enhance the degree of control obtained with barban. Crop competition is important for wild oat control; therefore, control may not be satisfactory in thin crop stands. In sugar beets apply 12 to 16 ounces per acre of barban.

Barban must be applied before the 14th day after wheat, durum and barley emerge and before the 4th leaf stage of the crop to avoid injury and poor wild oat control. Treat flax before the 12th leaf stage and soybeans before the first trifoliate leaf stage or no later than 14 days after crop emergence. There are no restrictions on winter wheat, sunflowers or sugar beets. Do not mix barban with any other chemical.

To reduce possible injury to wheat and barley, apply barban when the daytime temperature will exceed 50 degrees F. for 3 days following application. Barban is different from most herbicides since its action is greater at lower temperatures. Use the higher rate at temperatures above 85 degrees F. and on low soil fertility or droughty conditions. Frost prior to barban application does not increase barban injury to wheat and barley if the wild oat leaves are not damaged by the frost and temperatures after application are greater than 50 degrees F.

Leeds and Wells varieties of durum are more tolerant of barban than Botno, Ward and Rolette. Barban is still selective with the more susceptible varieties. When treating the less tolerant durum varieties, observe the precautions stated in the above paragraph very closely.

Preplant or preemergence incorporated applications of diallate (Avadex) at 1 1/2 pounds per acre controls wild oats in flax, corn, soybeans, potatoes and sugar beets. Triallate (Far-go) is applied preemergence to wheat at 1 pound per acre and barley at 1 1/4 pounds per acre for wild oat control. Both herbicides are volatile. Incorporate them in the top 2 inches of soil by harrowing immediately after application to prevent losses by evaporation.

Wild oats in alfalfa seeded with barley as a companion crop can be controlled with diallate. Apply diallate at 1 1/4 pounds per acre in the spring as a preemergence soil incorporated treatment. Or make a fall preplant soil incorporation treatment within 3 weeks of soil freeze-up and plant the alfalfa and barley the following spring.

Diallate and triallate can be applied in the fall after October 15 until freeze-up. Granular formulations of both are available for use as fall applications.

See Circular A-351, "Chemical Control of Wild Oats in Field Crops" for additional information.

#### TILLAGE SUBSTITUTE

Paraquat, a non-selective contact herbicide, can be used as a substitute for a weed controlling tillage operation when wet fields or the desire to conserve seedbed moisture make tillage impractical. Paraquat may be applied before planting or after planting until just before crop emergence. Apply paraquat in 5 to 10 gallons per acre of water by air or in 20 to 60 gallons per acre of water by ground. Add Ortho X-77 surfactant to the spray solution at 8 ounces per 100 gallons. Paraquat can be used on land intended for barley, wheat, corn, potatoes, sugar beets and soybeans. Paraquat is corrosive to aluminum so aluminum spray equipment and aluminum aircraft structures exposed to paraquat should be rinsed thoroughly immediately after use. Paraquat is quite toxic. Avoid contact with the skin. Even small amounts could be fatal, if swallowed.



## RELATIVE RESPONSE OF WEEDS TO HERBICIDES

	Barnyardgrass	Cocklebur	Field bindweed & Per. thistles	Foxtails (Pigeongrass)	Kochia	Lambsquarters	Pigweed, redroot	Sunflower, volunteer	Wild buckwheat	Wild mustard	Wild oat
<b>PREPLANT INCORPORATED</b>											
Dinitramine (Cobex)	G	P	N	G	G	G	G	N	F	P	P-F
EPTC (Eptam)	G	P	N	G	F	G	G	N	F	P	G
Trifluralin (Treflan)	G	P	N	G	G	G	G	P	G	N	F
<b>PREEMERGENCE</b>											
Alachlor (Lasso)	G	N	N	G	F	F	G	N	F	P	P
Atrazine (AAtrex)	G	F	P	G	G	G	G	F	G	G	G
Chloramben (Amiben)	G	P	N	G	F	G	G	N	G	F	F
Cyanazine (Bladex)	F	F	N	G	F	G	F	F	G	G	P
Di- & Triallate (Avadex, Far-go)	N	N	N	N-F	N	N	N	N	N	N	G
Metribuzin (Sencor, Lexone)	G	F	N	G	G	F	G	N	F	G	P
Propachlor (Ramrod)	G	P	N	G	G	F	G	N	F	P	P
TCA	G	N	N	G	N	N	N	P	N	N	P
<b>POSTEMERGENCE</b>											
Atrazine + oil (AAtrex)	G	G	P	G	G	G	G	G	G	G	G
Barban (Carbyne)	N	N	N	N	N	N	N	N	P	N	G
Bromoxynil + MCPA (Brominal Plus, Bronate)	N	G	F	N	G	G	G	G	G	G	N
Dalapon (Dowpon)	G	N	N	G	N	N	N	N	N	N	F
Desmedipham (Betanal-475)	P	P	N	P	F	G	G	P	F	G	N
Dicamba (Banvel)	N	G	G	N	G	G	G	G	G	F	N
Dicamba + MCPA (Mondak)	N	G	G	N	G	G	G	G	G	G	N
Endothall (Herbicide 273)	N	P	N	N	P	P	F	P	G	F	N
MCPA	N	G	G	N	F	G	F	F-G	N	G	N
Phenmedipham (Betanal)	P	P	N	F	F	G	P	P	G	G	N
2,4-D	N	G	G	N	F	G	G	G	P	G	N

G = Good      F = Fair      P = Poor      N = None

This table is a general comparative rating of the relative effectiveness of herbicides to certain weeds. Under very favorable weather conditions control might be better than indicated. Under unfavorable conditions, some herbicides rated good or fair might give erratic or unfavorable results.



**CHEMICAL WEED CONTROL**  
**For Field Crops**

Crop	Herbicide	Act. Ingrid. lb. per Acre	Weeds	When to Apply	Remarks
WHEAT, DURUM OR BARLEY	2,4-D amine 2,4-D L.V. ester	1/4 to 1/2	Broadleaf	Crops—5th leaf to boot	Do not apply later than boot stage. Barley more sensitive than wheat.
	MCPA amine MCPA ester	1/4 to 2/3	Broadleaf	Crops—emergence to early boot	Apply 1/2 lb/A or less from emer- gence to tiller stage.
	Bromoxynil plus MCPA ester	1/4 plus 1/4	Wild buckwheat and most broad- leaf weeds	Crops—3rd leaf to boot stage	Apply when weeds are in early seed- ling stage for best results. Com- mercial mixtures (Brominal Plus & Bronate) are available.
	Paraquat	1/2	Emerged annual grasses and broadleaf weeds	Preplant or anytime prior to crop emer- gence	A non-selective, postemergence herbicide. No soil activity. Apply with X-77 surfactant. Good coverage is essential.
WHEAT OR DURUM	Dicamba (Banvel) plus MCPA amine	1/8 plus 1/4	Wild buckwheat and most broad- leaf weeds	Crops—2nd through 4th leaf stage	Commercial mixture (Mondak) is available.
WINTER WHEAT OR RYE	2,4-D amine 2,4-D L.V. ester	1/4 to 1/2	Broadleaf	Crops—fully tillered to boot	Do not apply in the fall.
OATS	MCPA amine MCPA ester	1/4 to 1/2	Broadleaf	Oats—emergence to boot	Early jointing stage most sensitive. Possible injury to oats at any growth stage.
	Bromoxynil plus MCPA ester	1/4 plus 1/4	Wild buckwheat and most broad- leaf weeds	Crops—3rd leaf to boot stage	Apply when weeds are in early seed- ling stage for best results. Com- mercial mixtures (Brominal Plus & Bronate) are available.
	Dicamba (Banvel) plus MCPA amine	1/8 plus 1/4	Wild buckwheat and most broad- leaf weeds	Crops—2nd through 4th leaf stage	Commercial mixture (Mondak) is available.
SMALL GRAIN PRE-HARVEST	2,4-D L.V. ester or 2,4-D oil soluble amine	3/4 to 1 1/2	Broadleaf	Crops—dough stage to harvest	Use only when weeds may interfere with harvest operations. Do not feed straw to livestock.



Crop	Herbicide	Act. Incred. lb. per Acre	Weeds	When to Apply	Remarks
FLAX	MCPA amine	1/4	Broadleaf	Flax—2 to 6 inches tall	Use higher rates or MCPA ester for hard-to-kill weeds.
	Dalapon (Dowpon)	3/4	Annual grasses except wild oats	Best results obtained when flax is over 2 inches and weeds are under 2 inches tall	Mix MCPA with dalapon to control broadleaf and annual grassy weeds. Under drouth conditions, grass control is poor and flax injury may occur.
	Bromoxynil plus MCPA ester	1/4 plus 1/4	Wild buckwheat and most broad-leaf weeds	Flax—2 to 6 inches tall	Use for wild buckwheat control. Flax injury is possible.
	EPTC (Eptam)	2 to 3	Grasses and some broadleaf weeds	Preplant incorporated	Incorporation directions and rate discussed under flax narrative at beginning of Weed Control Guide. Flax safety is marginal. Weak on wild mustard.
CORN	Alachlor (Lasso)	2 1/2	Grasses and some broadleaf weeds	Preplant incorporated or pre-emergence	Ineffective against wild mustard. Usually less effective preemergence than propachlor (Ramrod) in North Dakota. Preplant incorporation gives more consistent weed control.
	Atrazine (AAtrex)	2 to 4	Broadleaf and grasses	Preplant incorporated or pre-emergence	Atrazine may remain in soil longer than one year and damage following crops other than corn or millet. Use higher rate on heavy soils and for quackgrass control.
	Cyanazine (Bladex)	2 to 3.2	Broadleaf and annual grasses	Preemergence	Soil residues unlikely the year after treatment. Weak on redroot pigweed. Use higher rate on heavy soils.
	Propachlor (Ramrod)	4 to 5	Grasses and some broad-leaf weeds	Preemergence	Ineffective against wild mustard.
	Atrazine plus Alachlor	1 plus 2	Most grasses and broadleaf weeds	Preplant incorporated or pre-emergence	See soil residue comment under atrazine.
	Atrazine plus propachlor	1 plus 3 (tank mix)	Broadleaf and annual grasses	Preemergence	Commercial mixture is available (ratio 1 lb. atrazine to 2.3 lb. propachlor). See soil residue comment under atrazine.
	(cont. on next page)	Atrazine plus Butylate (Sutan)	1 plus 3	Most grasses and broadleaf weeds	Preplant incorporated



Crop	Herbicide	Act. Incred. lb. per Acre	Weeds	When to Apply	Remarks
CORN (cont.)	Cyanazine plus Alachlor	1 to 2 plus 2	Most grasses and broadleaf weeds	Preemergence	Use lower rate of cyanazine on sandy soils.
	EPTC plus R-25788 (Eradicane)	4	Grasses and some broad- leaf weeds. Weak on wild mustard.	Preplant incor- porated	See discussions under corn at begin- ning of Weed Control Guide for rates and incorporation directions. R-25788 and naphthalic anhydride protect corn from injury by EPTC. EPTC plus R-25788 is a commercial mixture.
	EPTC (Eptam) plus naph- thalic anhydride (Protect)	4		EPTC preplant incor- porated with naph- thalic anhydride treated seed	
	Linuron plus propachlor	3/4 to 1 1/2 plus 1 1/2 to 3	Broadleaf and annual grasses	Preemergence	Use the higher rate on heavy soils. Soil residues unlikely the year after treatment.
	Atrazine (AAtrex) plus phyto- bland oil	1 to 2 plus a phyto- bland oil	Broadleaf and grasses	Early postemergence- weeds less than 1 1/2 inches tall	Use emulsifiable linseed or petro- leum oils at volume recommended on label. See soil residue comment under atrazine.
	Cyprazine (Outfox)	3/4	Broadleaf and annual grasses	Early postemergence	Cyprazine residue remains in soil longer than one year and may damage following crops other than corn. Best results when weeds less than 2 inches high.
	2,4-D amine	1/4 to 1/2	Broadleaf weeds	Postemergence, corn—3 inches to tasseling	Use drop nozzle when corn is over 8 inches tall but before tasseling.
	Dicamba (Banvel)	1/8 to 1/4	Wild buckwheat, Canada thistle, P. sowthistle	Postemergence, before corn is 36 inches tall	See narrative under corn at begin- ning of the Weed Control Guide.
SOYBEANS (See later section for wild oat control)	Chloramben (Amiben)	2 to 3	Annual grasses and broadleaf weeds	Preemergence	Wild oat control not adequate.
	Trifluralin (Treflan)	3/4 to 1	Grasses and some broadleaf weeds	Preplant incorporated	Incorporation directions discussed under soybean narrative at begin- ning of Weed Control Guide. No wild mustard control.
	Dinitramine (Cobex)	1/3 to 2/3	Grasses and some broadleaf weeds	Preplant, shallow incorporation	Incorporation directions discussed under soybean narrative at begin- ning of Weed Control Guide. Weak on wild mustard.
	Chloroxuron (Tenoran, Norex)	1	Wild mustard and some other broadleaf weeds, NOT GRASSES	When weeds are less than 2 inches tall and crop has first trifoliate leaf	Use as emergency wild mustard control measure. Must be applied with surfactant (Adjuvan T).
(cont. on next page)					



Crop	Herbicide	Act. Ingrid. lb. per Acre	Weeds	When to Apply	Remarks
SOYBEANS (cont.)	Alachlor (Lasso)	2 1/2	Grasses and some broadleaf weeds	Preemergence	Wild mustard and wild oat control not adequate. Preplant incorpora- tion gives more consistent weed control.
	Fluorodifen (Preforan)	4 1/2	Broadleaf and grasses	Preemergence	Wild oat control not adequate. Generally more effective on light soils.
	Metribuzin (Sencor, Lexone)	0.4 to 0.8	Broadleaf weeds including wild mustard and some grasses	Preemergence	Seed at least 1 1/2 inches below soil surface to reduce possible soybean injury. The rate is criti- cal. See label for details.
	Trifluralin plus Metribuzin	3/4 to 1 plus 1/4	Broadleaf weeds including wild mustard and annual grasses	Preplant incor- porated	Rate of metribuzin is critical. See label for details.
		3/4 to 1 plus 1/4 to 1/2		Trifluralin preplant incorporated, metri- buzin preemergence	
	Alachlor plus Metribuzin	2 plus 1/4 to 1/2	Broadleaf weeds including wild mustard and annual grasses	Preemergence	Do not incorporate. Use lower rate of metribuzin on light soils.
	Dinoseb, amine salts	1 1/2 to 2 1/4	Wild mustard	Cracking stage	Use the higher rate below 75°F and the lower rate above 75°F.
	Paraquat	1/2	Emerged annual grasses and broadleaf weeds	Preplant or anytime prior to crop emer- gence	A non-selective, postemergence herbicide. No soil activity. Apply with X-77 surfactant. Good coverage is essential.
Paraquat	1/4	Desiccant	Prior to harvest	Make application when beans are fully developed and half of leaves have dropped and remaining leaves are turning yellow.	
DRY, EDIBLE BEANS  (cont. on next page)	Chloramben (Amiben)	2	Annual grasses and broadleaf weeds	Preemergence	Wild oat control not adequate.
	EPTC (Eptam)	3	Grasses and some broad- leaf weeds	Preplant incor- porated	Incorporation directions discussed under sunflower narrative at beginning of Weed Control Guide. Weak on wild mustard.
	Trifluralin (Treflan)	3/4 to 1	Grasses and some broad- leaf weeds	Preplant incor- porated	Incorporation directions discussed under soybean narrative at begin- ning of Weed Control Guide. No wild mustard control.
	Fluorodifen (Preforan)	4 1/2	Broadleaf and grasses	Preemergence	Wild oat control not adequate. Generally more effective on light soils.



Crop	Herbicide	Act. Ingrid. lb. per Acre	Weeds	When to Apply	Remarks	
DRY, EDIBLE BEANS (cont.)	Dinoseb	3 to 4 1/2	Small broad-leaf weeds	Emergence, not beyond "crook" stage	Apply in 30 gallons of water per acre.	
SUNFLOWERS (See later section for wild oat control)	EPTC (Eptam)	3	Grasses and some broad-leaf weeds	Preplant incorporated	Incorporation directions discussed under sunflower narrative at beginning of Weed Control Guide. Weak on wild mustard.	
	Trifluralin (Treflan)	1/2 to 1	Grasses and some broad-leaf weeds	Preplant incorporated	Incorporation directions discussed under soybean narrative at beginning of Weed Control Guide. No wild mustard control.	
	Chloramben (Amiben)	2 to 3	Annual grasses and broadleaf weeds	Preemergence	Wild oat control not adequate.	
SUGAR BEETS (See later section for wild oat control)	EPTC (Eptam)	2 to 3	Annual grasses and some broad-leaf weeds	Preplant incorporated	Incorporation directions discussed under sunflower narrative at beginning of Weed Control Guide. Use higher rates on heavy, high organic matter soils. Some stand reduction and temporary stunting may occur from the use of EPTC. Weak on wild mustard.	
		4 to 4 1/2 (See narrative section for details.)		Fall incorporated after October 15 until freeze-up		
	Cycloate (Ro-Neet)	3 to 4	Annual grasses and some broadleaf weeds	Preplant incorporated		Use lower rate only on light, sandy soils. Incorporate same as EPTC. Sugar beets have better tolerance to cycloate than to EPTC. Following cycloate with a postemergence herbicide is suggested. Weak on wild mustard.
	TCA (various names)	6 to 8	Most annual grasses	Preemergence		Weak on wild oats. Do not use sugar beet tops for livestock feed.
	Pyrazon (Pyramin plus TCA)	3.8 plus 6 to 8	Annual grasses and most broad-leaf weeds	Preemergence		Has not been effective on soils with more than 5% organic matter.
	Pyrazon plus Dalapon (Pyramin Plus)	3.8 plus 2.2	Most annual grasses and broadleaf weeds	Postemergence when broadleaf weeds are in the two-leaf stage or earlier, and the sugar beets are in the two-leaf stage or later		Results on soils with more than 5% organic matter have been erratic
	(cont. on next page)					



Crop	Herbicide	Act. Ingrid. lb. per Acre	Weeds	When to Apply	Remarks
SUGAR BEETS (cont.)	Dalapon (Dowpon)	2 to 3	Most annual grasses	Apply from emer- gence to 6-leaf stage of sugar beets. Use directed spray after beets have 6 leaves	Use high rate if grasses have over 2-4 leaves or if they are growing slowly due to dry conditions. May be applied more than once up to a maximum of 5.9 lb/A per year. Some yield reduction may occur from rates over 3 lb/A.
	Endothall (Herbicide 273)	3/4 to 1 1/2	Wild buckwheat smartweed marshelder	Sugar beets should have 4-6 leaves. Do not apply later than 40 days after emer- gence	When temperatures are over 80°F., endothall may cause excessive injury, especially to very small sugar beets. Endothall is ineffec- tive at temperatures below 60°F.
	Phenmedipham (Betanal)	1 to 1.5	Most annual grasses and broadleaf weeds except redroot pigweed	Postemergence when broadleaf weeds are between cotyledon and four-leaf stage and the sugar beets are in the four-leaf stage or later	To avoid sugar beet injury, use no more than 1 lb/A following EPTC or TCA, do not apply if highest tem- perature during day is over 85°F. and apply late in afternoon or early in the evening.
	Desmedipham (Betanal- 475)	1 to 1 1/4	Most annual grasses and broadleaf weeds including red- root pigweed		
	Paraquat	1/2	Emerged annual grasses and broadleaf weeds	Preplant or anytime prior to crop emer- gence	A non-selective, postemergence herbicide. No soil activity. Apply with X-77 surfactant. Good coverage is essential.
POTATOES (See later section for wild oat control)	Dalapon (Dowpon)	6	Quackgrass	Preplant in spring when grass is 4 to 6 inches tall	Plow after 4 days and potatoes may be planted immediately
	EPTC (Eptam)	3 to 6	Grasses and some broadleaf weeds	Preplant or directed spray at dragoff	Incorporation directions discussed under sunflower narrative at beginning of Weed Control Guide. Weak on wild mustard.
	Linuron (Lorox)	3/4 to 2	Most annual grasses and broadleaf weeds	Preemergence (just before crop emerges)	Apply to crop planted 2 inches deep, after dragoff or hilling. Do not plant to other crops within 4 months after treatment.
	Trifluralin (Treflan)	1/2 to 1	Grasses and broadleaf weeds	After planting, incorporated. Use up to or immediately following dragoff	Care should be taken that incor- poration machinery does not damage seed pieces or elongating sprouts.
(cont. on next page)					



Crop	Herbicide	Act. Ingrid. lb. per Acre	Weeds	When to Apply	Remarks
POTATOES (cont.)	Chlorbromuron (Maloran, Bromex)	2 to 4	Most annual grasses and broadleaf weeds	Preemergence, after planting or dragoff	Do not plant crops other than potatoes, corn or soybeans within 6 months after application. Generally does not perform satisfactorily on heavy, organic soils.
	Paraquat	1	Most annual grasses and broadleaf	Preemergence—when weeds are up but before crop emerges	Do not apply later than ground cracking. Paraquat kills only emerged weeds.
POTATO VINE KILLING	Endothall (Des-i-Cate)	3/4 to 1	Desiccant	10 to 14 days prior to harvest	Use higher rate during cool, cloudy weather and on heavy vine growth.
	Dinoseb	1 1/4 to 2 1/2	Desiccant	10 to 20 days prior to harvest	See label for details. Rate depends on temperature, spray volume, potato variety and vigor of the vines.
	Paraquat	1/4 to 1/2	Desiccant	More than 3 days prior to harvest	Do not use when the potatoes are to be stored or used for seed.
GRASS Seedling	2,4-D	1/2 to 3/4	Broadleaf	After 3-leaf stage of grasses	Use rate for established grasses after tillering.
Established (See later section for control of specific perennial weeds)	2,4-D	3/4 to 2	Annual and perennial broadleaf weeds	Weeds—emergence to bud stage, pref- erably when young and actively growing	Do not graze dairy cows for 7 days after application. Do not apply after boot stage on grasses for seed production. Use 1 lb/A on annuals and gumweed and 2 lb/A on sages and other perennials.
LEGUMES Alfalfa and clover awith nurse crop	MCPA	1/8 to 1/4	Broadleaf	Legumes 2-3 inches tall and nurse crop 4-16 inches tall	Canopy of crop or weeds reduces injury. NOTE: POSSIBLE INJURY TO SWEETCLOVER AND ALFALFA.
	Dinoseb	1.1 to 1.5	Small broad- leaf weeds	Grain—3 to 6 inches tall and weeds small	Apply in 30 gallons of water per acre. Partial burning of grain leaves is not ordinarily harmful.
Alfalfa trefoil alone. Established or seedling stage	2,4-DB	1/2 to 1	Broadleaf	Weeds and legumes less than 3 inches tall, nurse crop 1- 6 inches tall	Sweetclover killed by 2,4-DB. Wild mustard control generally not adequate. 2,4-DB must be applied 30 days before hay har- vest or grazing. See narrative at beginning of Weed Control Guide for herbicides in legume establish- ment.
Alfalfa only	Simazine (Princep)	0.8 to 1.6	Grasses and broadleaf weeds including wild oats and mustard	After last cutting but before freeze- up	Do not use on sands or loamy sands or where soil pH is above 7.5. Use low rate on sandy loam. Apply to pure stands of alfalfa established at least 12 months.

Weed	Herbicide	Rate per Acre	Crop	When to Apply	Remarks		
WILD OATS Selective control in crops	Triallate (Far-go)	1 1/4 lb liquid	Barley	Fall—after October 15 and until freeze-up	Incorporate immediately by cultivation. Keep spring tillage to minimum. Use lower rate of granules on wheat		
		1 1/4-1 1/2 lb granules					
	Triallate (Far-go)	1 lb liquid	Wheat and durum	Spring—immediately after planting	Apply on smooth soil surface and incorporate immediately in top 2 inches by cultivation. Wheat must be below the incorporated zone.		
		1 1/4-1 1/2 lb granules					
	Diallate (Avadex)	1 1/4 lb	Barley, peas and lentils	Preplanting	Incorporate immediately by cultivation.		
		1 lb	Wheat and durum				
		1 1/2 to 2 lb	Flax, sugar beets, soybeans and potatoes				
		1 1/2 lb	Corn and lentils			Preplanting or preemergence	Incorporate immediately by cultivation.
		1 1/4 lb	Peas				
	Barban (Carbyne)	1 1/2 to 2 lb liquid	Flax and sugar beets	Fall—after October 15 and until freeze-up	Incorporate immediately by cultivation. Keep spring tillage to minimum		
		1 1/2 to 2 lb granules	Sugar beets				
		4 to 6 oz	Wheat, winter wheat, durum, barley, flax, peas, mustard, sunflowers and lentils			Wild oats-1 1/2 leaf stage. Crops: Small grain before 4th leaf stage; flax before 12th leaf stage; peas before 6th leaf stage; mustard before true 3rd leaf stage; winter wheat, sugar beets and sunflowers-no restrictions	Usually applied 4 to 9 days after wild oats emerge. Must be applied before the 14th day after wheat, durum, barley and lentils emergence and before the 4th leaf stage to avoid serious crop injury and poor wild oat control. Do not mix barban with any other chemicals. See Narrative for effects of temperature, low soil fertility and droughty conditions on barban activity.
	12 to 16 oz	Sugar beets					
4 to 6 oz	Soybeans	Before the first trifoliate leaf stage or no later than 14 days after crop emerges	Do not feed treated soybean forage or pods to livestock.				
FUMITORY  (cont. on next page)	Triallate (Far-go)	1 1/4 lb	Barley	Immediately after planting	Use only if wild oats also is a problem, because of cost. Incorporate in top 2 inches of soil by cultivation.		
		1 lb	Wheat and durum				
	Diallate (Avadex)	1 1/2 lb	Flax	Preplanting			



Weed	Herbicide	Rate per Acre	Crop	When to Apply	Remarks
FUMITORY (cont.)	Bromoxynil plus MCPA ester	1/4 to 1/3 lb plus 1/4 to 1/3 lb	Wheat and barley	After fumitory is established to boot stage of crop	Apply in 10 to 15 gal. water per acre. Other broadleaf weeds also will be controlled. Commer- cial mixtures (Brominal Plus and Bronate) are available.

**CHEMICAL WEED CONTROL  
For Perennial Weeds**

Weed	Herbicide <sup>1/</sup>	Act. Incred. Lb/A or Sq/Rd	When to Apply	Remarks
FIELD BINDWEED Fallow or post harvest	2,4-D L.V. ester or oil soluble amine	1 to 2 lb/A	Regrowth 6 inches to bud stage	Cultivate fallow until mid-July. Spray in late August or September. Respray in following year's crop.
Wheat and barley	2,4-D amine 2,4-D L.V. ester	3/4 lb/A 2/3 lb/A	Tiller stage of crop	Higher rates may injure crop but may be worthwhile, especially in small areas, to control bindweed.
Patches or individual plants in pastures or non-cropland <sup>2/</sup>	Picloram (Tordon 22K)	1 lb/A	When bindweed is actively growing	Tordon granules available. Do not use in areas with high water table. Do not graze dairy cattle on treated area.
	Dicamba (Banvel)	4 to 8 lb/A	When bindweed is actively growing	Apply to foliage and/or soil. Do not graze for 60 days or make hay for 90 days for dairy cows or graze or feed hay to beef cattle 30 days before slaughter.
LEAFY SPURGE On fallow	2,4-D L.V. ester	1 to 2 lb/A	4 to 6 inches	Cultivate or respray whenever re- growth is 4 to 6 inches high. Re- spray in following year's crop.
Pasture and Rangeland	2,4-D L.V. ester or oil soluble amine	1 to 2 lb/A	Early bud stage and fall	Apply both spring and fall for satisfactory control. Do not graze dairy cows for 7 days after treat- ment.
	Picloram (Tordon 22K)	1/4 to 1/2 lb/A	Any time spurge is actively growing	Retreatment at the same time usually will be necessary the following year. Do not graze dairy cattle on treated area.
Patches or indi- vidual plants in pastures  (cont. on next page)	Dicamba (Banvel)	4 to 8 lb/A	When spurge is actively growing	Apply to foliage and/or soil. Do not graze for 60 days or make hay for 90 days for dairy cows or graze or feed hay to beef cattle 30 days before slaughter.

<sup>1/</sup> Several soil sterilants will control perennial weeds. Follow directions on the label.

<sup>2/</sup> Non-cropland means roadsides and waste areas not used to produce animal feed.

Weed	Herbicide <sup>1/</sup>	Act. Ingrid. Lb/A or Sq/Rd	When to Apply	Remarks
LEAFY SPURGE (cont.)	Picloram (Tordon 22K)	1 to 2 lb/A	Any time spurge is actively growing	During a single season do not use more than 10 gals. of Tordon 22K for any 100 acre area. Do not treat more than 20 acres of any 100 acre area. Tordon granules available.
CANADA THISTLE AND SOWTHISTLE Wheat and Barley	MCPA amine MCPA ester	3/4 lb/A 2/3 lb/A	Tiller stage of crop	Higher rates than listed may injure crop but may be worthwhile, espe- cially in small areas, to achieve thistle control.
Fallow or post harvest	2,4-D	1 lb/A	6 inches tall and actively growing. Post harvest mowing promotes active regrowth	Cultivate fallow until mid-July. Spray in late August or September.
	Dicamba (Banvel)	1 to 2 lb/A		
Pasture and Rangeland	Picloram (Tordon 22K)	1/4 to 1/2 lb/A	6 inches tall and ac- tively growing. For fall treatment, mowing promotes active growth	Retreatment at the same rate usually will be necessary the following year. Do not graze dairy cattle on treated area.
	Dicamba (Banvel)	1/2 lb/A		Do not graze dairy cows for 7 days or make hay for 37 days after treat- ment. Do not graze meat animals in treated areas within 30 days of slaughter.
	2,4-D	1 to 2 lb/A		Do not graze dairy cows for 7 days after treatment.
Patches or individual plants in pastures	Picloram (Tordon 22K)	1 lb/A	When thistles are actively growing	During a single season do not use more than 10 gals. of Tordon 22K for any 100 acres. Do not treat more than 20 acres of any 100 acre area.
	Dicamba (Banvel)	4 lb/A		Do not graze for 60 days or make hay for 90 days for dairy cows or graze or feed hay to beef cattle 30 days before slaughter.

<sup>1/</sup> Several soil sterilants will control perennial weeds. Follow directions on the label.



Weed	Herbicide <sup>1/</sup>	Act. Ingrid. Lb/A or Sq/Rd	When to Apply	Remarks
QUACKGRASS	Dalapon (Dowpon)	6 to 11 lb/A	On fallow after 4 to 6 inches growth	Cultivate after 10 to 20 days.
	Atrazine (AAtrex)	4 lb/A	Apply 2 lb/A early spring and an addi- tional 2 lb/A at planting time	Plant only corn year of application and year following treatment.
AROUND BLDGS., TELEPHONE POLES, ETC.	Atrazine, bro- macil, monuron, prometone or similar products	See label	Any time during and prior to growing sea- son. See label	Use heavy rates for complete long- time soil sterility.

1/ Several soil sterilants will control perennial weeds. Follow directions on the label.

19

Note: Since going to press, profluralin (Tolban) has been registered by the Environmental Protection Agency. It is an emulsifiable concentrate containing 4 pounds of profluralin per gallon. It is a preplant incorporated herbicide for soybeans. Apply profluralin at the rate of 1/2 to 1 pound per acre and incorporate 2 to 3 inches deep for the control of barnyardgrass, foxtail (pigeongrass), common lambsquarters, redroot pigweed and certain other species, excluding wild mustard.

EPA also has granted state registration for a tank mix of picloram (Tordon 22K) plus 2,4-D amine. Apply picloram at the rate of 1/4 to 3/8 ounce (1 to 1 1/2 fluid ounces of product) per acre plus 2,4-D at 4 to 6 ounces acid equivalent (1/2 to 3/4 pint of 4 pounds per gallon product) per acre. Use the lower rate when the crop is in the 4 to 6 leaf stage and the weeds are small. Apply the higher rate to crops in the 6 leaf stage to early boot when the weeds are more advanced, or under dry conditions. The mixture controls wild buckwheat, redroot pigweed as well as other broadleaf weeds normally controlled by 2,4-D.

Other herbicides may be cleared for use by next spring. Check with your County Extension Agent if you have questions concerning new herbicides.

GLOSSARY OF CHEMICAL NAMES

COMMON NAME	TRADE NAME <sup>1/</sup> AND MANUFACTURER	CONCENTRATION AND COMMERCIAL FORMULATIONS <sup>2/</sup>
Alachlor	Lasso (Monsanto)	4 lb/gal L 15% G
Ametryne	Evik (Ciba-Geigy)	80% WP
Atrazine	AAtrex (Ciba-Geigy)	80% WP 4 lb/gal L
Barban	Carbyne (Gulf)	1 lb/gal L
Bromacil	Hyvar-X, Hyvar-XL (DuPont)	80% WP 2 lb/gal L
Bromoxynil	Buctril (Chipman) Brominal (Amchem)	2 lb/gal L
Bromoxynil and MCPA	Bronate (Chipman) Brominal Plus (Amchem)	2 lb/gal MCPA plus 2 lb/gal bromoxynil L
Butylate	Sutan (Stauffer)	6 lb/gal L, 10% G
Chloramben	Amiben (Amchem)	10% G 2 lb/gal L
Chlorbromuron	Bromex (Nor-Am) Maloran (Ciba-Geigy)	50% WP
Chloroxuron	Norex (Nor-Am) Tenoran (Ciba-Geigy)	50% WP
Cyanazine	Bladex (Shell)	80% WP 15% G
Cycloate	Ro-Neet (Stauffer)	6 lb/gal L
Cyprazine	Outfox (Gulf)	1 lb/gal L
Dalapon	Basfapon (BASF) Dowpon M (Dow)	74% WSP
Dalapon and TCA	Dowpon C (Dow)	46.5% dalapon 26.2% TCA WSP
Desmedipham	Betanal-475 (Nor-Am)	1.3 lb/gal L
Diallate	Avadex (Monsanto)	4 lb/gal L 10% G
Dicamba	Banvel (Velsicol)	4 lb/gal L
Dicamba and MCPA	MonDak (Velsicol)	1.25 lb/gal dicamba 2.50 lb/gal MCPA L
Dinitramine	Cobex (U. S. Borax)	2.0 lb/gal L
Dinoseb (DNBP)	Several (various)	1, 3, 5 lb/gal L 10% G
Endothall	Endothal, Herbicide 273 (Pennwalt)	1.46 lb/gal L 3 lb/gal L, 5% G
Endothall (as a desiccant)	Des-i-Cate (Pennwalt)	0.52 lb/gal L
EPTC	Eptam (Stauffer)	6 lb/gal L 10% G
EPTC plus R-25788	Eradicane (Stauffer)	6 lb/gal L
Fluorodifen	Preforan (Ciba-Geigy)	3 lb/gal L
Linuron	Lorox (DuPont)	50% WP
MCPA	Several (various)	Various L
Metribuzin	Lexone (DuPont) Sencor (Chemagro)	50% WP
Monuron	Telvar (DuPont)	G, L, WP Various
1,8-naphthalic anhydride	Protect (Gulf)	Seed treatment
Paraquat	Ortho Paraquat (Chevron)	2 lb/gal L
Phenmedipham	Betanal (Nor-Am)	1.3 lb/gal L
Picloram	Tordon 22K, Tordon 10K, Tordon Beads (Dow)	10%, 2% G 2 lb/gal L
Propachlor	Ramrod (Monsanto)	65% WP 20% G
Propazine	Milogard (Ciba-Geigy)	80% WP
Pyrazon	Pyramin (BASF)	80% WP
Pyrazon and dalapon	Pyramin Plus (BASF)	27% pyrazon 18.5% dalapon WP
Simazine	Princep (Ciba-Geigy)	80% WP 4% G
TCA	TCA (various)	4.76 lb/gal L 79.3% WSP
Triallate	Far-go (Monsanto)	4 lb/gal L 10% G
Trifluralin	Treflan (Elanco)	4 lb/gal L 5% G
2,4-D	Several (various)	L, G Various
2,4-DB	Butyrac (Amchem) Butoxone (Chipman)	L Various

<sup>1/</sup> "Several" means there are numerous trade names for the chemical. The mention of trade names does not imply that they are endorsed or recommended over those of similar nature not listed.

<sup>2/</sup> G—granular, L—liquid, WP—wetttable powder, WSP—water soluble powder.