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CHEMICAL WEED CONTROL

in FIELD CROPS

and for PERENNIAL WEEDS

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WEED CONTROL recommendations in this circular are based on information available from the North Dakota Agricultural Experiment Station and the Research Committee of the North Central Weed Control Conference.

Recommended rates are based on active ingredient or acid equivalent unless otherwise indicated. For example, 1 pint of 2,4-D (4 pounds 2,4-D acid per gallon) equals 1/2 pound of 2,4-D acid equivalent and 1 pound of dalapon powder equals 3/4 pound acid equivalent.

SELECTIVE HERBICIDES can be an effective supplement to good cultural practices in controlling weeds in field crop production. Timely applications of selective chemicals at the recommended rates will control many annual weeds satisfactorily without damaging the crop in which the weeds are growing. Perennial weeds such as field bindweed, leafy spurge, Canada thistle and perennial sowthistle in crops also can be controlled with chemicals.

To avoid crop injury and get good weed control, follow closely the instructions on the container. Consider both the crop tolerance and kind of weeds present in determining the rate to use.

Timely application of herbicides in growing crops is important. Weed competition reduces crop yield severely, unless weeds are removed when small.

Do not spray when there is danger of drift, or when the wind is blowing toward a neighboring crop or planting more susceptible than the crop being sprayed. Ideal temperatures for applying herbicides are 65 to 85 degrees. Below 60 degrees, weeds are killed very slowly; above 90 degrees there is danger of crop injury.

PREEMERGENCE HERBICIDES in North Dakota have given erratic control. Performance varies from year to year and from field to field. Good weed control 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 give unsatisfactory results. Herbicides that can be incorporated into the surface soil usually have a better chance for success.

CAUTION:

The weed control suggestions given in this circular are based on the assumption that all herbicides used in the past will have established tolerances with the Food and Drug Administration or their manufacturers will have requested an extension of the current label.

All agricultural pesticides which are tank mixed must be registered for use as a mixture by the U.S.D.A. Illegal chemical residues may result from use of unregistered mixtures.

The possibility of residues remaining on agricultural commodities from the use of herbicides has not been investigated at the North Dakota Agricultural Experiment Station. Therefore, no claims are made by the university or its employees that the herbicides discussed will or will not have residues. Any person who uses any of the herbicides mentioned in this circular does so at his own risk. Use each chemical only as recommended on the label of the container.

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CHEMICAL WEED CONTROL
For Field Crops

Crop	Herbicide	Act. Ingrid. lb. per Acre	Weeds	When to Apply	Remarks
WHEAT, DURUM OR BARLEY ^{1/}	2,4-D amine	1/4 to 1/2	Broadleaf	Crops--5th leaf to early boot	Do not apply later than boot stage. Barley more sensitive than wheat. Can be applied earlier than 2,4-D.
	2,4-D ester	1/4 to 1/2	Broadleaf	Crops--emergence to early boot	
	MCPA amine or ester	1/4 to 1/2	Wild buckwheat and most broadleaf weeds	Crops--3rd leaf to boot stage	
WHEAT ORDURUM	Bromoxnil plus MCPA ester	1/4	Wild buckwheat	Crops--2nd through 4th leaf stage	Apply when weeds are in early seedling stage. Commercial mixtures are available. Mix with 4 to 6 oz. per acre of MCPA for control of broadleaf weeds. CAUTION: EARLY APPLICATION ESSENTIAL. HIGHER RATES OR LATER APPLICATION MAY CAUSE CROP INJURY. Do not apply in the fall.
	Dicamba (Banvel)	2 oz (1/8 lb)	Wild buckwheat	Crops--2nd through 3rd leaf stage	
BARLEY	Dicamba (Banvel)	1 oz (1/16 lb)	Wild buckwheat	Crops--fully tillered to early boot	Do not apply in the fall.
WINTER WHEAT OR RYE	2,4-D amine	1/4 to 1/2	Broadleaf	Oats--emergence to early boot	Early jointing stage most sensitive. Possible injury to oats.
	2,4-D ester	1/4 to 1/3	Broadleaf	Oats--2nd through 4th leaf stage	
OATS ^{1/} ^{2/}	MCPA amine or ester	1/4 to 1/2	Broadleaf	Flax 2 to 6 inches tall	Use higher rates or esters only for hard-to-kill weeds.
	Dicamba (Banvel)	2 oz	Wild buckwheat	Best results obtained when flax is over 2 inches and weeds are under 2 inches tall	
FLAX ^{1/} ^{2/}	MCPA amine	1/4 or less	Broadleaf	Crops--early dough stage	Use only when weeds threaten to interfere with harvest operations.
	Dalapon (Dowpon) TCA	3/4	Annual grass not wild oats	Sorghum--4 to 12 inches tall, Millet--5th leaf to early boot	
SMALL GRAIN PRE-HARVEST	2,4-D ester	1	Broadleaf	Preemergence	Wettable powder or granules available. Ineffective against wild mustard. Not cleared for silage for dairy cows.
	2,4-D amine	1/4 to 1/2	Broadleaf	Preemergence	
SORGHUM AND MILLET	Propachlor (Ramrod)	4 to 5	Grasses and some broadleaf weeds	Preemergence	Atrazine residue may still occur. Not cleared for silage for dairy cows. Commercial mixture is available.
	Atrazine plus propachlor	1 plus 3	Broadleaf and annual grasses	Preemergence	
	Linuron plus propachlor (Londax)	3/4 to 1 1/2 plus 1 1/2 to 3	Broadleaf and annual grasses	Preemergence	
CORN	Atrazine (AAtrex)	2 to 4	Broadleaf and grasses	Preemergence	Trial use only. Use the higher rate on heavy soils. Soil residues not likely to occur. Atrazine may remain in soil longer than one year and damage following crops other than corn.

^{1/} When used as a nurse crop for legumes or grasses, see later sections.

^{2/} 2,4-D is not recommended unless such hard-to-kill weeds as Russian thistle, wild buckwheat, smartweed, or pigweed are present.

CHEMICAL WEED CONTROL
For Field Crops
(cont.)

Crop	Herbicide	Act. Ingrid. lb. per Acre	Weeds	When to Apply	Remarks
GRASS Seedling Established	2,4-D	1/2 to 3/4	Broadleaf	After 3-leaf stage	Heavier rates may be used after grass is well tillered.
	2,4-D	3/4 to 2	Broadleaf	Weeds--emergence to bud stage	Apply when weeds are susceptible. Do not graze dairy cows for 7 days after application.
LEGUMES Alfalfa and clover with nurse crop Alfalfa or trefoil alone. Established or seedling stage	Dicamba (Banvel)	1/4 to 1/2	White cockle, night-flowering catchfly and alfalfa	In spring when seed crop is 2 to 4 inches high	Use only in established perennial grasses grown for seed.
	2,4-DB	1/2 to 1	Broadleaf	Not before legumes are 2 inches tall	Sweetclover killed by 2,4-DB. Delay to get weed and crop canopy. NOTE: Possible injury to sweetclover and alfalfa.
	Dalapon (Downon)	3/4 to 1	Annual grasses, not wild oats	Weeds 1 to 2 inches tall	Seedling or old stands not for hay or pasture. Do not use with small grain nurse crop.
	TCA	5	Annual grasses, not wild oats		
	2,4-DB	1/2 to 1	Broadleaf	When weeds are small	2,4-DB and dalapon can be mixed but no dalapon label clearance for hay or pasture. 2,4-DB must be applied 30 days before hay harvest or grazing.
Alfalfa only	Simazine (Prigeep)	0.8 to 1.6	Grasses and broadleaf including wild oats and mustard	In fall after frost when alfalfa is dormant	Trial use only. 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 1 lb 1 1/4 lb 1 lb	Barley Wheat Barley Wheat and durum	Fall--after October 15 and until freeze-up Spring--immediately after planting	Incorporate shallowly by cultivation. Keep spring tillage to minimum. Apply on smooth soil surface and incorporate in top 2 inches by cultivation.
	Diallate (Avadex)	1 1/2 lb	Flax, sugarbeets and potatoes	Preplanting	Incorporate immediately after application.
			Corn and peas	Preplanting or preemergence	
		1 1/2 lb	Flax and sugarbeets	Fall--after October 15 and until freeze-up	Incorporate shallowly by cultivation. Keep spring tillage to minimum.
		4 to 6 oz	Wheat, winter wheat, durum, barley, flax, peas, mustard and sunflowers	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 and sunflowers--no restrictions	Usually applied 4 to 9 days after wild oats emerge. Must be applied before the 14th day after crop emergence and before small grain reaches 4th leaf stage to avoid serious crop injury and poor wild oat control. Mixing Carbyne with other herbicides is not recommended.
		12 to 16 oz	Sugarbeets		
		4 to 6 oz	Soybeans	Before the first trifoliolate leaf stage or no later than 14 days after crop emerges	Do not feed treated soybean forage or pods to livestock.

CORN (cont.)	Atrazine (AAtrex) (cont.)	1 to 2 plus 1 to 2 gal. oil	Broadleaf and grasses	Early postemergence--weeds 1½ inches tall or less	Application when weeds are over 1½ inches may result in poor control. Soil residues may still occur.
	2,4-D amine	1/4 to 1/2	Broadleaf	Postemergence, corn--3 inches to tassel	Use drop nozzle when corn is over 8 inches tall.
SOYBEANS	Alachlor (Lasso)	2 1/2	Grasses and some broadleaf weeds	Preemergence	Trial use only. Ineffective against wild mustard.
	Amiben	2 to 3	Annual grasses and broadleaf	Preemergence	Wild oat control not adequate. Band application reduces cost.
	Trifluralin (Treflan)	1/2 to 1	Grasses and broadleaf except mustard	Preplant and incorporate	Tandem disk in two directions 4 to 6 inches deep. Wild oat control not adequate.
	Chloroxuron (Tenoran)	1	Wild mustard and some others NOT grasses	When weeds are less than 2 inches tall and crop has first trifoliolate leaf	Use as emergency wild mustard control measure. Must be applied with surfactant (Adjuvan T).
PINTO BEANS	Alachlor (Lasso)	2 1/2	Grasses and some broadleaf weeds	Preemergence	Trial use only. Ineffective against wild mustard.
	Amiben	2	Annual grasses and broadleaf	Preemergence	Band application reduces cost.
	EPTC (Eptam)	3	Grasses and some broadleaf	Preplant and incorporate	Weak on wild mustard.
	Trifluralin (Treflan)	1/2 to 1	Grasses and broad- leaf except mustard	Preplant and incorporate	Tandem disk in two directions 4 to 6 inches deep. Wild oat control not adequate.
SAFFLOWER	Trifluralin (Treflan)	1/2 to 1	Grasses and broad- leaf except mustard	Preplant and incorporate	Tandem disk in two directions 4 to 6 inches deep. Wild oat control not adequate.
	EPTC (Eptam)	3	Grasses and some broadleaf weeds	Preplant and incorporate	Generally gives short-term weed control.
SUNFLOWERS (See later section for wild oat control)	Trifluralin (Treflan)	1/2 to 1	Grasses and broad- leaf except mustard	Preplant and incorporate	Tandem disk in two directions 4 to 6 inches deep. Wild oat control not adequate.
	Dalapon	3	Annual grasses, not wild oats	After weeds are up	Apply while beets are small.
SUGARBEETS (See later section for wild oat control)	TCA	5 to 7	Annual grasses, not wild oats	Preemergence	Do not use tops for livestock feed.
	Endothall (Herbicide 273)	1 to 2	Wild buckwheat and smartweed	Beets--3 to 6 leaf and weeds emerged	Do not apply more than 40 days after beet emergence.
	Phenmedipham (Betanal)	1 to 2	Broadleaf and grass- es, weak on pigweed	Weeds small--cotyledon to 4 leaf stage	Trial use only. See Caution on first page. Band application reduces cost.
	Cycloate (Ro-Neet)	3 to 4	Annual grasses and some broadleaf	Preplant and incorporate	Trial use only. Use lower rate only on light sandy soils. Apply to dry soil and incorporate immediately.
	EPTC (Eptam)	2 to 3	Annual grasses and some broadleaf weeds	Preplant and incorporate	Use higher rate on heavy, high organic soils. Some stand reduction and tempor- ary stunting may occur from the use of EPTC.

FUMITORY	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.
		Diallate (Avadex)	1 lb 1 1/2 lb	Wheat and durum Flax	Preplanting	
	Bromoxynil plus MCPA ester	1/4 lb plus 1/4 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.

GLOSSARY OF CHEMICAL NAMES

COMMON NAME	TRADE NAME 1/ AND MANUFACTURER	COMMON NAME	TRADE NAME 1/ AND MANUFACTURER
Alachlor	Lasso (Monsanto)	Linuron	Lorox (DuPont)
Amiben	Amiben (Amchem Products)	Linuron-Propachlor Mixture	Londax (DuPont)
Amitrole	Amino Triazole Weedkiller (American Cyanamid)	MCPA	Amine salts--Various Ester--Various
Amitrole-T	Weedazole (Amchem Products)	Monuron	Telvar (DuPont)
AMS	Amitrol-T (Amchem Products)	Phenmedipham	Betanal (Nor-Am)
Atrazine	Cytrol (American Cyanamid)	Picloram-2,4-D Mixture	Tordon 212 Mixture (Dow)
Barban	Ammate X (DuPont)	Propachlor	Ramrod (Monsanto)
Bromacil	AA-trex 80W (Geigy)	Propazine	Milogard 80W (Geigy)
Bromoxynil	Carbyne (Gulf Oil Corp.)	Simazine	Princep 80W (Geigy)
Bromoxynil-MCPA Mixture	Hyvar X (DuPont)	TBA	Various
Chloroxuron	Bucril (Chipman)	TBA-Sodium borate mixture	Benzabor (U.S. Borax)
Cycloate	Brominal (Amchem)	TCA	Various
Dalapon	Brominal Plus (Amchem)	Triallate	Far-go (Monsanto)
Diallate	Bromate (Chipman)	Trifluralin	Treflan (Elanco Products)
Dicamba	Brominal Plus (Amchem)	2,4-D	Various
Endothal	Tenorin (Ciba)	2,4-DB	Butyroc 118 (Amchem Products)
EPTC	Ro-Neet (Stauffer)		Butoxone (Chipman)
	Dowpon (Dow)		
	Avadex (Monsanto)		
	Banvel (Veisicol)		
	Herbicide 273, Endothal, Aquathal (Pennsalt)		
	Eptam (Stauffer)		

1/ The mention of trade names does not imply that they are endorsed or recommended over those of similar nature not listed.

CHEMICAL WEED CONTROL
For Perennial Weeds

WEED	HERBICIDE 1/	ACT. INGRED. LB/A OR SQ. RD.	WHEN TO APPLY	REMARKS
FIELD BINDWEED On fallow	2,4-D for large areas	3/4 lb. per A.	Regrowth 4 to 6 inches	Cultivate fallow until mid-July, then spray. Respray in following year's crop.
Wheat and barley	2,4-D amine 2,4-D ester	3/4 lb. per A. 2/3 lb. per 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 on non-cropland 2/ areas	Benzabor	1 to 1 1/2 lb. per sq. rd.	Late fall or early spring	Apply dry--long soil sterility.
	TBA	10 to 20 lb. per A.	Bud stage	Residual effect 1 year or more.
	Picloram plus 2,4-D (Tordon 212)	1 gal. per A.	When bindweed is actively growing	Vegetation may not grow in treated area for some time. Tordon granules available.
Patches or individual plants in pastures	Dicamba (Banvel)	4 to 8 lb. per A.	When weed 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 ester for large areas	1 to 2 lb. per A.	4 to 6 inches	No cultivation before spraying. Apply whenever regrowth is 4 inches high. Respray in following year's crop.
Pasture and Rangeland	AMS (Ammate X)	1 lb per sq. rd.	Late spring or summer	Use 2,4-D when seedlings appear after AMS application. Apply with a spreader-sticker.
	2,4-D	1 to 2 lb. per A.	Early bud stage and fall	Apply both spring and fall for satisfactory control.
	Amitrole Amitrole-T	4 to 8 lb. per A.	Bud to bloom stage	Use 50 gals. water per acre. Keep livestock off treated areas for 8 months.
Patches or individual plants on non-cropland 2/ areas	Picloram plus 2,4-D (Tordon 212)	1 1/2 gal. per A.	Spring or fall	Most grasses are not killed. Tordon granules available.
	Benzabor	1 to 1 1/2 lb. per sq. rd.	Late fall or early spring	Apply dry--long soil sterility.
Patches or individual plants in pastures	Dicamba (Banvel)	4 to 8 lb. per 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.
CANADA THISTLE AND SOWTHISTLE Wheat and Barley	MCPA amine MCPA ester	3/4 lb. per A. 2/3 lb. per A.	Tiller stage of crop	Higher rates than listed may injure crop but may be worthwhile, especially in small areas, to achieve thistle control.
Cropland areas	Amitrole Amitrole-T	4 lb. per A.	Bud to bloom stage	Wet thoroughly. Keep livestock off treated areas for 8 months.
	2,4-D	1 lb. per A.	Bud stage	Retreat as needed.
	Dicamba (Banvel)	4 to 8 lb. per A.	When weed 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.
Patches or individual plants on non-cropland 2/ areas	Picloram + 2,4-D (Tordon 212)	1 gal. per A.	When thistles are actively growing	Apply to foliage and/or soil.
QUACKGRASS On fallow	Dalapon (Dowpon)	7 to 10 lb. per A.	Spring after 4 to 6 inches growth	Cultivate after 2 to 3 weeks.
	Atrazine (AAtrex)	2 lb. per A. spring plus 2 lb. per A. planting time	Apply 2 lb. per A. early spring and an additional 2 lb. per A. at planting time	Plant only corn year of application and year following treatment.
Patches	Dalapon	20 to 25 lb. per A.	Grass 4 to 10 inches high	Use where cultivation after treatment is not possible. There may be a carryover of dalapon to the next year.
	Amitrole-T	4 to 8 lb. per A.	Actively growing	Cultivate after 3 weeks. Keep livestock off treated areas for 8 months.
WEEDS IN NATIVE OR CULTIVATED PASTURES 3/	2,4-D low volatile ester or oil soluble amine	1 to 2 lb. per A.	In early June when weeds are young and actively growing	Use 1 lb. per A. on annuals and gumweed and 2 lb. per A. on sages and other perennials. Retreat following year if necessary.
AROUND BLDGS., TELEPHONE POLES, ETC.	Atrazine, bromacil, monuron, prometon or similar products	See label	Anytime during and prior to growing season. See label.	Use heavy rates for complete long-time soil sterility.

1/ Several soil sterilants will do a very good job of perennial weed control. Follow directions of the manufacturer as they appear on the label.

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

3/ Legumes in pastures will be killed or severely injured by 2,4-D.