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Chemicals that Control Weeds

— a guide for 1963 —

by

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Agricultural chemicals must not be used for purposes other than those specified by the approved label on the container. The Federal Food, Drug and Cosmetic Act, as amended, authorizes seizure of any raw agricultural commodity moving in interstate commerce which carries a pesticide residue in excess of the established tolerance. Read the label carefully. Observe the precautions shown on the label when handling any chemical.

Because of the danger of drift, any user of an agricultural chemical must exercise judgment when spraying. Do not spray on a windy day. Wind will cause poor coverage and excessive drift.

This circular gives suggestions for weed control based on research results at the Nebraska Agricultural Experiment Station and elsewhere.

Extension Service
University of Nebraska College of Agriculture
and U. S. Department of Agriculture
Cooperating
E. F. Frolik, Dean; E. W. Janike, Director

FIELD CROPS—PREPLANT AND PREEMERGENCE

Preplant treatments are made before planting the crop. Preemergence treatments are applied from planting time to just before plant emergence. Postemergence treatments are applied after emergence of weeds or crop. Weed control with preemergence treatments may be poor if there is no rain to leach the herbicide into the soil. If it does not rain within a few days, preemergence herbicides should be incorporated into the surface soil with a rotary hoe. Excessive rainfall may leach some of the more soluble herbicides too deeply. Soils high in organic matter or clay content generally require more herbicide than do sandy soils for equivalent weed control. Preemergence weed control is more satisfactory on surface-planted crops and when applied to prepared seedbeds free of clods and trash.

Some weed species are resistant to particular herbicides. Herbicides should be rotated to control a wider weed spectrum and to reduce the build-up of any particular herbicide in the soil. Do not use atrazine or propazine on land that will be planted to crops other than corn or sorghum the following year—they may carry over and injure sugar beets, beans, potatoes, alfalfa, and small grain. Residue problems increase westward. Handle Randox with care to avoid irritation.

Preemergence and preplant herbicides are formulated as granulars, wettable powders and liquids. Sprayers should provide good agitation of spray solution and be equipped with 50-mesh or coarser screens to avoid clogging. A 13-inch band application will reduce the total herbicide used in 40-inch rows by two-thirds.

Crop	Herbicide	Lbs active ingredient[1] needed per acre	Apply this amount commercial product	Application time	Remarks
Castorbeans	EPTC	2 to 3	1⅓ to 2 qt Eptam	Preplant or at planting	Immediately incorporate into the soil by double disking.
Corn	atrazine	2 to 3	2.5 to 3.75 lb Atrazine 80W	Preemergence	On sandy soil use only atrazine and at the 2 lb rate. 2,4-D may cause injury to corn. Atrazine does not control fall panicum.
	2,4-D ester	1 to 2	1 to 2 qt[3]		
	CDAA and TCBC	3½ + 7	5 qt Randox T		
Field beans	EPTC	3	2 qt Eptam	Preplant	Immediately incorporate into the soil by double disking.
Sorghum	CDAA	5 to 6	5 to 6 qt Randox	Preemergence	Randox controls annual grassy weeds. Heavy rains may leach herbicides and cause injury to germinating sorghum.
	propazine—for seed purposes only	3	3¾ lb Propazine 80W		
Soybeans	CDAA	5 to 6	5 to 6 qt Randox	Preemergence	Randox controls annual grassy weeds. Incorporate amiben if no rain occurs within 3 days of application.
	amiben	3	6 qt Amiben		
Sugar Beets	PEBC	3 to 4	2 to 2⅔ qt Tillam	Preplant	Immediately incorporate into the soil by double disking. Use four pound rate on heavier soils. Tillam does not control kochia.

FIELD CROPS—POSTEMERGENCE

Excellent growing conditions make weeds more susceptible to 2,4-D and other postemergence herbicides. Likewise, crops may be more subject to herbicide damage when they are growing rapidly. Adjust herbicide dosages downward when excellent conditions for growth are present and upward when ideal growth is limited by one or more factors.

Crop	Herbicide	Lbs active ingredient[1] needed per acre	Apply this amount commercial product	Application time	Remarks
Barley	2,4-D amine 2,4-D ester	½ to ¾ ¼ to ½	1 to 1½ pt[3] ½ to 1 pt[3]	5-leaf to early boot	Do not treat winter barley in the fall. Spray pennycress and mustards before April 15.
Corn	2,4-D amine 2,4-D ester	½ to 1 ¼ to ½	1 to 2 pt[3] ½ to 1 pt[3]	Before corn is 18″ high—over 18″ use drop nozzles	Later applications may cause brittleness and stalk breakage. Use lower rate when good growing conditions exist to reduce corn injury.
Flax	Dalapon MCPA	1 ¼	1¼ lb Dowpon ½ pt[3]	Before weeds are 1½″ tall	Dowpon and MCPA may be mixed for application.
Oats	2,4-D amine MCP	½ 1	1 pt[3] 1 qt[3]	6-leaf to flag leaf	Some injury may be expected at any stage with 2,4-D.
Sorghum	2,4-D amine 2,4-D ester	½ ¼	1 pt[3] ½ pt[3]	During the period sorghum is 4 to 12 inches high	Spraying before 4″ stage may inhibit root development, and spraying during the stage from 13″ through early boot may inhibit head development.
Sugar Beets	Dalapon	2	2½ lb Dowpon	Grassy weeds less than 2″ tall	For annual grasses.
Wheat	2,4-D amine 2,4-D ester	½ to ¾ ¼ to ½	1 to 1½ pt[3] ½ to 1 pt[3]	5-leaf to early boot	Do not treat winter wheat in the fall. Spray pennycress and mustards as soon as good growing conditions occur.

PASTURES, RANGES, AND FORAGE CROPS

Area or use	Herbicide	Lbs active ingredient[1] needed per acre	Apply this amount commercial product	Application time	Remarks
Alfalfa, and birdsfoot trefoil seedlings	EPTC	3	2 qt Eptam	Preplant	Incorporate into the soil by double disking. Do not graze forage within 60 days of treatment. Early legume injury may occur.
	dalapon	2 to 3	2½ to 3¾ lb Dowpon	2 to 4 weeks after alfalfa emerges when grass seedlings are less than 2″ tall	For annual grasses. Do not sell first year's crop or feed treated forage to lactating dairy cows or animals being finished for slaughter. Can be mixed with 4-(2,4-DB)
	4-(2,4-DB)	1	2 qt 2 lb/gal Butoxone or Butyrac	When weeds are mall	For broadleaf weeds. Do not use treated forage for 30 days.
Cool-season grass seedlings	2,4-D	½ to ¾	1 to 1½ pt[3]	2- to 4-leaf stage	For broadleaf weeds.
Warm-season grass seedlings	2,4-D	¼ to ½	½ to 1 pt[3]		
Warm-season grasses for seed	monuron, diuron or atrazine	3	3.75 lb Karmex, Telvar or Atrazine 80W	Spring or fall before weed emergence	For seed fields only. Do not use during year of establishment. Less effective in heavy residues.
Annual broadleaf weeds in pastures and ranges	2,4-D	1	1 qt[3]	When weeds are small	Apply in April for pennycress and other mustards.
Perennial broadleaf weeds in pastures and ranges	2,4-D	1 to 2	1 to 2 qt[3]	At bud stage of predominant weeds[2]. April for dandelions	Annual treatment for 2 to 3 years may be necessary.

NON-CROP AREAS

Area or use	Herbicide	Lbs active ingredient[1] needed per acre	Apply this amount commercial product	Application time	Remarks
Fence rows and roadsides (broadleaf weeds)	2,4-D	1	1 qt[3]	Weed height 2 to 4 inches	Repeat treatments may be necessary. Add 1 lb/acre of 2,4,5-T for wild rose and horse nettle.
Irrigation ditchbanks	monuron or diuron	8	10 lb Karmex or Telvar	Soon after ditches are open	Use enough water to insure good coverage. Use screens of 50 mesh or larger. Agitation required.
	simazine or atrazine	6	7½ lb Simazine 80W or Atrazine 80W	Before weeds appear or soon thereafter	Use enough water to insure good coverage. Agitation required.
Soil sterilant for drives, storage areas, industrial sites, parking lots, fence lines, etc.	diuron or monuron	10 to 20	12.5 to 25 lb Telvar or Karmex	Follow manufacturer's recommendations	Complete control of annuals, biennials, and most perennials. Consider possible damage to nearby trees, shrubs, and grass and possible movement of sterilant with water and wind before herbicides are leached into the soil.
	simazine or atrazine	10	12.5 lb Simazine 80W or Atrazine 80W		
	erbon	40 to 80	10 to 20 gal Novon concentrate or Baron		
	monuron-TCA		1 lb Urox per sq rd		
Mixtures	borate-monuron	Follow manufacturer's recommendations.	Ureabor		
	chlorate-borate		Polybor-chlorate, Chlorax, and Atlacide		
	chlorate-borate-monuron		Chlorea		
	simazine-amitrole		Amizine		
	silvex-dalapon		Garlon	Early weed growth	

LAWN AND TURF WEEDS

Weed	Herbicide	Lbs active ingredient[1] needed per acre	Apply this amount commercial product	Application time	Remarks
Broadleaf weeds such as dandelion, ragweed, field bindweed and plantain	2,4-D amine or silvex	1	2 tbs[3] per gallon of water per 1000 sq ft	Spring, summer, or fall	Avoid drift on desirable broadleafs. Do not use ester formulations of 2,4-D, damaging fumes drift unpredictable distances. Spray when calm.
Chickweed, henbit, violets and knotweed	silvex	Follow manufacturer's recommendations		Spring or fall	Use enough water to insure good coverage.
Crabgrass	AMA or DMA (organic arsenics)	Follow manufacturer's recommendations		After emergence	POISONOUS. Repeat treatment every 7 days for 2 or 3 applications. Also effective on foxtail.
	PMA		3 oz of 10% material/1000 sq ft	2 to 4 leaves on crabgrass	POISONOUS. Repeat treatment every 7 days for 3 applications. Also controls certain diseases.
	kerosene		1 qt/100 sq ft	2 to 4 leaves on crabgrass	Use water-white kerosene. Do not dilute. Apply when temperature is below 90° F.
Crabgrass, foxtail and other annual grasses	arsenicals	3 to 5 lb metalic arsenic/1000 sq ft	12 lb calcium arsenate, 24 lb lead arsenate	Preemergence (early spring before weeds germinate or late fall)	POISONOUS. Also controls certain insects. Use only on established grass. Rake lawn prior to application and water in.
	dacthal zytron	Follow manufacturer's recommendations		Preemergence in spring before weed seeds germinate	Use only on established grass. Rake lawn prior to application and water in.
Nimblewill	DMA or AMA plus 2,4-D zytron liquid	DMA or AMA rates suggested on container for crabgrass control plus 2,4-D at dandelion rate. Follow label recommendations on zytron.		When growing vigorously in June and July	Thoroughly wet all plants. Repeat applications three times at intervals of 7 to 10 days.
White clover	2,4-5-T or silvex	Follow manufacturer's recommendations		Spring or fall	Repeat treatments may be necessary.

TROUBLESOME WEEDS AND WOODY PLANTS

Weed	Herbicide	Lbs active ingredient[1] needed per acre	Apply this amount commercial product	Application time	Remarks
Buckbrush	2,4-D ester	1 to 2	1 to 2 qt[3]	Full foliage[2] (May 10 to 25)	Aerial equipment: apply chemical in 2 to 5 gal carrier/A. Ground equipment: use sufficient water to insure good coverage.
Bur ragweed (Franseria)	2,3,6,-TBA, and PBA as listed for field bindweed; erbon as listed for leafy spurge control.				
	2,4-D	2	2 qt[3]	During June[2]	Same as for field bindweed except amine formulations less effective. If soil moisture conditions are poor, use oil-water emulsions as a carrier.
Canada thistle	2,3,6-TBA, and PBA as listed for field bindweed control.				
	2,4-D	2	2 qt[3]	Spring (early bud) and fall (rosette)[2]	Same as for field bindweed.
	amitrole	4 to 6	8 to 12 lb Amino Triazole or Weedazol	Before bloom or on regrowth following mowing[2]	Use enough water to insure good coverage. Plan to treat for several consecutive years.
Cottonwood, willows and Chinese elm	2,4-D ester	2 to 4	2 to 4 qt[3]	Full foliage[2] (early June)	Aerial equipment: at least 5 gal carrier/A. Annual treatment for 2 to 3 years may be necessary. Basal treatment: 2 qt of herbicide/10 gal of diesel. Spray tree trunk to point of run-off.

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Weed	Herbicide	Lbs active ingredient needed per acre	Apply this amount commercial product	Application time	Remarks
Dogbane	2,4-D ester	1	1 qt[3]	Bud stage[2]	Use lower rates in crops.
Downy brome	atrazine	2	2.5 lb Atrazine 80W	Preemergence fall or spring prior to April 1	Use only in waste areas such as fence rows and ditchbanks. Do not use on cropland. Use sufficient water to insure good coverage.
	atrazine+amitrole monuron+amitrole	1+½ 1+½	1.25 lb Atrazine 80W or Telvar plus 1 lb of Amino Triazole or Weedazol	Postemergence in spring prior to April 10	
Field bindweed	2,4-D	1	1 qt[3]	Bud stage in spring and on vigorous fall growth[2]	Avoid tillage 10 to 12 weeks before and 1 to 2 weeks after application. Plan to treat for several consecutive years.
	2,3,6-TBA (Benzoic acid)	20	1½ lb/sq rd Granular TBA or ½ pt/sq rd Benzac 1281 or Trysben 200	Fall or spring	Do not disturb areas during year of application. Fall application more effective. High summer temperatures reduce effectiveness.
	PBA (Benzoic acid)	40	10 gal/A or ½ pt/sq rd of 4 lb/gal polychlorobenzoic acid	Fall or spring	Same as for 2,3,6-TBA.
Hoarycress (perennial peppergrass)	2,3-6-TBA, and PBA as listed for field bindweed control.				
	2,4-D	2 to 4	½ to 1 gal[3]	Early bud in spring or rosette stage in the fall[2]	Same as for field bindweed except amine formulations less effective.
Johnsongrass	TCA	80	100 lb 90% Sodium TCA	Early spring	Use enough water to insure good coverage. Retreat escaped plants.
	dalapon	5	7 lb Dowpon	8 to 12 inches new growth or regrowth[2]	Repeat treatment 3 times, 10 to 20 days apart.
	erbon	½ lb/sq rd	1 pt Novon Concentrate	Early spring	Use enough water to insure good coverage. Retreat escaped plants.
Leafy spurge	2,3-6-TBA, and PBA as listed for field bindweed control.				
	2,4-D	2	2 qt[3]	Early bud stage[2]	Same as for field bindweed except amine formulations less effective.
	AMS	4 lb/sq rd	4 lb Ammate X	Spring	Use enough water to insure good coverage. A sticker-spreader increases effectiveness.
	erbon	1 lb/sq rd	1 qt Novon Concentrate	Fall or spring	Use enough water to insure good coverage
Milkweed	amitrole	4	8 lb Amino Triazole or Weedazol	Bud to bloom stage[2]	Use enough water to insure good coverage
Nodding or musk thistle	2,4-D	1	1 qt[3]	Spring before flowering stalks lengthen and late fall treatment of rosettes[2]	A biennial. Chemicals other than 2,4-D not necessary for effective control.
Poison ivy	amitrole		2 tbs Amino Triazole or Weedazol/gal water	Full foliage (June)[2]	Thoroughly wet all vegetation.
	2,4,5-T or 2,4-D+2,4,5-T		2 tbs[3] per gallon water		
	AMS		¾ lb Ammate X/gal water		
Puncture vine	2,4-D ester	1	1 qt[3]	Pre-bud stage most effective	Mature burs not affected by 2,4-D.
Ragweed	2,4-D	1	1 qt[3]	Early summer[2]	Follow-up treatments may be necessary.

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Weed	Herbicide	Lbs active ingredient needed per acre	Apply this amount commercial product	Application time	Remarks
Russian knapweed	2,3,6-TBA, and PBA as suggested for field bindweed; erbon as listed for leafy spurge control.				
	2,4-D	2	2 qt[3]	Early bud stage[2]	Same as for field bindweed except amine formulations less effective.
Russian olive	2,4-D+2,4,5-T	1+1	2 qt[3]	Full foliage[2] (early June)	Same as for cottonwood.
Sagebrush (sand or green)	2,4-D ester	1	1 qt[3]	4 to 8 inches new growth (June)[2]	Same as for buckbrush.
Shatter cane	EPTC	3	2 qt Eptam	10 days prior to corn planting	Incorporate immediately by double disking. Surface plant 10 days later 1½″ deep. Delay cultivation until weeds appear.
Tanweed	2,4-D ester	1	1 qt[3]	When growing vigorously[2]	Controls top growth principally. Repeat treatment necessary.
Wild rose	2,4,5-T	1 to 2	1 to 2 qt[3]	Late spring or early summer[2]	Follow-up treatments may be necessary.
Yucca	silvex	2	2 qt Kuron	June[2]	Use diesel as a carrier.

[1] Refers to acid equivalent, phenol equivalent, or active ingredient as applicable.
[2] Retreatment may be necessary.
[3] Calculated on the basis of 4 lb/gal material. For other formulations see conversion table at right.

CONVERSION TABLE

Lb. of Active Ingredient Per Gal. of Commercial Product	Pints of Commercial Product Needed Per Acre to Give the Following Lbs. of Chemical Per Acre		
	¼ lb.	½ lb.	1 lb.
2.00	1	2	4
2.64	¾	1½	3
3.00	⅔	1⅓	2⅔
3.34	⅗	1⅕	2⅖
4.00	½	1	2
6.00	⅓	⅔	1⅓

CALIBRATION OF EQUIPMENT

Calibrate equipment before using to make sure that it will apply the desired amount of herbicide per acre. Thoroughly clean and check equipment to see that all parts are working. Select the speed at which the equipment is to be operated and drive around in the field to be sure that everything is working properly. Calibrate on ground that has the same compaction as ground on which the equipment will be used.

Sprayers

The number of gallons per acre a sprayer will discharge depends upon the ground speed, nozzle pressure, spacing of the nozzles, and size of nozzle opening (orifice). Herbicide formulations and temperatures also affect spray discharge.

Calibrating Broadcast Type Sprayers

1. Measure the effective width of the boom in feet. (Number of nozzles times the spacing between any two adjacent nozzles.)
2. Set nozzle height so there is a 50 percent overlap of the spray pattern or follow the manufacturer's recommendation.
3. Divide the width of the boom into 43,560 (the number of square feet in an acre) to get the number of feet of travel necessary to cover one acre.
4. Measure and stake off the number of feet you need to travel for one acre. (A fraction of an acre such as ¼ or ½ can be used.)
5. Fill the supply tank and boom with clean water at the starting point.
6. Spray the measured area exactly as you would in the field, using the same speed and pressure.
7. When you get to the end of the course immediately shut off the sprayer.
8. Measure carefully the number of gallons required to refill the spray tank. This is the volume of water the sprayer will deliver per acre (or fraction of acre as you determined in step 4.)
9. Use this calibration information to determine the amount of herbicide to apply to a given volume of water in the spray tank. Assume that you determined your sprayer applies 18 gallons per acre. If you want to spray four pounds of Randox (4 lb/gal) per acre, add one gallon of Randox to each 17 gallons of water in the spray tank.

Calibrating Band Sprayers

Most principles involved in broadcast sprayer calibration also apply to band applicators. For hand spray application use "E" type orifice tips. They deliver the same amount of spray material over the entire width of the spray pattern.

With 40″ row spacing on a planter, 13,080 feet of row are required for one acre. Traveling a distance of 327 feet with a 4-row planter is one-tenth of an acre (327 x 4=1308).

Begin band sprayer calibration by attaching plastic bags to each nozzle to catch its output. Assume your equipment is 4-row, you travel 327 feet and collect a total of one gallon of water from the four nozzles. The one gallon represents an application on one-tenth of an acre; therefore your sprayer is applying 10 gallons per acre on a broadcast basis. (If the nozzles were placed high enough the ten gallons would be sprayed over all the surface soil.) Nozzle height is an important factor in determining the dosage.

Carefully adjust the distance between the nozzles and the surface soil to obtain the desired spray band width. Adjusting the nozzle height so the 10 gallons of water is applied to a 20-inch band concentrates the spray on one-half the area so the application rate becomes 20 gallons per acre on the area sprayed; a 13-inch band concentrates the spray on one-third the area so the rate becomes 30 gallons per acre on the area sprayed; and a 10-inch band concentrates it on one-fourth the area making a rate of 40 gallons per acre.

Now add your chemical at the recommended dosage rate. Assume you are using amiben at 3 pounds per acre for preemergence weed control in soybeans. You determined your equipment is applying 30 gallons of water per acre sprayed in the 13-inch band. Add 6 quarts (1½ gallons) of amiben (2 pounds of active ingredient per gallon) to each 28½ gallons of water in your spray tank to obtain the proper mixture.

Granular Applicators

The calibration of band applicators for granular herbicides is similar to band spray calibration. There is one main difference—there is no adjustment for band width.

Set the rate control adjustment as suggested by the manufacturer. Add granules to the hopper. Attach bags or other containers so they collect all granules discharged by the applicator. If your unit is 4-row with 40″ spacing travel 327 feet (this represents one-tenth acre). Remove the collecting containers (they should all contain approximately the same amount) and carefully weigh together all the granules collected.

Assume you collected 4 ounces of granules. Your applicator is applying 4 x 10 or 40 ounces (2½ pounds) of granules. In case the rate should be increased or decreased change the rate control adjustment and recalibrate.