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Excellent weed control is possible in grain sorghum with mdoern, up-to-date herbicides.

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WEED CONTROL IN SORGHUM

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For many years sorghum was planted and cultivated with corn planting and cultivating equipment. Good weed control was difficult to obtain because the crop could not be cross-cultivated. Better annual weed control has been obtained with a rotary hoe, flextine harrow, and herbicides. Using corn planting equipment made it essential to plant sorghum in 40- to 42-inch rows; these newer implements and herbicides can be used on sorghum planted in narrower rows. Even though newer weed control methods are very helpful, it is frequently necessary to use at least one row-crop cultivation to get good weed control.

ROTARY HOE

The rotary hoe controls annual weeds early in the season. Its efficiency depends on pulling it at a speed of 8 to 10 miles per hour when the weeds are just emerging. Use a shield over the hoe or behind the tractor driver's head as protection from flying clods and stones. It is most effective if the soil is crusted as a result of drying after a rain; but it is also effective on moist soil. It may cover small plants growing in furrows, wheel tracks, or loose soil. If crop plants are large, hoe during the heat of the day to prevent breaking plants.

A much larger acreage can be hoed than can be row-crop cultivated in the same time. Although several hoeings are generally needed to replace one row-crop cultivation, two hoeings can be done for approximately the same cost as the first row-crop cultivation. (The first cultivation is slightly higher than later cultivations.) The rotary hoe is generally not effective if weed seedlings are big enough to develop a green color.

FLEXTINE HARROW

The flextine harrow is used much the same way as the rotary hoe except that it is operated more slowly. It is most effective at 2 miles per hour or less. The rotating action of the flexible tines make it effective for killing weed seedlings. As with the rotary hoe, a much larger acreage can be covered than with the row crop cultivator. Several harrowings are generally needed to replace one row-crop cultivation, but three harrowings can be made for about the same cost as the first cultivation. The harrow is most effective on weed seedlings ¼ inch high or less.

COSTS OF CULTIVATION

If labor is not considered, the cost of rotary hoeing is about 45 cents per acre, while the flextine harrow costs 21-24 cents per acre, and row-crop cultivation costs about 66 cents. If labor is worth $1.25 per hour, the costs increase to 67 cents, 35 cents, and 91 cents per acre, respectively. The first row-crop cultivation takes longer than others and the cost would be some higher than the 66 or 91 cents quoted here. Consequently two rotary hoeings or three harrowings can be done for approximately the same cost as the first row-crop cultivation.

SPRAYING WITH 2,4-D

Spray with ⅓ pound per acre of an ester of 2,4-D or ½ pound with an amine of 2,4-D when the sorghum is 4-12 inches tall to base of uppermost leaf to control broad-leaved annual weeds.

2,4-D is used for controlling broad-leaved weeds in sorghum. Forage sorghums are generally more tolerant to 2,4-D than grain sorghums unless the forage sorghums are grown for seed. Forage yields are seldom reduced by 2,4-D application, but treatment at the wrong time may decrease grain yields greatly.

Do not spray sorghums before they are 4 inches tall. Both forage and grain sorghums can be severely injured and sometimes killed if treated at this stage. The best time to spray is when plants are 4-12 inches tall. These heights are determined by measuring from

the ground up to where a new leaf is emerging. An application of ⅓ pound of 2,4-D acid in ester form or ½ pound in amine form during this period seldom causes a serious yield reduction. However, brace roots are sometimes injured. Severe injury may result in lodging.

Grain sorghum is in the most susceptible stage of development when approximately 12 inches tall. The head begins to develop within the plant only a few inches above the ground. Use a sharp knife or razor blade to slit the stalk. If the head can be seen, do not spray with 2,4-D.

Severe damage to grain yield results from 2,4-D application at the time that the sorghum is heading.

Little damage occurs from spraying after the grain has started to form. When the sorghum has reached this stage, annual weeds have already done their damage, but high clearance sprayers with drop nozzles should be used to spray perennial noxious weeds.

ATRAZINE

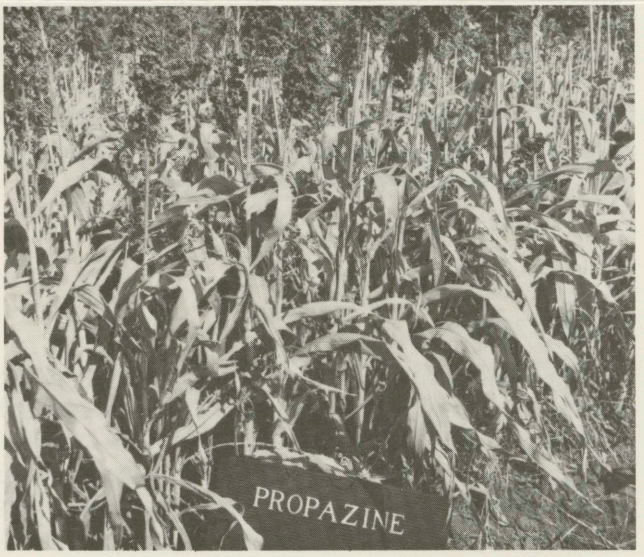
Atrazine may be applied as a pre-emergence or early post-emergence herbicide at 2-3 pounds active ingredient per acre to control most annual grassy and broad-leaved weeds. When making pre-emergence applications use the higher rate on heavy soils or soils high in organic matter (4 to 5%). See Table 1 for 1965 test results.

Do Not Use Atrazine As a Pre-Emergence Treatment on Light Sandy Soils.

Early post-emergence treatments may be made on light, medium or heavy soils. The sorghum root system has become established before chemical treatment hence less chance of injury on light soils prevails. Spray when sorghum seedlings are 2 to 4 inches tall and weeds are one inch or less tall.

For good results from pre-emergence applications at planting time (see figure 1) ½ to ¾ inch of rain is needed during the next two weeks following application. If less than ½ inch of rain falls within 2 weeks after application, rotary hoe or harrow to kill later emerging weeds. The tillage kills some weed seedlings and helps activate the herbicide to kill later germinating weeds.

In periods of low rainfall post-emergence applications may be more effective than pre-emergence. Atrazine sprays give contact kill of young weeds that are up without further rainfall. These applications leave herbicide residue on the soil for later growing weeds provided adequate moisture then falls for activation and weed control. Pre-emergence treatments will control sand burs while post-emergence treatments do not.



Figures 1, 2, 3. In figures 1 and 2 are seen grain sorghum plots where atrazine and propazine were applied respectively as pre-emergence treatments. Both of these treatments gave excellent late season weed control and increased the yield over the cultivated check (figure 3) approximately 1300 pounds per acre.

Band treatments should be 14 inches wide for best results. However, narrower bands should be used in listed sorghum.

Residue from over 1 pound per acre of this herbicide applied in sorghum 1 year generally damages the crop planted the next year. Damage from residue is reduced if the herbicide is applied in bands over the rows. Less area is covered and tillage, diagonally across the field, the following spring dilutes the residue by mixing treated soil with untreated soil. In one test, plowing reduced residual effect more than did disking.

Although an over-all application will replace one and sometimes two cultivations, the cost of the herbicide and the carry-over effect from chemical residues generally make it impractical to use such a treatment. Since the equivalent of two-row crop cultivations will generally be needed anyway, they will kill weeds between the rows.

Early post-emergence tests, with reduced rates of atrazine mixed with an emulsifiable dormant spray of oil and water, indicate effective results can be obtained while minimizing the problem of carry-over. However, further testing is needed before such a practice can be recommended.

Band treatments can be made with sprayer mounted on the planter or may be made later with a regular field sprayer that has nozzles spaced the same width as the rows.

Be sure that you have good agitation in the sprayer tank to keep atrazine in suspension. Use 15-20 gallons of water per acre on area treated. Use special nozzles that give uniform coverage over the entire width of the band and use 50-mesh nozzle screens. Nozzles on regular field sprayers are designed to overlap and deliver low volumes of water. Consequently, they do not give uniform coverage over the swath of any one nozzle. They are also equipped with fine screens.

PROPAZINE

Pre-emergence applications of propazine in grain sorghum control many of the same weeds as atrazine (see figure 2). Propazine is used at 2 pounds active ingredient per acre in medium to heavy soils only. See table 1 for 1965 test results.

Propazine, although similar to atrazine, can only be used as a pre-emergence herbicide. Like atrazine, it has a carry-over problem of chemical residue and resultant damage to small grains planted the following year.

In making propazine applications use large mesh screens, good tank agitation and 15 to 20 gallons of water per acre to the area treated as with atrazine treatments. Propazine hasn't given good control of sandburs.

Band treatments should be 14 inches wide for best results. However, narrower bands can be used in listed sorghum.

CDAA

Use 4 pounds of active ingredient per acre of CDAA (tradename Randox) to replace first cultivation for controlling annual grassy weeds. Granules are recommended in preference to sprays.

This chemical controls most annual grasses if applied pre-emergence to warm soil (60-65 F.) and if a minimum of ½ to ¾ inch of rain falls during the first week after application. CDAA generally gives better weed control on heavy soils high in organic matter than on light soils low in organic matter. It is relatively volatile and relatively emulsifiable in water. Therefore, it must be leached into the soil before it volatilizes, but heavy rain (2½ inches) may leach sprays beyond the root zone of weed seedlings.

Granules are effective over a wider range of conditions. They are effective if applied to cool soil, are not rendered ineffective by heavy rains, and are effective if rain is not received for 10 days or 2 weeks.

Rainfall records during 1952-61, indicate that the rainfall at sorghum planting time would have been adequate to activate CDAA sprays and give good weed control in eastern South Dakota 5 out of the 10 years. Granules would have been effective 7 or 8 years.

CDAA gives weed control for a shorter period of time than atrazine and does not give good weed control as often as atrazine, but does not leave a chemical residue that will damage next year's crop.

CDAA spray has a repulsive odor and is very irritating to the skin. The fumes irritate the eyes. Granules are much less irritable to handle. If you use a spray, wear goggles and protective clothing when spraying. You may want to use rubber gloves and a respirator when putting the chemical into the sprayer.

An over-all application seldom replaces more than

Table 1. 1965 Sorghum Weed Control Demonstrations

Herbicide	Rate/Aacre	Weed Control*	
		Grass	Broad-leaved
Atrazine (pre)	2½ lbs.	87	93
Atrazine (post)	2½ lbs.	90	100
Propazine	2½ lbs.	87	93
CDAA (granules)	4 lbs.	52	53
Check	-----	0	0

*Average estimate of percent weed control in August for 5 counties.

the first row-crop cultivation. Since cultivations are generally required to give good weed control, they will control weeds between rows and there is no point in making over-all treatments.

Band treatments should be 14 inches wide for best results. However, narrower bands should be used in listed sorghum.

COST OF HERBICIDES

The cost of application is very small if applied with a planter attachment; however, it is about 75 cents per acre if a field sprayer is used after planting.

Table 2 lists current prices on treatments with atrazine, propazine and CDAA.

Table 2. Chemical Costs

Herbicide Treatment*	Cost of Product**	Cost per lbs. active	Cost of treatment*** 14" band	overall
Atrazine (WP)	$2.45 pp	$3.00	$2.00 to 3.00	$6.00 to 9.00
Propazine (WP)	2.85 pp	3.56	2.37	7.12
CDAA (EC)	7.80 pg	1.95	2.60	7.80
CDAA (granules)	0.44 pp	2.20	2.93	8.80

*WP equals wettable powder, EC equals emulsifiable concentrate. Atrazine and propazine are formulated as 80% wettable powders. CDAA is formulated as a 4 pounds per gallon emulsifiable concentrate or a 20% granule.

**pp equals price per pound; pg equals price per gallon.

***Costs of herbicide treatments are based on current suggested retail prices at this writing. To obtain cost for 7 inch band divide cost of 14 inch band by 2.

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