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Weed Control

Herbicides for Grain Sorghum 1984

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Federal regulations on the use of herbicides change frequently, so stay informed on the status of label registration. To the best of our knowledge, this guide sheet conforms to laws and regulations at the time of writing.

You must read and understand the labels on herbicides you plan to use. You may legally use a herbicide at lower than label rates, but you must not exceed those label rates.

About the tables. An attempt has been made to list herbicides and their combinations, so you can easily compare rates of product and active ingredient, broadleaf or grassy weed control, proper applications, and some of the limitations. Not all information is listed in the tables. For more information on such things as organic matter content, please refer to the label.

Label rates take precedence over rates included in this guide sheet.

Several abbreviations are used in Tables 1 and 2. Liquids are listed by label reference and are abbreviated as follows: L = Liquid; E or EC = emulsifiable concentrate; F or FL = flowable liquids; and MTF = multiple temperature flowables. Dry formulations which can be mixed in water are: DF = dry flowable and W = wettable powders. Granules (G) are dry formulations that cannot be mixed with water but must be applied as purchased. The italicized formulations are the ones used as examples in the column, "Rate of product/acre." One pound of active ingredient of a herbicide is equal to 1 quart of 4L, 1.1 pounds of 90 percent DF, or 1.25 pounds of 80 percent W formulation.

Herbicide performance. Information included in this guide sheet is based on research and comparative performance over a period of years. However, herbicide performance depends on many factors that cannot be controlled or foretold. (See Guide 4903,

"Factors Affecting Herbicide Performance.") Results may vary widely from those normally expected. This information does not and cannot imply satisfactory performance in all cases. An element of risk is involved in the use of any herbicide. We have made no effort to list treatments in order of preference in this guide sheet.

Comparative performance with emphasis on weed control and crop tolerance is a major factor in herbicide evaluation. Cost has not been considered in this publication. The use of herbicides alone will not solve all weed problems because no herbicide treatment is superior in all circumstances. The use of herbicides in conjunction with good cultural and management practices will help control weeds. In the fall before planting, survey the fields in which you plan to grow sorghum. This will give you an indication as to whether you can expect more of a problem with broadleaf weeds or grasses, and it will help you identify individual weed species that may be a problem next year.

Using preplant herbicides

There are no sorghum herbicides labeled for preplant incorporation only, as there are with some other crops. However, Dual, Lasso, Igran, and limited applications of atrazine and Milogard are labeled for shallow incorporation. This process is often called surface blending. These treatments may have an advantage in a dry spring if rain does not fall within about seven days after application. Treatments that may be applied preplant and shallowly incorporated are designated by the phrase *may be* under the PPI column of Table 1. Comments about specific herbicides and their potential for preplant use can be found in the next section, "Using pre-emergence herbicides."

Using pre-emergence herbicides

Pre-emergence herbicides are applied after planting but before sorghum emergence. Rainfall or irrigation is necessary to activate these herbicides. If rainfall does not occur within about seven days after application, a light cultivation may be necessary to control the weeds that may emerge with the crop. Igran or Modown may cause injury to the sorghum crop if it's splashed onto the emerged plants by rainfall.

Atrazine. Atrazine is labeled by some manufacturers for use as a preplant incorporated herbicide. However, restrictions on soil type and organic matter

Table 1. Preplant or Pre-emergence.

Herbicide	Formulation	Soil	Product	Rate/acre	Preplant incorporation	Weeds controlled		Limitations
				Active Ingredient (lbs./acre)		Grass	Broadleaf	
Atrazine	4L,90%DF, 80%W	coarse medium fine	3.2 pts. 4.0 pts.	do not use (1.6) (2.0)	may be	few	yes	Do not use on medium or fine-textured soils with less than 1% organic matter
Dual	8E	coarse medium fine	1.5 pts. 2.0 pts. 2.5 pts.	(1.5) (2.0) (2.5)	may be	yes	few	Use Concep II treated seed.
Dual + Atrazine (tank mix or Bicep package)	8E 4L,90%DF 80%W	coarse medium fine	1.5 pt. + 1.3 lb. 2.0 pts. + 1.8 lb.	do not use (1.5 + 1.1) (1.8 + 1.6)	may be	yes	yes	Use Concep II treated seed. Do not use on medium textured soils with less than 1.5% organic matter.
Lasso	4EC	coarse & medium fine	3.0 qts. 4.0 qts.	(3.0) (4.0)	may be	yes	few	Use Screen treated seed.
Lasso + Atrazine (tank mix or package)	4EC 4L,90%DF, 80%W	coarse medium fine	2.0 qts. + 1 qt. 2 qts. + 1.25 qts. 2.25 qts. + 1.5 qts.	(2.0 + 1.0) (2.0 + 1.25) (2.25 + 1.5)	may be	yes	yes	Do not use on sand. Use Screen treated seed.
Ramrod	4FL 65%W 20 G	all	4.0 qts. - 5.0 qts.	(4.0 - 5.0)	no	yes	few	Use higher rates on soils with higher organic matter (greater than 3%) or in areas with heavy weed infestations.
Ramrod + Atrazine (tank mix or package)	4FL,65%W 4L,90% DF,80%W	coarse medium fine	3 qts. + 1.2 qts. 3 qts. + 1.4 qts.	do not use (3 + 1.2) (3 + 1.4)	no	yes	yes	May be used on coarse-textured soils with organic matter greater than 3%.
Milogard	4L, 90%DF, 80%W	loamy sand sandy loam loam and finer	4 pts. 4.8 pts.	do not use (2.0) (2.4)	no	few	yes	Not registered for preplant application in Missouri.
Dual + Milogard (tank mix or Milocep package)	8E 4L,90%DF, 80%W	coarse medium fine	1.9 pt. + 1.0 lb. 2.1 pts. + 1.3 lb.	do not use (1.9 + 0.8) (2.1 + 1.0)	may be	yes	yes	Use Concep II treated seed. May be used on sandy loam soils.

Lasso + Milogard	4EC 4L,90DF, 80%W	coarse medium fine	2 qts. + 1 lb. 2.5 qts. + 1.3 lb. 3 qts. + 1.3 lb.	(2.0 + 0.8) (2.5 + 1.0) (3.0 + 1.0)	no	yes	yes	Use Screen treated seed. On coarse soils with less than 1% organic matter, reduce Milogard rates according to label.
Ramrod + Milogard	4FL,65%W 4L, 90%DF, 80%W	coarse medium and fine	2.5 qts. + 0.8 qt. 3 qts. + 1 qt.	(2.5 + 0.8) (3.0 + 1.0)	no	yes	yes	On coarse-textured soils with less than 1% organic matter, reduce Milogard rates according to label.
Bladex + Ramrod	4L,80W 65%W	sandy loam silt loam clay loam	1.0 qt. + 3.6 lbs. 1.2 qt. + 4.5 lbs. 1.4 qt. + 5.1 lbs.	(1.0 + 2.4) (1.2 + 3.0) (1.4 + 3.4)	no	yes	yes	Do not use on sand or loamy sand.
Igran	80%W	sand loamy sand & medium fine	do not use 2.5 lbs. 3.0 lbs.	(2.0) (2.4)	may be	some	some	Do not apply to emerged sorghum.
Dual + Igran	8E 80%W	coarse medium fine	1.25 pt. + 1.5 lb. 1.75 pt. + 2.2 lbs. 2.0 pt. + 2.5 lbs.	(1.25 + 1.1) (1.75 + 1.75) (2.0 + 2.0)	may be	yes	yes	Use Concep II treat-seed.
Igran + Atrazine	80%W 4L,90%DF, 80%W	sandy loam loam and finer	do not use 2.0 lbs. + 1.0 lb.	(1.6 + 0.8)	may be	some	yes	Do not apply to emerged sorghum.
Igran + Milogard	80%W 4L,90%DF, 80%W	sandy loam loam and finer	2.0 lbs. + 0.5 lb. do not use	(1.6 + 0.4)	may be	yes	yes	Do not apply to emerged sorghum. Do not use on sand.
Modown	4F 80%W	all	3 - 4 pts.	(1.5 - 2.0)	no	no	yes	Do not use on sweet sorghums or sorghum sudans.
Modown + Ramrod	4F 4FL 65%W	coarse medium and fine	3 qts. + 1.25 qt. 4 qts. + 1.5 qt.	(3 + 1.25) (4 + 1.5)	no	yes	yes	Do not apply after sorghum has begun to crack the soil just before emergence.
Lasso + Modown	4EC 4F,80%W	coarse medium fine	2 qts. + 1.25 qt. 2.5 qts. + 1.6 qt. 3 qts. + 1.6 qt.	(2 + 1.25) (2.5 + 1.6) (3 lb. + 1.6)	no	yes	yes	Do not apply after sorghum has begun to crack the soil surface just before emergence.

Table 2. Postemergence herbicides for grain sorghum.

Herbicide	Form	Soil	Product	Rate/acre	Active Ingredient (lbs./acre)	Weeds controlled		Limitations
						Grass	Broadleaf	
<i>Broadcast or banded</i>								
Atrazine	4L 90%DF,80%W		4.0 - 6.0 pts.		(2.0 to 3.0)	some	yes	Apply before weeds reach 1.5 inches in height.
Atrazine + crop oil concentrate	4L,90%DF,80%W		2.4 pts. + 1 qt.		(1.2)	yes	yes	May cause crop injury. Apply after sorghum reaches 3-leaf stage.
2,4-D Amine	4L		1.0 to 1.5 pt.		(0.5 to 0.75)	no	yes	Do not apply during boot, flowering, or dough stage.
Banvel	4L, 2L		0.5 pt.		(0.25)	no	yes	Apply before sorghum is 15 inches tall or 25 days after emergence.
Brominal	ME4		0.5 pt. - 1 pt.		(1.25 - 0.5)	no	yes	Do not apply when foliage is wet.
<i>Directed sprays</i>								
Paraquat	2CL		1.0 pt. - 2.0 pts.		(0.25 lb. - 0.5)	yes	yes	Keep spray off all but the lowest 3 inches of the sorghum plants. Follow other height restrictions.
Lorox	4L,50%W		1.0 pt. - 2.0 pts.		(0.5 - 1.0)	yes	yes	Same as above.
<i>Postemergence Incorporated</i>								
Treflan	4EC,4MTF	coarse medium fine	0.75 pt. 1.0 pt. 1.5 pt.		(0.38) (0.5) (0.75)	yes	few	Cultivation before and after application is required.
Prowl	4L	coarse medium fine	1.5 pt. 2.5 pt. 3.0 pt.		(0.75) (1.25) (1.5)	yes	few	Same as above.
Prowl + Atrazine	4L 4L,90%DF,80%W	coarse medium fine	2.0 pts. + 1.25 lb. 2.5 pts. + 1.25 lb.	do not use	(1.0 + 1.0) (1.25 + 1.0)	yes	yes	Same as above.
<i>Spot treatment or rope wick application</i>								
Roundup	4L		1 gal. in 2 gals. water: wick 1 gal. in 9 gals. water: roller applicator 1 gal. in 19 gals. water: roller applicator			yes no yes	yes yes no	Apply when weeds are at least 6 inches above sorghum canopy.

content are stringent and must be observed. Pre-emergence applications of atrazine are also labeled, but crop injury is possible. Crop injury may increase when you use planter press wheels that form a depression in the soil. This permits soil containing atrazine to be moved by heavy rains and concentrate in areas above the seed. Atrazine acts mainly through root absorption.

Dual (metolachlor). This herbicide offers excellent control of grassy weeds and some small-seeded broadleaf weeds.

Only seed properly treated with the seed protectant Concep II should be planted, or crop injury is likely.

For preplant treatments, a shallow incorporation to mix the herbicide in the upper 1 to 2 inches of soil should be used. Do not apply more than seven days before planting. Incorporation works best when little rainfall follows application and planting. Heavy rains after incorporation may reduce herbicide effectiveness. Pre-emergence applications are most effective when subsequent rainfall activates the herbicide. High soil moisture before crop emergence may cause injury, but the crop can be expected to outgrow this effect. If dry weather follows a pre-emergence treatment, cultivate to remove weeds emerging after planting. Dual acts mainly through shoot absorption.

Lasso (alachlor). Lasso offers excellent control of grassy weeds and some small-seeded broadleaf weeds. Control is comparable to that of Dual and better than propachlor in most instances. For control of specific weeds, observe label recommendations of the various herbicides.

Only seed properly treated with the seed protectant Screen should be planted, or crop injury is likely.

When using Lasso preplant, apply it within seven days before planting, and shallowly incorporate into the upper 1 to 2 inches of soil. Incorporation is not recommended on coarse soils. Lasso acts mainly through shoot absorption.

Ramrod (propachlor). Because this herbicide is registered only for pre-emergence uses, moisture is required after application to activate this product. On coarse soils, $\frac{1}{2}$ inch of rainfall is required. On medium and fine-textured soils high in organic matter, $\frac{1}{3}$ to $\frac{3}{4}$ inch of rainfall is required. Less rainfall is required to activate Ramrod than Dual or Lasso. Better weed control results from moisture within 10 days after application. Generally, lower amounts of rainfall are necessary when soil moisture is high at time of application. On coarse-textured soils low in organic matter, heavy rains may leach Ramrod below the zone where weed seeds germinate, resulting in poor weed control. Ramrod is superior to Dual or Lasso for control of grassy weeds on fine-textured soils, but it is inferior on coarse and medium-textured soils. Ramrod is a mild irritant to the skin and mucous membranes. Follow label precautions when handling it. Ramrod acts mainly through shoot absorption.

Milogard (propazine). Milogard is a triazine herbicide that may remain in the soil longer than any of the other herbicides labeled for use in grain sorghum. It is **not** labeled as a preplant incorporated treatment when used by itself, but it may be incorporated when used in conjunction with certain other herbicides. Milogard carryover depends on soil type, pH, and organic matter, so **carefully** observe label recommendations. Milogard offers good control of broadleaf weeds, but it controls few grasses. Milogard is absorbed primarily through plant roots.

Bladex (cyanazine). This triazine herbicide is labeled only as a pre-emergence tank mix with Ramrod. Bladex can cause crop injury, especially if heavy rains follow a pre-emergence application, and must not be applied after the sorghum crop begins to emerge. Bladex is absorbed principally by plant roots when it's used as a pre-emergence treatment.

Igran (terbutryn). Igran is a triazine herbicide that gives better grass control than other triazines, especially on emerged seedlings. It should be shallowly incorporated into the top 1 to 2 inches of soil within two weeks of planting when it's applied preplant. This herbicide has generally not performed as well as atrazine for broadleaf control in Missouri. Crop injury may result from raindrops splashing treated soil onto emerged sorghum seedlings. Igran performs better when used in combination with other herbicides than it does by itself. Igran is absorbed by roots and foliage. The foliar activity of Igran makes it a good burn-down chemical for use in no-till cropping systems.

Modown (bifenox). This herbicide works well on broadleaf weeds, but it controls only a few grasses. Heavy rains after application may leach the herbicide below the zone where weed seeds germinate, resulting in poor weed control. Modown may injure sorghum from splattering if no rainfall has fallen between application and sorghum emergence. A light cultivation may prevent injury. Modown should not be applied after sorghum seedlings begin to emerge.

Mixtures. Mixtures of herbicides usually give a broader spectrum of weed control than one herbicide alone. Notice that atrazine is recommended as a preplant incorporated treatment when applied in combination with Dual or Lasso. That's because the rates of atrazine necessary for satisfactory broadleaf weed control are lower than those for grassy weed control. Consequently, injury to the sorghum crop is less likely with these lower atrazine rates. Also, the added grass control from the other herbicides broadens the spectrum of weed control.

Some herbicides, such as Milogard, are labeled for preplant incorporated use as a tank-mixture, but they are not labeled for that use when applied alone, so be sure to read and follow label directions.

Using postemergence herbicides

Postemergence herbicides can be used after the crop and weeds emerge. Herbicides are available that will

give both broadleaf and grass control, but grass control is more difficult to achieve. Broadcast sprays, post-directed sprays, and postemergence incorporated treatments are all registered for use in Missouri. Some labels allow the use of surfactants and crop oil concentrates in conjunction with the herbicide, and some do not. Because the additions of surfactants or crop oils increase the chances of crop injury, read and follow the label carefully. Do not mix herbicides with fertilizer solution for postemergence uses.

Atrazine. Apply before weeds reach 1.5 inches in height, or poor weed control may result. If you're adding crop oil or crop oil concentrate to improve grass control (not all atrazine manufacturers allow this treatment by their label specifications), apply after sorghum reaches the 3-leaf stage. Do not use oil when sorghum is under stress or when sorghum is wet and succulent from recent rainfall, as crop injury may result. Adding crop oil to atrazine has resulted in injury too often to be recommended for general use.

Banvel (dicamba). Banvel offers excellent control of broadleaf weeds. Sorghum growing under stress is more likely to be injured by Banvel. Banvel applied when sorghum is rapidly growing may cause temporary rolling or leaning of the plants. Application after the sorghum crop has reached 15 inches in height or 25 days after emergence can cause partial or complete sterility in the developing head. Banvel can be applied any time before that. Take care to minimize drift to sensitive, desirable plants.

Brominal (bromoxynil). This treatment for broadleafed weeds has not been researched extensively yet, but advantages seem to be its relative crop safety and fewer problems with drift to sensitive plants. Do not spray when foliage is wet from rain, dew, or irrigation because leaf tip burn may result.

2,4-D Amine. Most annual broadleaf weeds in grain sorghum can be controlled with 2,4-D amine. Ester formulations are not labeled for use in grain sorghum. Sorghum is most tolerant to 2,4-D amine when it is 4 to 20 inches tall. Injury may occur if applications are made before the 4-inch stage or after head exertion has begun. After sorghum reaches 15 inches in height, use drop nozzles to minimize contact with foliage. Poor weed control can often be attributed to application after weeds are too big. To reduce breakage of stalks, from temporary brittleness caused by 2,4-D, delay cultivation for eight to 10 days after treatment. Take care to minimize drift to sensitive plants. Label directions and precautions vary among different brands of 2,4-D, so follow the label recommendations on the specific brand of 2,4-D used.

Lorox (linuron). This herbicide is considered a contact herbicide and is labeled for use as a directed spray in sorghum. The nozzles must be arranged to keep the herbicide off the upper sorghum leaves. Ideally, a skid boot system or something equivalent should be used to keep the boom height constant. Drop nozzles will

Table 3. Grazing restrictions.

Atrazine: Do not graze or feed treated forage for 21 days after application.
Dual: none.
Lasso: none.
Ramrod: Do not graze or feed sorghum forage, silage, or fodder from treated fields to dairy animals.
Milogard: not listed on label.
Igran: Do not graze or feed forage from treated areas.
Bladex: none.
Modown: none.
2,4-D: none.
Banvel: Do not graze or feed treated sorghum, forage, or silage before mature grain stage.
Brominal: Do not graze treated fields or cut for feed within 30 days of application.
Prowl: none.
Treflan: none.
Lorox: Do not graze or feed treated plants within three months of application.
Paraquat: none.
Roundup: Do not feed or graze treated areas within eight weeks after application.

allow the spray to be directed between the rows and kept off all but the lower 3 inches of the sorghum plant. The lower leaves of the crop are likely to be killed. Treat when sorghum is 12 inches tall or more.

Very careful application is necessary.

Paraquat. This contact herbicide should be applied as a directed spray in a manner similar to that of Lorox. Lower leaves that receive the spray are likely to be killed. Apply when sorghum is 15 inches tall or, if drop nozzles are used, 18 inches. Paraquat may be used as a burn-down treatment for no-till planting (see Guide 4905).

Prowl (pendimethalin). The sorghum field must be cultivated and all emerged weeds destroyed before application. Cultivation before application should throw at least 1 inch of soil over the base of the sorghum plants to prevent brace root damage. Prowl treatments to control grassy weeds can be applied after the sorghum crop is 4 inches tall until the last cultivation at layby. Drop nozzles should be used if sorghum foliage would prevent uniform coverage of the soil surface. After Prowl application, a cultivation to uniformly incorporate the herbicide to a depth of 1 to 2 inches is necessary. Some treated soil should be moved over the base of the sorghum plants to prevent weed emergence in the row. Rolling cultivators work best for the incorporation cultivation, but sweep cultivation will work if several narrow sweeps are used. Incorporate as soon as possible after spraying for best results, but it must be done within three days. Prowl is absorbed primarily by emerging shoots.

Do not apply preplant incorporated or pre-emergence.

Treflan (trifluralin). Treflan can be applied over the top of grain sorghum 8 inches or taller to control grassy weeds. Soil must be cultivated before application to remove established weeds and to cover the base of the sorghum plants with 1 inch of soil. Apply Treflan after the crop is well established (8 inches or taller) as either an over-the-top spray or as a directed spray. Use drop nozzles if foliage prevents uniform coverage of the soil surface. Herbicide incorporation must be completed within 24 hours after herbicide application and may be accomplished with a sweep type cultivator or a rolling cultivator. When using a sweep type cultivator you should have three to five sweeps per row middle and the machine should be operated at 6 to 8 miles per hour. Set the middle sweeps to avoid exposing untreated soil. Treflan is absorbed primarily by emerging shoots.

Do not apply preplant incorporated or pre-emergence.

Table 4. Storage restrictions for liquid or flowable grain sorghum herbicides

Atrazine: Very stable over several years with only slight sensitivity to extreme temperatures.

Dual: This product may be stored at temperatures down to -30 degrees F.

Lasso: Store above 32 degrees F to keep product in solution. Below 32 degrees F, crystals may form and settle to the bottom. If crystals form, place in a warm room (72 degrees F), and shake the container frequently for several days to re-dissolve before using.

Ramrod: Store above 20 degrees F and below 100 degrees F to keep liquid in suspension. Below 20 degrees F the product may freeze. If frozen, mix well to re-suspend when temperature is above 40 degrees F. Above 100 degrees F, the product may become thick and unsprayable.

Milogard: Very stable over several years with only slight sensitivity to extreme temperatures.

Bladex: none.

Modown: If exposed to freezing temperatures, store at temperatures above 55 degrees F for 24 hours or until completely thawed. Shake well before using.

2,4-D: If exposed to subfreezing temperatures, warm to at least 40 degrees F, and mix thoroughly before using.

Banvel: All formulations are extremely stable.

Brominal: Not listed on label.

Prowl 4E: Do not store below 40 degrees F.

Treflan EC: Avoid freezing. Store above 40 degrees F. If frozen, poor weed control may result. Do not store near heat or flame. MTF (Multiple Temperature Formulation) may be stored in unheated facilities.

Lorox: Do not freeze.

Paraquat: Store at temperatures above 32 degrees F.

Roundup: It will freeze at temperatures below -20 degrees F, but it will go back into solution upon thawing. It is stable up to 140 degrees F.

Roundup (glyphosate). This herbicide is registered for spot treatment to control hard-to-kill weeds in grain sorghum. It will kill the crop plants in the treated spots. Apply according to label instructions. Roundup can also be used with a wiper applicator. Mix 1 gallon of Roundup in 2 gallons of water and in severe weed infestation, reduce ground speed. Also, a trip in the opposite direction may be beneficial. This treatment is especially good for Johnsongrass and shattercane control when it's applied to the weeds during the boot stage. Sorghum is very susceptible to Roundup, so make sure that the herbicide does not contact the grain sorghum foliage. Roundup may also be used before no-till planting of sorghum.

Information about grazing restrictions, storage precautions, and crop rotation restrictions are listed in Tables 3, 4, and 5.

Table 5. Crop rotation restrictions.

Atrazine: If application is made after June 10, do not rotate with crops other than corn or sorghum the next year. Winter wheat may be planted 15 months after atrazine application if the broadcast rate was less than 1½ lb./acre.

Dual: Barley, oats, rye, or wheat may be planted 4½ months after a preplant or pre-emergence treatment.

Lasso: none.

Ramrod: none.

Milogard: Corn may be planted 12 months after treatment. Do not plant other crops for 18 months. Sorghum may be replanted in soil treated with Milogard.

Igran: Wheat may be planted four months after application. All other crops may be planted seven months after application.

Bladex: none.

Modown: Do not plant crops other than corn, soybeans, grain sorghum, small grains, or rice until the following year.

2,4-D: none.

Banvel: All crop uses of Banvel are intended for a normal growing interval between planting and harvest. If this interval is shortened, such as in cover crops that will be plowed under, do not follow up with the planting of a sensitive crop.

Brominal: Winter wheat and other crops may be planted the following season.

Prowl: Other crops can be planted the following year. Winter wheat and winter barley may be planted in a tilled seedbed 120 days after application unless crop failure or destruction occurs.

Treflan: If annual rainfall since application has exceeded 20 inches, rotational restrictions apply only for sugar beets.

Lorox: After four months any crop can be planted.

Paraquat: none.

Roundup: none.

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