

## WEED CONTROL IN NO-TILL SOYBEANS

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Weed control in no-till planted soybeans is almost completely dependent upon herbicides. no-till soybeans are most commonly planted as a doublecrop following winter small grain harvest. In some cases the small grain winter cover crop may be grazed, cut for hay or silage, or left as a mulch. Occasionally soybeans are no-till planted into Previous crop residues. In each of these cropping systems, herbicides must be applied to control any grass and broadleaf weeds present at planting, kill any cover crop, and provide residual action against germinating weed seeds. Therefore, a herbicide treatment for no-till soybeans must serve a dual purpose--kill existing vegetation at planting and provide residual weed control. A postemergence herbicide may also be needed to control broadleaf weeds 3 to 4 weeks after soybean planting for a complete weed control program.

### Weed Control Methods

In planning a weed control program, four methods should be considered: 1) crop rotations, 2) crop competition, 3) cultivation including seedbed preparation, and 4) herbicides. How do these apply to no-till planted soybeans?

Crop Rotation. Most growers fail to realize the value of crop rotation for weed control. Certain weeds may be easier or cheaper to control in corn than in soybeans and vice versa. For example, large-seeded broadleaf weeds, such as cocklebur, jimsonweed, and Pennsylvania smartweed, can be easily controlled in corn with preemergence herbicides or by a postemergence application of 2,4-D, Banvel, Evik, or Lorox over a period of several weeks. Thus in corn, you have greater flexibility in time of application, number of applications, and herbicide selection. For economical control, these weeds are more difficult to control with preemergence herbicides in soybeans and timing of postemergence applications is very critical and some crop injury may occur. This again emphasizes the need for greater managerial skills in a no-till system. Rotating crops also helps prevent buildup of problem weeds because we are able to use different herbicides to control a broader spectrum of weed species. The rotation of herbicides, as well, will reduce the possibilities of herbicide buildup in the soil.

Crop Competition. Crop competition is vital to the overall management system of no-till and especially doublecrop soybeans. These later plantings should be in narrow rows, 15 to 20 inches. Soybean plants in narrow rows form a canopy a few weeks after planting to successfully shade out weeds germinating later. Cultural practices, such as good seed, proper fertilization and liming, effective insect and disease control, and narrow rows are very important in giving the crop the competitive edge in shading out weeds late in the season. Dense small grain stands can also reduce the potential weed infestation and weed size at planting time for doublecrop no-till soybeans.

Cultivation and Seedbed Preparation. If the weeds present dictate cultivation and/or plowing or disking for seedbed preparation, then no-till is not the planting system to choose. For example, johnsongrass, bermudagrass, and yellow and purple nutsedge cannot be controlled well enough in a no-till system. However, certain preplant soil incorporated herbicides are effective in controlling these perennial weeds.

In no-till doublecrop soybeans, our experience indicates that the small grain should be planted in a conventional seedbed rather than overseeding it in the previous crop. The stand of small grains has been better and hence greater yields. Also weed control and yield of the no-till planted soybeans have been greater following small grains which were conventionally planted. When fields are fall tilled and planted to small grains, cutleaf evening-primrose, horseweed, whitehead aster, and wild lettuce, which are difficult to control with paraquat, are not a problem. In addition, perennial weeds such as trumpet creeper, horsenettle and briars are less prevalent where fields have been tilled in the fall. The effects of tillage on weed control is one reason we do not advocate continuous no-till planting but do suggest no-till as one alternative planting system within a total crop management system.

Herbicides. To plan a weed control program for no-till planted soybeans, you must know the weeds present in the field, the soil organic matter and texture, and the capabilities of herbicides labeled for no-till soybeans. The first step in any weed control program is to identify the weeds present. Survey your fields in the late summer or fall for the next year's crop, because the weeds present in the fall will surely be back next year. Record the weeds identified and their severity on a "weed map" of your farm. First, the existing weeds will indicate whether or not to no-till plant. Next they aid in selecting the herbicide to provide residual weed control and in determining possible needs for additional postemergence applied herbicides. The weeds present at planting and their size will influence the choice and rate of the herbicide to control existing vegetation and will further help in selecting preemergence and postemergence herbicides. To select the appropriate herbicide and rate for your soil, the soil organic matter and soil type must be known. Once the weeds have been identified and the organic matter and soil texture determined, you must match this information with the capabilities and limitations of herbicides labeled for use in no-till soybeans.

The tank mixtures of herbicides labeled for planting treatments in no-till soybeans are listed in Table 1. Paraquat and Roundup kill emerged annual grass and broadleaf weeds. Residual control of annual grass and broadleaf weeds is provided by Lorox, Lexone (or Sencor), Lasso, or Surflan in the combinations as listed. The rate ranges in pounds of active ingredient per acre are also indicated. Specific rates for the residual herbicides are determined by the soil texture and soil organic matter and can be found on the herbicide labels.

All the labeled herbicides providing residual weed control in no-till soybeans have restrictions covering soil texture and/or soil organic matter (Table 2). Treatments involving Lorox or Lexone (or Sencor) should not be used on sand or loamy sand soils low in organic matter for the soybeans may be injured.

The relative susceptibility of weeds to the preemergence surface-applied herbicides used in no-till soybeans is presented in Table 3. Lasso and Surflan provide good to excellent control of annual grass weeds while Lorox or Lexone (or Sencor) give moderate to good control. Lorox or Lexone (or

Table 1. Tank mixtures of herbicides labeled for no-till soybeans.

Herbicides	Rate: lb active per acre
Paraquat 2CL + Lorox 50WP	0.25 + 0.5-2.5
Paraquat 2CL + Lexone 50WP	0.25-0.5 + 0.375-0.75
Paraquat 2CL + Sencor 50WP	0.25-0.5 + 0.375-1
Paraquat 2CL + Lasso 4EC + Lorox 50WP	0.25-0.5 + 2-3 + 0.5-1.5
Paraquat 2CL + Lasso 4EC + Lexone 50WP	0.25-0.5 + 2-2.5 + 0.25-0.75
Paraquat 2CL + Lasso 4EC + Sencor 50WP	0.25-0.5 + 2-2.5 + 0.25-1
Paraquat 2CL + Surflan 75WP + Lorox 50WP	0.5 + 0.75-1.5 + 0.5-1
Paraquat 2CL + Surflan 75WP + Sencor 50WP	0.5 + 0.75-1.5 + 0.25-0.5
Roundup 4WS + Lasso 4EC + Lorox 50WP	1.5-4 + 2-3 + 0.5-1.5

Table 2. Label restrictions on soil texture and organic matter (OM) for herbicides applied in combination with Paraquat or Roundup for no-till soybeans.

Herbicide	Sand or loamy sand		Sandy loam or loamy sand		Any Soil		
	b	<1/2 <2	<1 <2		<1/2 <1 >3		
-----%OM-----							
<u>Paraquat Plus</u>							
Lorox	x					x	
Lexone <sup>a</sup>				x		x	
Sencor				x			
Lasso + Lorox	x				x(D)	x(M)	
Lasso + Lexone		x					
Lasso + Sencor				x			
Surflan + Lorox							x
Surflan + Sencor				x			x
<u>Roundup Plus</u>							
Lasso + Lorox	x					x	

<sup>a</sup> Do not use on sand soil

<sup>b</sup> No limitation on %OM

D = According to Dupont label; M = According to Monsanto label

Table 3. Relative susceptibility of weeds to preemergence surface-applied herbicides for no-till soybeans.

	Lasso	Lexone Sencor	Lorox	Surflan
<u>Annual grasses</u>				
Broadleaf signalgrass	E	P	P	G
Crabgrass	E	G	G	E
Fall panicum	E	G	G	G
Foxtails	E	G	G	E
Goosegrass	E	G	G	E
<u>Annual small-seeded broadleaf weeds</u>				
Florida pusley	G	F	G	G
Lambsquarters	F	E	G	G
Pigweed	E	E	E	G
Ragweed	F	G	G	P
<u>Annual large-seeded broadleaf weeds</u>				
Cocklebur	P	F	F	P
Jimsonweed	P	E	F	P
Morningglory	P	F	P	P
Smartweed	P	G	F	P

E=Excellent control, G=Good control, F=Fair control, P=Poor control

Table 4. Postemergence herbicide rate table.

Weed	Size (inches)	Basagran (pt)	Preemerge (pt)	Dyanap (pt)	Tenoran (lb)
Cocklebur	up to 2	1.5	1.0	2.0	3.0
	2-4	1.5	2.0	3.0	x
	4-6	1.5	x	4.0	x
	6-10	2.0	x	x	x
Smartweed	up to 2	1.5	1.0	2.0	3.0
	2-4	1.5	2.0	4.0	x
	4-6	1.5	x	x	x
	6-10	2.0	x	x	x
Jimsonweed	up to 2	1.5	1.0	2.0	3.0
	2-4	1.5	1.0	2.0	x
	4-6	1.5	2.0	3.0	x
	6-10	2.0	x	x	x
Morningglory*	Up to 2	3.0	1.0	2.0	3.0
	2-4	x	2.0	3.0	x
	4-6	x	x	4.0	x
	6-10	x	x	x	x
Sicklepod	up to 2	x	x	x	3.0
	>2	x	x	x	x

x=Do not use

\*There are some variations in susceptibility among species.

Sencor) also gives partial control of large-seeded broadleaf weeds such as cocklebur and morningglory.

### Weed Control Programs for No-Till Soybeans

Control of Existing Vegetation. Paraquat and Roundup in the tank mix control emerged annual grass and broadleaf weeds. Paraquat rates are 1 to 2 pt/A. Use the lower rate when emerged annual weeds are small, 1 to 3 inches tall. Increase to 2 pt/A when weeds are 4 to 6 inches tall. We have found that crabgrass, fall panicum and lambsquarters over 3 inches tall are difficult to control with Paraquat. For these weeds Roundup is better. Also select Roundup when annual broadleaf weeds exceed 6 inches tall and perennial weeds are present. Paraquat may be used to control winter small grain cover crops. Use 1 pt/A for rye and 2 pt/A for wheat, oats or barley.

Roundup is used at 1.5 qt/A. In no-till systems it should be considered primarily for control of emerged annual weeds or a cover crop, for at normal application dates perennial weeds may be too young for most effective control. The use of 2 to 4 qt/A of Roundup may further reduce the competition of emerged perennial weeds, especially in doublecrop soybeans.

In doublecrop no-till soybeans, planting and herbicide application should immediately follow small grain harvest. Weeds at this time are smaller and easier to control. Furthermore, because of the competition provided by a properly managed small grain crop, the weed seedlings are frequently small, spindly and succulent. Given a few days after small grain harvest, these weeds develop rapidly and become more difficult to control with foliar applications. If considerably tall weeds are present at small grain harvest, set the combine as high as possible to save the foliage of the weeds in order to have a greater contact area for the foliar applied herbicide. Weed stubble or stems will not be controlled and resprouting usually occurs.

Using ground application equipment, apply tank mixtures with Paraquat or Roundup in 20 to 60 gal of water/A immediately before, during or after planting but before the crop emerges. Thoroughly cover the live vegetation with spray. The amount of water per acre should be increased as the density of stubble, crop residue or weeds increases. In our tests and demonstrations, 40 gal of water/A applied with 40 psi has been satisfactory. If the straw has not been removed or baled, it may trap the spray lessening kill of existing vegetation and residual weed control. If planning for doublecrop soybeans, put a straw shredder on the combine.

To Paraquat tank mixtures add Ortho X-77 Spreader or DuPont Surfactant WK at 1 pt/1000 gal of spray mixture. Do not add additional surfactant to Roundup.

Residual Weed Control. When the weed infestation and soil information for a field have been gathered, that particular weed complex can be put into one of three groups. These become the basis for selecting the proper pre-emergence or residual herbicide treatment.

1. Annual small-seeded broadleaf weeds plus moderate infestation of annual grass weeds. The tank-mix combinations for this situation are Paraquat + Lorox and Paraquat + Lexone (or Sencor). Grass and broadleaf weed control is frequently of short duration, 3 to 4 weeks, for Lorox. Lexone (or Sencor) may provide slightly improved grass control and better control of morning-glory, jimsonweed, and smartweed. Length of control may be of sufficient duration for no-till doublecrop soybeans planted in narrow rows but too short for full-season soybeans. These treatments should not be selected if fall panicum or broadleaf signalgrass is a problem.

Lorox should not be used on sand or loamy sand soils nor on any soil with less than 1/2% organic matter for it may injure the soybeans. Five percent organic matter is the upper limit for use of Lorox, because organic matter ties it up reducing the amount available for adequate weed control. Do not use Lexone (or Sencor) on sandy loam or loamy sand soils with less than 2% organic matter. In these soils Lexone (or Sencor) may injure soybeans, particularly under heavy rainfall which moves the herbicide into the soil where it is absorbed by the soybean roots and moved into the top of the plant. Plant soybean seed at least 1 1/2 inches deep on flat or raised seedbeds to reduce potential injury from Lorox or Lexone.

2. Annual small-seeded broadleaf weeds plus increased control of annual grass weeds. These herbicide combinations offer better and longer control of annual grass weeds: Paraquat + Lasso + Lorox; Paraquat + Surflan + Lorox and Roundup + Lasso + Lorox. Lasso is a consistently effective preemergence grass control herbicide and usually provides approximately 6 weeks of control. Surflan, on the other hand, requires more water for activation, since it leaches less than Lasso, but offers the advantage of longer season grass control. Often rainfall is less reliable following application for no-till doublecrop soybeans and consequently weed control from Surflan is less favorable. Combinations with Lasso are more effective in controlling fall panicum and broadleaf signalgrass. Any of these three tank mixes are possibilities for full-season or doublecrop no-till soybeans. Lasso or Surflan in a tank mixture improves the control of volunteer small grains.

3. Annual small-seeded broadleaf weeds plus increased control of large-seeded broadleaf weeds and of annual grass weeds. Lexone (or Sencor) in the following tank mixtures increases control of large-seeded broadleaf weeds (such as cocklebur, jimsonweed, and morningglory): Paraquat + Lasso + Lexone (or Sencor) and Paraquat + Surflan + Sencor. The statements made in the previous section also apply to these mixtures.

Postemergence Weed Control. Additional broadleaf weed control may be needed 3 to 4 weeks after planting especially for large-seeded broadleaf weeds--cocklebur, morningglory, jimsonweed, and Pennsylvania smartweed. Our experience shows there may be less large-seeded broadleaf weeds in no-till. Postemergence herbicides with suggested rates for controlling weeds of different sizes are presented in Table 4.

Although Basagran is very effective on certain large weeds, particularly cocklebur, it is more effective and economical when applied early to smaller weeds. Sicklepod is resistant and morningglory is partially controlled at high rates. Basagran also gives yellow nutsedge control.

Apply Premerge or Dyanap in 8 to 10 gal of water/A and at 60 psi. Small orifice nozzles are required. Raise the spray boom approximately 30 inches above the soybeans. Application of Premerge may be repeated after 4 to 5 days. Sicklepod is resistant to Premerge and Dyanap. Do not apply when soil or soybeans are wet, when it is windy, or when the temperature is below 75°F or above 95°F.

Apply 3 lb/A of Tenoran before weeds are over 2 inches tall. Add a nonionic surfactant at 1 pt/25 gal of spray. Tenoran is the best postemergence herbicide for control of sicklepod.

If good early season control of morningglory and cocklebur is not achieved, 2,4-DB (Butyrac 200, Butoxone) applied over-the-top 10 days before bloom up to mid-bloom will provide additional control of cocklebur and partial control

of morningglory. This late treatment reduces weed interference at harvest but yield has already been reduced by these weeds. Therefore, use 2,4-DB only as a salvage treatment.

#### Future Herbicide Treatments

Research indicates that Paraquat + Dual + Lorox or Lexone (or Sencor) and Roundup + Dual + Lorox or Lexone (or Sencor) are effective in no-till soybeans. Annual grass weed control has been excellent.

A different approach to weed control in doublecrop no-till soybeans is the application of Surflan early in standing wheat or oats. Surflan may be applied over-the-top of small grains from full-tillered to boot stage. Our results indicate weed control is greatly improved with an additional application of Lorox or Lexone at soybean planting.

Embark applied over-the-top of soybeans in the 2 to 7 trifoliolate stage will control volunteer corn and sorghum and suppress johnsongrass from rhizomes and seedlings. This treatment has an experimental use permit.

Roundup applied with a recirculating sprayer when weeds are taller than the soybeans effectively controls johnsongrass and other perennial weeds. This practice has an experimental use permit. Roundup does have a label in certain states for spot treatment of johnsongrass in soybeans. Roundup has also been successful in the control of johnsongrass where no-till soybean planting has been delayed until johnsongrass reached the boot stage. However, no pre-emergence applied herbicide currently gives a high enough degree of control of germinating seed to provide a complete johnsongrass control program.

#### Summary

A weed control program for no-till soybeans at planting consists of a foliar applied herbicide to control existing vegetation plus one or two herbicides for residual control of annual grass and broadleaf weeds. In addition, a postemergence applied herbicide may be needed to control broadleaf weeds 3 to 4 weeks after planting.