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Recent Advances in Reduced Tillage Systems for Wheat

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Reduced tillage in wheat production is rapidly growing in interest among wheat producers because of the potential it offers for reduced fuel consumption, increased soil conservation, and increased soil moisture storage during the summer fallow period. Two of the major hinderances to successful reduced tillage and no-tillage programs in the past were failure to obtain uniform stands and inability to adequately control weeds. During the past few years researchers at OSU have worked to develop reduced tillage and no-tillage systems. With the recent developments in seeding equipment suitable for use in heavy straw cover and more effective herbicides, reduced tillage in wheat production is becoming more successful.

While no one system can be singled out as the best for all circumstances, several options exist that should be considered by farmers interested in incorporating reduced tillage practices into their production scheme. Potential problems, however, do exist. Concern has been expressed that long term reduced or no-tillage programs could lead to increased severity of foliar disease and perennial weed populations. Although additional research is necessary to completely answer these questions, 1981 field observations indicate that drastic increases of foliar diseases in reduced-till versus clean-till plots have not occured.

Drill Characteristics and Performance

Seeding in heavy stubble requires drills that will place the seed into moist soil without clogging up or pushing residue around the seed. The drill must be equipped with rolling coulters 14 inches in diameter or larger. A sharp coulter is essential regardless of type (fluted, ripples, notched, or smooth). They should be weighted or spring pressured, and set deep enough to cut through the stubble without punching it into the furrow. Smooth or notched coulters are best for cutting stubble. Fluted coulters provide more loose soil for seed coverage and throw straw away from the row better. However, they do not scour as well when the soil is wet, require more weight for penetration, and will not cut damp straw effectively.

The furrow opener, either double-disk or hoe, must properly place the seed firmly into contact with moist soil at a uniform, controlled depth. For very firm soil, hoe openers are usually used. Double-disk openers do a good job under most other soil conditions and are less prone to clogging. Depth control is important, since planting too deep slows and/or inhibits emergence of short statured wheat varieties. Shallow planting may result in uneven germination and emergence due to poor seed-soil contact and may predispose the seedling to increased winter kill.

Press wheels should be standard equipment on all minimum tillage drills. The type of press wheels differ from drill to drill but in general all adequately firm the soil around the seed. In very moist fields, the soil may collect on the wheels and pick up the seed. If this happens, either delay planting until conditions improve or remove the wheels and replace with short log chains or window weights until the soil dries.

The coulters, openers, and press wheels should be closely coupled to prevent cut straw from falling back into the furrow. Rows should be spaced a minimum of ten inches apart and the planter units staggered along the frame to allow heavy stubble to move between them. The drill should also have a minimum ground clearance of 12 inches when in operation.

Drills equipped with fertilizer attachments may be advantageous since the resulting fertilizer placement will increase nutrient use efficiency and stimulate seedling vigor. Straw collecting on the fertilizer attachment mountings is a potential problem.

Herbicide Descriptions

A good weed control program is essential for reduced tillage farming to be successful. The basic management systems developed thus far rely heavily upon several different types of herbicides which are often used in combination with mechanical tillage. Presently, there are five herbicides approved and available for use in these systems. Before using these chemicals, be sure to follow the label directions carefully, taking special notice of the necessary safety precautions and limitations (such as grazing restrictions).

Paraquat CL is the most commonly used contact type herbicide. Recommended rates range between 1 to 2 pints per acre, either used alone or in tank mixes with Bladex 80W. Paraquat will kill all the vegetation existing at the time of application. The use of an adequate volume of water and X-77 surfactant with the herbicide will insure good coverage of all weed foliage. This herbicide will be most effective when applied before the weeds become large and vigorous, for example, immediately following harvest.

Roundup is a translocated herbicide that is sometimes used to kill existing vegetation. One quart per acre gives good control of most small annual weeds. Adding a surfactant and using lower rates appears to have promise as a new program for Roundup usage, but experience is still limited. Research in this area is continuing. Roundup can be used effectively for early weed control (after harvest) or later in the season as long as growing conditions are good and weeds are not under severe stress. Roundup should never be mixed with other herbicides.

Bladex 80W has recently received a 24(c) label for use in reduced tillage systems only in Oklahoma. No other postharvest residual herbicide is presently labeled for this use (this includes the other Bladex formulations). If this compound or tank mixes wtih it are chosen for summer fallow residual weed control, it is important to carefully read the 24(c) label. If broadleaf weeds are present at application time, Bladex 80W may be tank mixed with the low volatile ester of 2,4-D. Rainfall is needed to activate Bladex 80W since it's herbicidal action is through the root system.

Banvel is a translocated herbicide for broadleaf weed control. It may be applied after harvest by broadcast or as a spot treatment to emerged, actively growing weeds. Rates of ½ to 1 pint per acre will provide good control of small (less than two inches tall) annual broadleaf weeds. Higher rates are required to kill larger weeds. Perennial broadleaf weeds can be controlled by applying 2 to 4 pints per acre during the bud to flowering stage of growth. Wheat may be planted in the fall following Banvel applications without crop injury as long as the interval between application and planting is at least 45 days per pint of product used per acre.

2,4-D is another translocated herbicide manufactured under numerous trade names and different formulations. This phenoxy herbicide will control a number of broadleaf weeds at rates ranging from ½ to 2 lb/A depending on weed species and size.

Reduced Tillage Systems

System I. Use of postemergence herbicides with optional tillage

This system would be suitable for those fields that have an established history of good year-round weed control. Since the weed seed populations will have been reduced in these soils, one application of a postemergence herbicide (Paraquat, Roundup, 2,4-D or Banvel) after harvest may provide adequate weed control until late August or September.

At this time, a completely no-till option can be followed by applying Paraquat or Roundup to control volunteer wheat and other weeds. If this option is chosen, no straw removal should be attempted.

The other, and possibly more economical, alternative is to destroy the volunteer by mechanical tillage (either a wide sweep or chisel with small sweep attachments) and apply anhydrous ammonia simultaneously . If the soil is fairly moist or if rainfall occurs soon after tillage, volunteer control may be less than desired.

System II. Use of a residual herbicide with optional tillage

This would be the most advisable system under most circumstances. The only residual herbicide labeled for this use in 1981 is Bladex 80W.

If weeds are present in the stubble after harvest, two approaches are available. One is to destroy the existing weeds by mechanical tillage then apply Bladex 80W for residual weed control. If this approach is chosen, care must be taken to choose an implement that will not leave the field rough or cloddy, since such conditions reduce herbicide effectiveness. A chisel with sweeps or a wide sweep would probably be more suitable than a disc.

Another approach is to tank mix Paraquat and surfactant with Bladex 80W for a postharvest application to kill the existing grass and broadleaf weeds and provide residual activity. If grassy weeds are absent, 2,4-D can be used in place of Paraquat. Bladex 80W can be used alone if the field is weed free following harvest. Late weed escapes and volunteer can be controlled with either a contact type herbicide (Paraquat or Roundup) or mechanical tillage (which can also be equipped for simultaneous application of anhydrous ammonia).

Other Considerations

Straw maintenance. It is important to have the straw spread as uniformly as possible after harvest. This will help alleviate most of the clogging problems caused by the straw that passes through the combine and is left in windrows or piles. To facilitate even straw distribution, combines should be equipped with straw spreaders or choppers, or the loose straw should be baled off.

Timing of Tillage. The timing of late tillage is an important factor in seed bed preparation. If tillage is just prior to sowing, difficulty in drilling can be encountered due to loose surface mixture of straw and soil. Ideally, late tilllage (primarily for volunteer control) should be done early enough to allow the seed bed to firm up or it could be packed or rolled.

Fertilization. It is important to remember that nitrogen is required for the decomposition of straw residues. Apply an extra 20 pounds of nitrogen for each ton of straw per acre. If the soil test indicates the nitrogen level to be adequately above that needed to reach the pre-determined yield goal, no extra nitrogen will be necessary.

References

There are several references that can be obtained at your county extension office that may be helpful to you in choosing and properly using herbicides for control of your weed problems.

Precision Calibration of a Sprayer	FS 1203
Guide to Effective Weed Control	FS 2750
Factors Affecting Herbicide Performance	FS 2767
Weed Control in Winter Wheat	FS 2770
Wild Buckwheat Control in Wheat	FS 2773
Cheat Control in Wheat	FS 2774
Wild Oat Control in Wheat	FS 2772

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