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Wheat Following Corn: To Till or Not To Till

Don Hershman-Extension Plant Pathologist

Because of logistical reasons, most of the wheat in Kentucky is planted in fields behind corn. In the majority of those fields, the corn residue is disturbed by some sort of tillage operation prior to planting wheat. True conventional tillage (i.e., plowing and discing) is rare, but one to three discing operations is very common, and is often preceded by shredding or mowing of corn stubble in order to facilitate wheat planting.

There is a movement by the Kentucky Small Grain Growers Association to encourage more no-till wheat production in the state of Kentucky. To this end, the KySGGA Board of Directors has set a goal of 75% of the wheat acres in no-till production by the year 2005. Currently, only about 30% of the wheat in the state is planted following no-till practices. One of the obstacles to achieving the goal set by the KySGGA is the general fear, by producers, that head scab is enhanced by planting wheat, no-till, following corn. Opinions on whether or not this fear is justified are wide-ranging, but no data exists which either refutes or confirms the relationship between corn residue in a field at planting and subsequent head scab levels following wheat flowering in the spring in Kentucky.

The residue-head scab connection is, in fact, based on a biological reality that the head scab fungus, Fusarium graminearum (telemorph: Gibberella zea), affects both corn and wheat and that the fungus survives in corn residue. Most farmers are concerned that planting wheat into undisturbed corn residue will provide a large "crop" of spores of the scab fungus and the result will be greater levels of head scab compared to where corn residue is "tilled" or where wheat is planted after soybean.

My observations over 14 years have not supported the fear of no-till wheat following corn. However, because of a general lack of field data on this question, I am unable to make a very strong case to support my view.

To address the lack of field data connecting corn residue with head scab in wheat, the KySGGA funded a head scab survey during 1997-98. The survey involved 99 fields and 83 of those fields were in 14 widely-scattered counties in Kentucky. The remaining 16 fields were in neighboring counties in Illinois, Indiana or Tennessee. Survey data were compiled by crop consultants with Miles OptiCrop and WheatTech. Actual crop residue data were collected for each field in the fall following wheat planting operations, and head scab ratings were made in the spring using a standardized rating procedure.

The first-year results of the survey indicated a significant ($P=<0.001$), but relatively poor (R-square = 0.28), relationship between corn residue levels in the fall, and incidence and severity of head scab in the spring. Basically, there was a highly variable relationship between head scab and corn residue, which suggests that factors other than corn residue were more important in determining the level of head scab in a field. My opinion is that

weather conditions at the time the wheat was flowering (which were not accounted for in the survey) probably played the greatest role in determining head scab levels. Plans are already underway to conduct a similar survey in 1998-99.

I don't want to mislead you into thinking that corn residue cannot or does not have an effect on head scab development. Clearly, scab inoculum comes from some (not all) corn residue and disease levels can be increased as a result of that inoculum. However, it is my opinion, which is supported by many years of observations and now first-year survey data, that scab levels in Kentucky are not be largely affected by the presence of corn residue in a field. Why? If you consider that Kentucky grows about 1.5 million acres of corn, and that most of those acres are planted (along with wheat) in small, widely-scattered fields throughout central and west Kentucky; and that spores of the scab fungus can be wind-borne (up to 6 miles according to recent research in the midwest), it does not take much to imagine that scab spores could be very widespread in a given county or region of the state, regardless of the crop or tillage which preceded wheat planting.

In the long term, my ideas regarding the potential for increased head scab when planting no-till wheat behind corn may change as new data come to light. However, my present recommendation to farmers is to not avoid no-till wheat (behind corn) simply because of a perceived head scab threat. Rather, there are more important considerations such as weighing the economic benefits of no-till wheat against the main negatives such as stand establishment difficulties and increased weed problems.

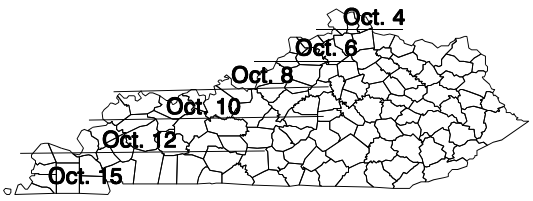
Avoiding Insect Problems

Doug Johnson-Extension Entomologist

There can be no doubt that AVOIDING insects is the most effective and economical method of insect control in winter wheat. In general, this control can be achieved by delaying planting until after the weather begins to cool down. As a rule of thumb, this means not planting until after the Hessian Fly free date. The graphic below illustrates the Hessian Fly free dates suggested for Kentucky. These dates are not carved in stone and can vary based on the weather patterns of a particular season. For instance, if the weather is continually warm the recommended planting date would be later than the fly free date, while in a season with early cool weather or frost the recommended date would be earlier. It is important to understand that from the insect control point of view, planting earlier than the fly free date should be viewed as having greater risk of insects and associated diseases, while planting after the date will have reduced risk.

There are three insects that attack wheat in the fall of the year. Of these, the Fall armyworm is the least important and only occurs in the fall. There is no treatment threshold, but one to two worms per square foot may be a good number to use for triggering a control application. This is complicated by the fact that Fall armyworms are 'grazing' on the wheat and will not kill the plants.

Map showing normal safe dates for sowing wheat (approximate), to escape injury by Hessian Fly.



Adapted from: Metcalf, C.L., W.P. Flint, and R.L. Metcalf. Destructive and Useful Insects. McGraw-Hill. NY. 1962. P.534

The Hessian Fly for which the fly free date was named also attacks in the fall causing loss of stand through the winter. However, if the population is able to over winter there may be a spring population that can cause further stand loss or reduction in plant vigor. We do not have a good handle on how much damage Hessian fly is causing in Kentucky. We do know that we have a biotype of Hessian fly (L) that can break all know resistance genes, and that insecticide applications are of little use. Therefore, the fly free date is the most important

control.

By far, the most important pests are the aphid complex which vectors the Barley Yellow Dwarf virus. Primarily, the Bird cherry-oat aphid, but also the corn leaf aphid commonly occur in the fall. The impact of all of these pests can be reduced by delaying planting until after the Hessian Fly free date.

Delayed planting is a powerful tool for pest avoidance. However, this control alone may not provide all the control needed especially for aphids and Barley Yellow Dwarf Virus. You should scout your fields on a regular basis ESPECIALLY from plant emergence until the daily temperatures fall below 50 degrees.

You may also want to keep up with the current situation by reading the Kentucky Pest News on the Net at:

http://www.uky.edu/Agriculture/kpn/kpnhome.htm

You may also receive this publication via e-mail or regular postal service. To request addition to the mailing list, just contact someone in the Wheat Group.

For additional information, refer to the following University of Kentucky publications:

ID-125 - "A Comprehensive Guide to Wheat Management In Kentucky"
IPM-4 - "Kentucky IPM Crop Management Manual for Small Grains"
ENT - 47 - "Insecticide Recommendations for Small Grains"
Entfact - 110 Fall Armyworm
Entfact - 101 Hessian Fly in Kentucky

Nitrogen Rates and Timing on No-Till Wheat in Logan County- 1998

Lloyd Murdock-Extension Soils Specialist

The objective of this study was to look at different nitrogen rates and time of spring application on no-till wheat yields.

The wheat was managed for high yields. Pioneer 2540 was planted on October 8, 1997. Harmony Extra, Tilt and Warrior were used to protect the plants from weeds, diseases and insects. A freeze on March 8, 1998 and unusually hot temperatures in May probably reduced the yields.

Table 1. Effect of N on Yield

N Treatment			Yield (13.5% H_2O)
February	March	Total	
---------- lb/acre ----------			bu/acre
30	90	120	75.4 a
50	50	100	74.9 ab
40	40	80	74.2 ab
30	70	100	72.9 abc
60	60	120	69.8 bc
30	110	140	68.5 c
0	120	120	68.3 c
0	0	0	47.0 d

Conclusions: The yields were good, but not exceptional. High rates of N were not needed to obtain the maximum yields. The 80 lb/ac rate resulted in yields as high as the 120 lb/ac rate. The yields of treatments with the same total rate of N but with different ratios applied between February and March were about the same in most cases. The treatments with the high rates of N added in March, after the freeze, were not helpful and actually resulted in the lowest yields. This is contrary to what might have been expected. In May, these two treatments were visually better than the other treatments. This indicates that looks are many times not important, we just think they are!

1997-98 Residue Management Study
Mechanical Shredding Comparison

Lloyd Murdock, Jim Herbek, John James, Dottie Call

Research Objective: This study compares different methods and timing of mechanical shredding of corn stalks of different corn maturities against no shredding and no corn residue and their effect on no-till wheat planting.

Research Treatments:

1. Remove all corn residue and plant into clean residue conditions (full season corn).
2. Plant at an angle into standing harvested corn stalks (full season corn).
3. Plant directly into standing corn residue, not angled (full season corn).
4. Plant directly into standing corn residue, not angled (early season corn).
5. Rotary mow corn residue after harvest and plant into mowed residue (full season corn).
6. Flail mow corn residue after harvest and plant into mowed residue (full season corn).
7. Plant directly into standing harvested corn and flail mow after planting (full season corn).
8. Flail mow corn residue after harvest and plant into mowed residue (early season corn).

Methods: Corn was planted using an early season variety and a late variety. Both varieties were harvested at 21% moisture and harvest dates were 9-5-97 and 9-22-97 for the early and late corn.

All mechanical shredding was completed immediately after harvest of each corn variety, except for Treatment 7 which was flailed immediately after wheat planting. All residue was removed from Treatment 1, but the plots were **not** tilled.

Wheat was planted no-till at the rate of 35 seeds/sq. ft. with a 7 inch row spacing.

Results:

Wheat Stands - Stands of wheat in the fall are seen below in Table 1. The highest stands were in the treatment with all residue removed. Flail shredding after corn harvest resulted in the next best treatment regardless of corn maturity. A step below this was rotary mowing of stalks, planting diagonally in standing corn residue, and planting with the rows of the early variety of standing corn. By far, the worst stands were planting with the rows of the late variety of corn and flail shredding after planting.

Table 1. Effect of Residue Management on Wheat Stands in November

Treatment	Corn Maturity	Wheat Stand Plants/sq. ft.
1. Residue behind combine (as is)	Full	16.7 e
2. Flailed after harvest	Full	24.3 b
3. Flailed after wheat planting	Full	17.9 e
4. Rotary mowed after harvest	Full	21.2 cd
5. Residue behind combine (as is)	Early	20.0 d
6. Flail after harvest	Early	22.4 c
7. Removed all corn residue	Full	26.8 a
8. Residue behind combine (as is) diagonally planted	Full	21.4 cd

Visual Observation During Spring Growth - During the entire season, wheat growing where the corn stalks were flailed after wheat planting looked yellower and less vigorous in growth. In February, the wheat planted behind the early maturing corn had a greener color and had more overall growth. The flail chopped treatment was the better of these two treatments. Both of these treatments looked better than where all the residue was removed. In May, (at heading) the two best looking treatments were 1) all residue removed and 2) flail shredding of early maturing corn after harvest. Chlorophyll measurements were taken on April 14 and there were no differences in the readings. Therefore, looks may be deceiving.

Yields - The yields of the experiment (Table 2 were not high and were probably affected by the unfavorably high temperatures in May. The yields were disappointing and were not high enough to allow separation of some of the better treatments. In fact, some of the better treatments in terms of stands and early growth were not among the highest yielding treatments.

Table 2. Effect of Residue Management on Wheat Yields		
Treatment	Corn Maturity	Yield (13.5% H_20) bu/ac
1. Residue behind combine (as is)	Full	53.3 b
2. Flailed after harvest	Full	60.9 ab
3. Flailed after wheat planting	Full	55.2 ab
4. Rotary mowed after harvest	Full	57.4 ab
5. Residue behind combine (as is)	Early	62.2 a
6. Flail after harvest	Early	59.4 ab
7. Removed all corn residue	Full	55.4 ab
8. Residue behind combine (as is) diagonally planted	Full	59.8 ab

Conclusions: Stands were best achieved when all residue was removed, but flail shredding of corn after harvest gave similar results and appeared to be an excellent alternative. It was better than the rotary mowing and the standing corn residue. The worst treatment in all respects was flail shredding of corn residue after wheat planting.

1997-98 No-Till Wheat Trial

Lloyd Murdock, Jim Herbek, Jim Martin,
John James, Dottie Call

Introduction: The objectives of this experiment are to see if high yields can be produced by no-till wheat and to see if no-till wheat is an economical alternative compared to conventionally planted wheat. The second objective is to watch the effects of the wheat tillage treatments on succeeding crops and on the long-term soil effects.

Tillage: The method of planting (no-till vs. conventional) had a significant effect on yields this year and the conventional tillage plots yielded more than no-till wheat by 7 bu/ac. The reduction in yield by no-tillage may have been due to the freeze in March and more vole damage.

The six-year average is about 5.5 bu/ac greater for the conventional tillage treatment.

Yields According to Tillage		
Treatment	1998 Yields (bu/ac)	Yields ('93-'98)
Conventional	85 a	93.3
No-Till	78 b	87.8

Nitrogen Rate: Nitrogen was managed for intensive production with 1/3 of the N applied at Feekes 3 and the remainder at Feekes 5. Increasing the N rate from 90 to 120 lbs/ac had little effect on yield this year. There is also little difference in the six year average yields.

Yields According to Nitrogen Rate		
Treatment (lb/ac)	Yields (bu/ac)	Yields ('93-'98)
No-Till 90	76 b	86.0
No-Till 120	79 b	87.8
Conv. 90	86 a	91.5
Conv. 120	83 a	93.8

Weed Control: Common chickweed, henbit, and a small amount of cheat were among the major weed species found in this study. In general, the level of weed control for conventional till plots treated with Harmony Extra were equal to the no-till plots that were treated with Gramoxone Extra in the fall followed by Harmony Extra in the spring. Treatment of no-till with only Harmony Extra in fall or spring resulted in weed control sufficient for high yields. Cheat was found in only small amounts in the no-till plots. The weed pressure in the untreated no-till check plots did not reduce the wheat yields this year. The six-year averages indicate that the average of the 3 weed control treatments used are about equally effective on yield.

Herbicide Treatments		
Treatment	**1998 Yields (bu/ac)**	**Yields ('93-'98)**
No-Till - Fall Harmony Only	77 a	89.2
No-Till - Spring Harmony Only	75 a	87.8
No-Till - No Herbicides	75 a	75.3
No-Till - Peak	77 a	
No-Till - Fall Gramoxone Spring Harmony	79 a	89.8

Wheat Stands: The fall stand counts over a five-year average show about 10% less plants in the no-till plots as compared to the conventional plots when planted at the same rate. This year plant counts were almost identical for the two treatments.

Wheat Stands (Plants/sq. ft.)		
Treatment	**Fall - 1998**	**Fall (5 Yrs. Avg.)**
No-Till	26.6	25.6
Conventional	26.5	27.6

Wheat Head Density: Head counts made at maturity are very similar. The number of heads/ft^2 were in the range where high yields might be expected.

Treatment	Head Counts Head/ft^2	1993-98 Avg.
No-Till	64.4 a	62
Conventional	63.5 a	65

Long-Term Soil Effects:

Soil Physical Factors - There appears to be little difference in the soil physical factors between the two tillage systems as determined by the measurements that were made. The soil density and the soil strength for both systems were very similar and were in excellent condition for crop growth.

Soil Chemical Factors - There were no differences between the two tillage systems in the amount of organic matter contained in the top 3 inches. There were also no differences in the pH, soil phosphorus or soil potassium between the two systems.

Yields of Succeeding Crops (Soybeans & Corn) - Both soybeans and corn are no-tilled after the two tillage systems in which wheat is grown. The soybeans are double-cropped after the wheat and the corn is planted the next spring before the wheat is planted in the fall. These crops are harvested for yield to determine if the wheat tillage systems have an effect.

At this time, it appears that both corn and soybeans tend to yield more (about 5%) where the wheat was planted no-till (see table below). However, the differences are not significant statistically, but the trend is fairly consistent. It will take several years to confirm this effect since it takes several years for the long-term effects to become established.

Temperature and Wheat Growth - Temperature loggers were placed at different heights and depths within the soil and wheat canopy to develop a temperature profile that might help answer questions concerning the differences between tilled and no-tilled wheat on growth vigor and winterkill.

Late winter freeze damage occurred in March of 1998. The data collected indicates that no-tillage conditions may lower the temperatures under no-till conditions. The coldest temperature occurred on March 8 and the temperature at ground level was 33^o F in the conventional stand and 2^o for the no-till stand. However, the wheat was at Feekes 5, so we did not observe any differences in winter damage. The no-till plants turned yellow and were a little slow to recover, but the heads were unaffected.

Effect of Wheat Tillage Systems on the Yield of Succeeding Crops		
Year	**Wheat Tillage System**	
	No-Till	**Conventional**
	Soybeans (bu/ac)	
1997	45.1	42.7 N.S.*
1996	54.5	50.8 N.S.
1995	24.4	22.2 N.S.
1994	49.5	51.6 N.S.
Avg.	43.4	41.8
	Corn (bu/ac)	
1997	211.9	199.3 N.S.
1996	--- Harvest Data Lost ---	
1995	186	191 N.S.
1994	206	178 **
Avg.	201.3	189.4

* N.S. means no significantly statistical differences.
** Statistically different at the 0.1% level.

Managing the Wheat Enterprise

Dick Trimble-Extension Ag Economist

The past production season has not been a good experience for many Kentucky wheat producers. At seeding time last year things looked quite good for wheat producers. We were not expecting a great year, but expectations were rather reasonable. Things were proceeding along well until most of the Commonwealth experienced a mid-March freeze that was damaging to the wheat crop. There was uncertainty as to the extent of the damage immediately after the freeze and then things looked better. Subsequent to the freeze, producers experienced additional production problems with hot weather in May, disease infestations, and heavy rain and wind in June that were all damaging to the wheat crop. As a result of these assorted production problems, the latest estimate of Kentucky's average wheat yield was 44 bu/ac. This is a 10 bu/ac or 18% reduction from the 54 bu/ac achieved in 1997.

All wheat producers across the U.S. did not experience production problems as did Kentucky farmers. It is expected that national wheat yields will show an overall increase over last year. In addition, wheat exports are also down as a result of economic problems around the world, particularly in Russia and Asia. This combination of a larger wheat supply and reduced export demand has resulted in a wheat price that is much lower than expected. The state average wheat price during August was $2.20/bu which was up $.05 from the July average price of $2.15/bu. At planting time, a year ago, the expected season average wheat price was about $3.80/bu, which seems to be a price that will not be achieved during the current marketing year.

This combination of poor wheat yields and low prices have combined to make the wheat enterprise look uninviting when compared to the experience of most producers over the past couple of seasons. Wheat producers should not throw up their hands in frustration and simply give up and abandon the wheat enterprise. Rather, those producers that are serious about wheat production should look to make some difficult decisions about their wheat enterprise this season. If you are going to produce wheat this season, your first decision must be that you are going to more closely manage the enterprise this year. There seems to be a general feeling that the relatively poor expectations concerning the upcoming season dictate that a producer should immediately adopt a cost cutting approach to wheat production. This is probably the wrong approach concerning the management input. The relatively difficult production decisions will require the full attention of the farm business manager. Now is not the time for the serious wheat producer to abandon his management responsibilities.

The first thing the manager must determine is how many acres of wheat will be produced. There is a general belief that wheat acreage nationwide will be down drastically this season as a result of expected low wheat prices. All producers should survey the acres they are planning to devote to wheat production and select only those acres that are well adapted to the production of wheat. Given the low expected price, this would not seem to be the year to plant marginally productive wheat acres. Only the best, most productive acres should be

seeded to wheat.

After this important decision is made, you should proceed to make your production plans as you have in the past. However, you should realize that each and every decision you make this year could prove to be a critical decision. The first thing to realize is that a simple cost cutting approach to wheat production may not be the best approach this year. Rather, you should look at every input decision and ask the simple question: ***Will it pay?*** If the input will pay for itself and there is anything above and beyond the cost of the input, it should be a good decision to use that input. The same reasoning should be used concerning the amount of any specific input such as fertilizer. The simple rule that should be followed is: "***As long as the value of the output is greater that the cost of the input, continue to add input***." This will insure that all inputs are used correctly and the most appropriate decisions are made throughout the production season.

This may seem to be a fairly simple rule, but the simplicity is its strength. What you must realize is that conditions surrounding this rule are constantly changing. Using nitrogen fertilizer as an example may serve to clarify this simple rule for the use of any production input. If nitrogen costs $.20/lb and wheat is $5.00/bu, then each pound of nitrogen must produce at least .04 ($.20/$5.00)bushel of wheat to be a worthwhile input. However, if the wheat price falls to $2.00/bu then nitrogen must produce at least .10 ($.20/$2.00) bushels to be worthwhile. This kind of relationship is what determines the correct approach to decision making concerning the use of each and every input to the wheat production process. Admittedly, it may be difficult to estimate your wheat crop's response to each and every input to the production process. However, just the simple realization that there is no simple standard recipe for wheat production will go a long way to improve the decision making process. Adopting this way of thinking and analysis and asking the simple question, ***"Will it pay?"*** should help improve the performance of your wheat enterprise. It is not just a simple cost cutting approach to wheat production. Rather, it is an approach that dictates a much greater input of the management input.

According to Dr. Steve Riggins, in an article contained in this newsletter, the expected wheat price for the upcoming production marketing year could be $2.75 to $3.50/bu. This expected price in combination with the cost of each and every input should determine the level of use of each input. This lower expected price does indicate that the general level of inputs should be reduced from what it has been in the recent past, unless the input cost has also been reduced. One exception to this rule involves the management input. As mentioned earlier, wheat production this season should require more management input. This is particularly true concerning the use of inputs such as insecticides and fungicides. They should be applied if and only if they are needed and if they will pay for themselves. This would seem to dictate an increased use of crop scouting to monitor crop production conditions and treat problems as they occur. This should result in more appropriate production decisions than the use of a standard production recipe. The key to the success of this approach and the total wheat enterprise is the constant, unrelenting application of the management input.

Wheat Price Outlook

Steve Riggins-Extension Ag Economist

Wheat prices have been under strong downward pressure for several months due to record large world production levels of wheat and nearly record levels of coarse grain production. Additionally, the 1998 U.S. wheat crops appears to be the second largest of the decade at roughly 2.55 billion bushels. The 1998 wheat crop is also the second consecutive U.S. crop in excess of 2.5 billion bushels. With large U.S. and world supplies of wheat and coarse grains, competition in the export market has been intense. Recent financial problems by major importing countries have only added to the difficult export market environment. Currently the USDA is projecting ending stocks of U.S. wheat for May 31, 1999 at 819 million bushels. This is the second largest carryover stock level of the decade, exceeded only by the 1990-91 crop year carryover of 868 million bushels. World stocks levels are forecast to remain large, but somewhat below last season's level.

Even though U.S. and world wheat stocks will be large relative to the past few years they will not

be large by historic levels. The USDA numbers place world stocks relative to use for the 1998-99 crop year at 22%, up somewhat from the 19% levels of the 1995 and 1996 crop years and down fractionally from the 23% figure for the 1997 crop, however, this is well below the 28% — 34% stocks/use ratios of the late 1970's to late 1980's period. World wide usage of wheat continues to grow and disappearance is at the highest levels in history. It would not take much of a down-turn in world production of wheat to turn wheat price outlook higher. Wheat prices have not been this low since the mid 1980's. They will not stay this low for ever. Current expectations are for U.S. winter wheat plantings to decline this fall for the third consecutive year. With lower acreage for harvest next year in the U.S. it would not take much of production problem in another major wheat producing country for wheat prices to rise.

July 1999 Chicago futures prices for wheat recently topped $3.00 per bushel for the first time in several days. Wheat producers should monitor this market carefully and develop a marketing plan for any remaining 1998 crop wheat still owned and also have a set of price targets in mind at which they would begin pricing 1999 crop wheat. The current spread between cash prices and the July futures price indicates that good quality wheat could be held profitability in on-farm storage and delivered next spring if there is normal basis appreciation. The question of whether or not to store wheat commercially or to use basis or delayed price contracts hinges on the cost of those alternatives. With a “normal” basis next spring (-15 to - 25 cents per bushel) a July Futures price of $3.00 implies a cash price of $2.75 to $2.85 for wheat hedged now and held on-farm for delivery next May or June. Barring a significant shortfall in U.S. or world wheat production in 1999 farmers might expect to see the July futures contract trade as high as $3.25 to $3.50 per bushel between now and the end of winter dormancy. It will probably take some type of production or government news event to push wheat prices above those levels.

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Visit the new UK Wheat Science Web Site!
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