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PREPLANT DECISIONS GREATLY IMPACT FUTURE DISEASE RISK

Don Hershman, Extension Plant Pathologist

Many Kentucky wheat producers have their total disease management program in place once the seed is in the ground. By that time, numerous decisions have been made, either specifically or by default, including: crop rotation, tillage/seedbed preparation, variety and seed quality, seed treatment, planting date, method, and seeding rate; and fall fertility. Individually and collectively, these factors can play a very important role in future disease development and, thus, yield loss due to diseases.

Crop Rotation and Tillage: These production variables are linked when it comes to disease management in wheat. For example, in a field where wheat is sown following corn or soybean, tillage is inconsequential for most wheat pathogens. That is, levels of most pathogens will be similar whether wheat is planted no-till or following conventional tillage. Fortunately, most wheat fields grown for grain in Kentucky are planted behind either corn or soybean. In contrast, when wheat is planted in consecutive years in a field, pathogens that either survive in crop residue or require more than a few months for populations to decline may be more severe the second time wheat is grown in a field. This is especially true where a field is planted no-till because of the high levels of wheat residue that will exist in that production system. Examples of common diseases where the causal organism survives in wheat straw are: take-all, speckled leaf blotch, leaf and glume blotch, and tan spot.

In rare instances, no-tillage may enhance seed and seedling disease problems simply due to the effect of surface residue on soil temperature and moisture. Overall, soil moisture levels will be increased when the soil surface is covered with a high percentage of residue of any previous crop or even weeds. In addition, surface residue tends to keep soil temperatures warmer in the fall and cooler in the spring compared to fields with low levels of surface residue (i.e., tilled fields). Examples of diseases that may be slightly worse in no-till include: seed and seedling diseases caused by *Pythium or Fusarium*, take-all disease, and soil-borne viruses. Many producers fear that substantially more Fusarium head blight (FHB) will develop when wheat is planted no-till behind corn. Although the risk for *slightly* more FHB does exist with this system, there is no evidence that FHB will be noticeably more severe than in a conventionally-tilled field, regardless of previous crop. Weather

conditions just before, during, and for two weeks after flowering appear to play the dominant roles in determining the incidence and severity of FHB in a field and region.

Variety Selection: The disease resistance characteristics of the wheat variety (ies) you plant will have a tremendous impact on the potential for certain important fungal and viral diseases to develop later. However, no one variety is resistant to all diseases for which resistance is available. Thus, it is important to plant more than one variety with different resistance characteristics to reduce the risk that any one disease will cause serious losses. There are some diseases, such as take-all, for which no resistance is available. In those instances, which variety you plant will not affect disease development. There are some disease situations where the potential for disease in an otherwise susceptible variety is impacted by some growth characteristic of that particular variety. For example, because FHB is weather dependent during crop flowering, planting a few varieties that may flower during slightly different periods may limit the extent of FHB on a farm due to escape.

Seed Quality and Seed Fungicides: In all situations we recommend you plant only high quality seed if grain production is your goal. The use of a broad-spectrum seed treatment fungicide with this seed may protect stands from seed and seedling should soil conditions become stressful due to adverse weather or planting method; however, seed treatment should be looked at in a risk management context. That is, do not expect seed treatment fungicides to enhance stands and yields in most situations. But, depending on the risk level that one is willing to assume, some producers might be willing to spend the additional $1.25 - 1.50 per bushel of seed to reduce the risk that disease might affect stand establishment.

If loose smut is a concern in any seed lot, we recommend you treat the seed with a smut-effective fungicide such as Raxil or Dividend. A small amount of loose smut in a seed production field can result in a serious epidemic and yield losses when that seed is planted the following year. This concern is especially valid where saved seed is planted!

Planting Date: By avoiding early planting dates, you could significantly reduce the potential for certain diseases to develop. For example, if you delay planting wheat until after the Hessian fly-free date for your area, the risk that a serious barley yellow dwarf (BYD) problem will develop is greatly diminished. Similarly, avoiding early planting dates may limit the severity of take-all disease and the soil-borne viruses, such as wheat spindle streak mosaic.

Nitrogen Fertility and Seeding Rate: Excessive top growth in the fall, which is encouraged by high nitrogen fertility and/or excessive seeding rates, may enhance certain diseases and should be avoided. Leaf rust, for example, may develop to a significant extent in the fall and this can increase the risk that the disease will successfully overwinter and cause serious losses the following spring. Excessive top growth in the fall also encourages aphid development and survival and this, in turn, can result in greater levels of BYD.

MAKING NO-TILL WHEAT PRODUCTION PROFITABLE

Larry Grabau and John Grove (UK),
Phil Needham (Opticrop)
Scott Jones (Wheat Tech)

Four field tests of no-till wheat have been established on Kentucky farms. Those tests are in Caldwell, Daviess, Fayette, and Logan Counties. The UK Wheat

Science group is managing the Caldwell and Fayette tests, Opticrop is managing the Daviess test, and WheatTech is managing the Logan test. Each test includes two replications with 4 strips per replication. Two of those four strips are no-till; the other two strips are managed with conventional tillage. Each group has chosen two different wheat varieties to plant in their tests. Management practices have been implemented to attempt to maximize profitability of both conventional and no-tillage systems.

Preliminary results below show that, on avg, no-till stand establishment was similar to conventional stand establishment. However, no-till stands were lower than conventional stands for both the Daviess and Logan tests, but higher for both the Caldwell and Fayette tests. This difference should be taken into account when interpreting yield data we collect later this summer. Corn residue levels were very low for conventional tillage, and very high for no-tillage. This should make for a sharper contrast than we had in the previous year's tests, in which residue levels for conventional tillage ranged from 33 to 66%.

Test	**Stands (Plants/yd^2)**		**Corn residue Cover (%)**	
	NT[a]	CT	NT	CT
Caldwell	279	238	93	11
Daviess	197	258	95	0
Fayette	263	249	85	4
Logan	217	260	87	0
Means	239	251	90	4

[a]NT = no tillage; CT = conventional tillage

Winter and spring weather has been relatively kind to our wheat trials this season. However, there was some delay in applying spring N, especially on the Caldwell test. This would be expected to be to the disadvantage of that trial in general, and of the no-till plots in particular. So far, weed control, insect control, and disease management has been effective at all four sites. We will continue to monitor these studies, and will be reporting yields soon after harvest.

PLANTING FARMER SAVED WHEAT SEED - ARE YOU REALLY SAVING MONEY?

Dennis M. TeKrony, Department of Agronomy
University of Kentucky

When grain yields in 1999 were excellent in most regions of the state, however grain prices are low and many farmers are trying to cut corners to save on production costs for next year. One area considered is planting farmer saved seed. Thus, farmers must decide if they should purchase planting seed of private or public varieties **OR** plant bin-run seed from their own production or that of a neighbor. There are advantages and disadvantages that must be considered before this decision is made.

Variety Selection and Cost of Seed:

Most farmers are well aware of the wide range of excellent public and private varieties available and can compare performance of these varieties in data from performance trials conducted by the University of Kentucky or other sources. If seed is purchased from a dealer the cost may range from $7.00 to $16.00 per 50 lb. unit for privately developed varieties to $5.00 to 7.00 per 50 lb. unit for certified seed of publicly developed varieties. Thus, at a seeding rate of 35 seeds per sq. ft. the seed cost may range from $15.00 to 45.00 per acre (depending on the variety purchased and its seed size).

If seed is planted from the farmers bin the costs will vary depending on the following: was the seed cleaned, bagged, treated and tested prior to planting? Custom cleaning costs in Kentucky range from $1.25 to 2.00 per bushel depending on additional fees for bagging and storage. If the seed is treated with a fungicide it may cost another $1.25 to 1.50 per bushel. Thus, assuming $2.50 per bushel for market wheat the cost of farmer saved wheat may range from $9.50 to 15.00 per

acre. This appears to be an advantage for farmer save seed especially over private varieties, **BUT other factors must be considered.**

Seed Quality:
All certified seed and seed of most privately developed varieties has passed both field inspection and seed testing standards for varietal purity, freedom from certain weed and other crop seeds and certain diseases (i.e. loose smut). In addition, most certified seed and seed of private varieties has been treated with a fungicide to control seed-borne (i.e. loose smut) and seedling diseases. All certified seed must exceed 85% germination, however the seed of most public and private varieties exceeds 90% germination. Thus, seed of public and private varieties offered for sale is assured to be high in purity and germination.
Farmer saved seed may also be of high quality, **but many times is not.** The reason is that farmer saved seed may or may not be genetically pure. If the variety has been grown for several years, it will probably be contaminated with seed of other varieties and may not have the original disease resistance and yield potential. In addition, farmer saved seed will usually fall into one of the following categories:

- **Bin run.** No seed cleaning, seed treatment or testing prior to planting. Thus, the only quality check is "It looks good". **This is not recommended and could result in replanting due to poor germination or serious spread of weeds, such as annual ryegrass, cheat and hairy chess, which have become major weed problems in wheat fields in recent years.**

- **Custom cleaned.** Seed is cleaned by a custom conditioner, but not treated. This seed may on may not be tested for germination and is not usually tested for purity and weed seed contamination. **This procedure is risky**, because the seed may still contain unknown weed seeds (even though cleaned), since it hasn't been tested for purity and it will have no protection against seed-borne (i.e. loose smut) or seedling diseases.

- **Custom cleaned, treated and tested.** If farmers are planting their own saved seed, **this procedure is recommended**. This will provide the basic seed quality information and aid in planting decisions. This procedure does not insure varietal purity, however.

The cost of a purity, germination and seed count test at the Seed Laboratory, Division of Regulatory Services, University of Kentucky is $15.00. Individual tests costs are: seed count - $4.00, germination- $7.00 and purity - $5.00. **If a farmer is uncertain about weed seed contamination and germination of bin run seed, sample the bin and have it tested.**

Legal infringement and liability:
Most public and private wheat varieties sold and planted in Kentucky today have been protected through the US Plant Variety Protection Act (PVPA, 1970, 1994). This means that seed of the variety may not be reproduced, sold or offered for sale without the permission of the owner.

The original PVPA (varieties protected prior to April, 1995) allows the farmer to save only as much seed of a protected variety as needed to plant a crop on his (her) holdings (owned, rented or leased land). If planting intentions change, the farmer may sell the remaining saved seed, but the amount planted plus the amount sold cannot exceed the amount required to plant his holdings.
In 1994 the Act was amended allowing the farmer to save enough seed of a variety protected after April, 1995 to plant back on his (her) own holdings, but **none** of the saved seed may be sold without permission.

Under both the original and amended Plant Variety Protection Act, it is an infringement to clean, bag or stock farmer saved seed if the quantity exceeds what the farmer can legally save for planting purposes.

So, what implication does Plant Variety Protection have for Kentucky farmers?? Since most wheat varieties are protected, farmers can save seed and plant it on their own farm without violating the owner's rights under PVPA. If the variety was protected under the original PVPA (prior to1994), farmers can only sell seed to their neighbors if his original planting intentions changed and then the total seed sold and planted cannot exceed the amount required to plant his holdings.

Example, using a 2 bushel per acre seeding rate, a farmer with a 500 acre farm could save a maximum of 1000 bushels for planting. If his planting intentions change and he only planted 150 acres he could sell only the remaining 700 bushels.

If a variety was protected after the 1994 amendment, the farmer can only save seed for planting on his own holdings. If the seed is sold, offered for sale, or title to or possession of the seed is transferred for reproductive purposes, without authorization of the owner of the variety, it is an infringement of the Act. **Thus, farmers cannot legally sell or trade seed of a variety protected (post 1994) to another farmer.**

A partial list of those public and private wheat varieties protected before and after the 1994 amendment to PVPA is shown below. To be certain regarding Plant Variety Protection of a public or private variety the farmer should check with the owner, seed dealer or Kentucky Seed Improvement Association.

Summary:

Farmers saving their own wheat seed can potentially save some input costs for planting in the fall of 1999. However, farmers should only plant seed of a known variety that has been cleaned, treated and tested. Compare the total costs and potential returns to purchasing high quality certified seed of public or private varieties. Be careful that by saving a few dollars you aren't risking liability by violating Plant Variety Protection laws or planting seed with weed seed contamination or disease infection.

Partial list of those wheat varieties protected under the Plant Variety Protection Acts (1970, 1994 (See statement at bottom of page).

PUBLIC

Pre-1994	**Post-1994**
Becker	Glory
Caldwell	Jackson
Cardinal	Patterson
Clark	Pocahontas
Madison	Roane
Wakefield	

PRIVATE

Pre-1994	**Post-1994**
Coker 9474	Agripro Elkhart
FFR 555	Agripro Foster
P2552	Agripro Mason
P2684	Agripro Patton
P2548	Coker 9663
P2545	P2540
P2580	P2568
P2510	25W33
P2684	25W60
	25R57

If a public or private variety is not shown on this partial list, check with the seed dealer,

seed company or Kentucky Seed Improvement Association (public varieties) to determine status regarding Plant Variety Protection.

Economic Summary of On-Farm Tillage Comparisons Funded by KySGGA/KySGPB in 1997 through 1999

Larry Grabau, Department of Agronomy

		ST Advantage		Additional ST Costs		Additional NT Costs			
Test	Managed by:	Yield (bu/a)	Value	Residue Mgmt	Tillage	Seed	Herbicide	N Fertility	Net ST Benefit
			---------- $/A ----------						
1998 Daviess	OC	+0.2	+0.6	6	22	0.9	15	0	-11.5
1998 Fayette	UK	+4.9	+14.2	0	22	9.1	0	5.6	+6.9
1998 Logan	WT	+6.1	+17.7	0	22	10.7	0	0	+6.4
1999 Caldwell	UK	+5.6	+15.7	6	25	4.4	0	3.2	-7.7
1999 Daviess	OC	-3.7	-10.4	6	22	5.8	15	0	-17.6
1999 Fayette	UK	+1.5	+4.2	0	22	7.1	2.2	4.2	-4.3
1999 Logan	WT	+6.4	+17.9	0	22	12.4	7.9	0	+16.2
Means	UK/OC/WT	+3.0	+8.6	2.6	22.4	7.2	5.7	1.9	-1.6

NOTES AND ASSUMPTIONS (Economic Summary of On-Farm Tillage Comparisons Funded by KySGGA/KySGPB 1997-99)

Larry Grabau
Department of Agronomy

1. Abbreviations: ST- some tillage; NT- no-tillage; OC - Miles Opti-Crop; UK - University of Kentucky, and WT - Wheat Tech.

2. Expenses which were in common were not considered in this analysis, as the goal of the project was to compare economic advantages of the two tillage systems.

3. No economic credit was given for the long-term economic advantage likely to result from use of no-tillage methods (through the conservation of topsoil).

4. No economic credit was given for the potential benefits of no-tillage methods to rotated corn and soybean crops.

5. We assumed that neither test weight nor harvest moisture were influenced by tillage system.

6. Both ST and NT were managed to optimize their profitability rather than to obtain the highest possible yields.

7. Specific practices employed (for example, the type and number of tillage passes) are shown in detail in the attached summaries of individual test locations.

8. Each location included two varieties and two replications. Calculated yield differences between tillage systems are assumed to represent real differences.

9. In five of the above tests, the later maturing variety produced higher yields than did the earlier maturing variety (within a given location). Rather than picking the better variety to paint this economic collage, we averaged across the two (to make our conclusions more supportable).

10. This data should be interpreted with some caution, as environmental conditions in coming seasons could clearly affect the outcomes of the two tillage systems. (However, some management considerations may have already helped buffer NT wheat from winterkill; for example, none of these 7 tests were planted in early October, and that may have helped account for the similar survival of most NT tillers in the face of a severe spring freeze in early March, 1998).

11. In 1998, we used a market price of $2.90/bu. The income deficiency payment for 1998 tests brought the value of the 1999 crop to $2.80/bu.

12. No adjustments were made for differing speed of operations; for example, ST was not penalized for slightly slower combining, nor was NT penalized for slower

speeds while drilling the crop.

For More Information, Contact:

Dottie Call, Wheat Group Coordinator
UK Research and Education Center
P.O. Box 469, Princeton, KY 42445

Telephone: 270/365-7541 Ext. 234

E-mail: dcall@ca.uky.edu
Visit Our Website: http://www.ca.uky.edu/ukrec/welcome2.htm