Alabama Winter Wheat Production Guide

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2011-2012

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WHEAT VARIETY SELECTION

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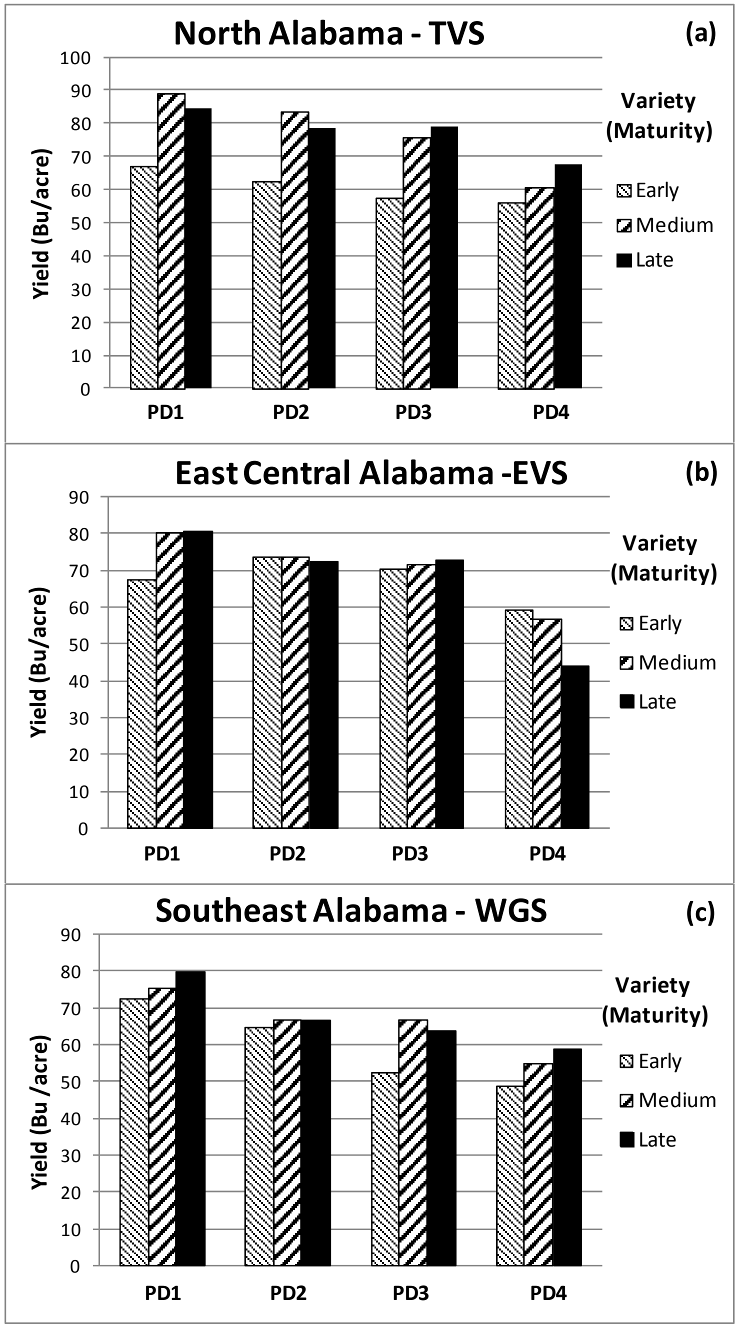
One of the most important decisions a farmer makes each year is variety selection. This choice is crucial to ensure high grain yield, quality and to allow implementation of an effective management plan. Selecting the right variety for a particular environmental condition can reduce potential risk for pests and diseases and adverse weather events. The effect of variety selection and its relation with planting date have been studied during the last two years (2009 - 2010 and 2010-2011) in Alabama (Figure1). Data showed that in North Alabama, the highest yield was achieved by planting early in the season, ~ October 15, either medium or late maturity wheat varieties. These varieties require longer vernalization and growing days than the early maturing varieties. In east central Alabama, for earlier planting dates the best options were medium and late maturity varieties rather than the early maturity variety. However, for late plantings an early maturing variety performed better than the others. In southeast Alabama, similar to north Alabama, medium and late maturing varieties yielded higher than early maturing varieties. In summary, these two years of research data suggest that late maturing varieties should be planted early in the season and early-maturing varieties should be considered for late plantings.

In addition to the level of maturity of the variety, there are other characteristics to consider when selecting a variety: yield potential (the most important), disease and pest resistance, lodging, test weight, heading date, and year-to-year yield variability. The first resource a farmer has in making this decision is variety test performance data. Although you should look for a variety with stable yield at many locations over several years, information on varieties adapted to your area is also important. Since many varieties today are sold only for a few years, the best approach when selecting a variety is to look at the variety information developed by the Auburn University official variety testing program and other state performance tests that are replicated in numerous locations. Auburn University publishes annually the performance of small grain varieties for grain in Alabama. This document presents data from variety trials conducted under a broad range of environmental conditions in Alabama. Results of the variety tests are available at: http://www.ag.auburn.edu/agrn/alabamavarietytesting// or http://www.alabamacrops.com

Other characteristics important when selecting a variety are:

- *Pest resistance*. Every year it is necessary to re-evaluate variety choices to ensure that the genetic resistance of varieties against disease populations has not been eliminated or reduced.
- *Straw strength and height*. A variety with good straw strength reduces potential yield losses associated with lodging. Because varieties with poor straw strength typically will lodge when high rates of nitrogen are applied, you should select varieties with good lodging resistance in high yield management situations.
- *Test weight*. Standard test weight for US #2 wheat is 58 lbs/bushel. If the test weight of wheat is lower than the usual standard, the grower will received a reduced price. Therefore, select the variety that has the best combination of all the characteristics needed in the high yield environment.

Last but not least, the selection of the variety is not complete if quality seed is not planted. Certified seed guarantees good germination and freedom from weed seed.



Location	Planting date			
	Date 1 (PD1)	Date 2 (PD2) Typical farmer's planting date	Date 3 (PD3)	Date 4 (PD4)
North - TVS	Oct. 15-17	Oct. 29-30	Nov. 15	Nov. 30
East Central -EVS	Oct. 21-23	Nov. 6-8	Nov. 20-22	Dec. 5
Southeast - WGS	Oct. 29	Nov. 13-16	Nov. 26-30	Dec. 10

Figure 1. Effect of Planting Date and Variety on Yield of Soft Red Winter Wheat in Alabama. Average of data collected in 2010 and 2011.

SEEDBED PREPARATION AND TILLAGE

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Selecting a tillage or land preparation method can have significant effects on a producer's wheat yields and returns. Conventional tillage can bury crop residue, reducing diseases and other pests, while preparing a seedbed for accurate placement of wheat seed. However, tillage can also destroy organic matter and may cause a producer to become non-compliant with USDA conservation programs.

Conservation tillage production methods can contribute to increased soil moisture, organic matter and tilth, while reducing soil erosion and nutrient losses, and may lead to increased incentives from government programs. Decreases in equipment, labor and fuel costs have all been documented with conservation tillage, however, growers need to balance these savings with potential loss of grain yields, or select a system that optimizes returns.

Soils in the southeastern United States can develop compacted layers or hardpans that can restrict root growth and reduce wheat yields. While adequate soil moisture is usually not a limiting factor during most of the wheat growing period, studies conducted across the Southeast have shown that wheat yields can often be increased by using some sort of tillage. Tillage deep enough to disrupt hardpan layers is often needed on sandy and sandy loam soils, while high clay content soils often respond to shallow tillage. Studies in Georgia have shown that early root growth was limited in compacted no-till soils compared to those with some form of deep tillage. Wheat roots growing in dense no-till soils had more low-oxygen stress, leading to increased Pythium disease infection and delayed root development.

Large amounts of plant residue under conservation tillage at planting can result in yield reductions up to 20 percent due to poor drill penetration, and uneven seed placement and furrow closure. Some strategies to ensure good crop establishment are: i) careful setting and monitoring of coulters and openers of no-till drills, ii) reducing planting ground speed, and iii) increasing seeding rate by 10-15 percent compared to rates used in conventionally tilled seedbeds.

Deep tillage studies in Alabama have been shown an increase in the number of heads, kernels per square feet, and yield. Experiment Station studies have shown increases of 9 to 20 bu/A when using deep tillage (chiseling to 6 -9 inches or turn-plowing to 8 -10 inches) compared to no-till on sandy soils. On high clay soils (Tennessee Valley and Black Belt), disking to 3 -5 inches was usually sufficient to break up shallow compaction and increase yields by 8 to 16 bu/A, but no-till has also produced comparable yields to conventional tillage on Limestone Valley soils. In Florida, wheat responded to tillage in 2 of 3 years on a sandy loam soil. On-farm trials in central Alabama have consistently shown 15 to 23 bu/A increases with deep tillage (12 inches or less). In a silt loam soil in central Mississippi, tillage increased yields by 3 to 13 bu/A. Paraplowing to a 7-inch depth was not usually significantly different from paraplowing to 14 inches. In south Alabama and Florida, lack of a traffic pan resulted in little response to deep tillage, so that testing for the presence of a hardpan with a sharp rod or penetrometer may help a grower decide if deep tillage is needed.

After deep tillage, growers should be careful to limit traffic and other tillage operations, especially disking, to avoid recompacting soil. Several conservation tillage implements are available to break up compacted layers, such as "paraplows" or various types of chisel plows, which limit crop residue burial and help preserve soil organic matter and quality.

Under no-till, heavy crop residue like corn can tie up soil nitrogen, and limited root growth can affect uptake of applied N. Tiller development can be slower and tiller densities less than with conventional tillage, but tiller development across no-till and conservation tillage can be comparable to conventional tillage following cotton. However, tiller development can be compensated by manipulating the timing of spring nitrogen applications. Application of an additional 40 lb/A of N has been shown to increase no-till yields to equal or exceed that from conventional tillage on a silt loam soil in Kentucky.

Yield losses associated with crop injury from wheel traffic of tractors or in-crop spraying and fertilizer spreading can be reduced if the grower keeps the traffic in the same lines. Controlled traffic can also reduce compaction problems, facilitate spray application through firmer soil, and reduce stunting of the crop following wheat. Traffic patterns or tramlines provide controlled traffic and can be established by skipping rows in the field (blocking drill spouts that corresponds with the location of the sprayer tires), or by chemically killing emerged rows. In general, setting up tramlines is simpler if your sprayer width is a multiple of your drill width. Spray equipment should be a minimum of 40 feet for tramlines to be economical. All application equipment, including that of custom applicators, will need to use the same width and wheel spacing for this method to be most successful.

Research has shown that tramlines do not reduce yield when they are spaced a minimum of 40 feet apart. Border rows adjacent to the tramlines will compensate for the yield reduction from the unplanted area. This is not the case if you simply run over the wheat with equipment, because crushed wheat plants will not yield much grain, but will compete for water and nutrients and prevent border rows from compensating. Another method for establishing tramlines is to apply glyphosate using a spray tip mounted behind the tires of the sprayer on the first trip over the field. Controlled traffic aided by GPS-based auto-guidance systems is becoming more popular among producers because it enhances proper implementation of conservation tillage and increases in field efficiency: fuel, fertilizer, herbicide, and time. (The complete tramlines publication by Shannon Norwood and others can be found at: http://www.aces.edu/timelyinfo/BioSysEng/2008/September/BSEN-08-09.pdf)

PLANTING PRACTICES

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Planting dates

Planting date is a key factor in producing high yielding small grain cereals including wheat. In most cases, the reduction of yield potential and the increase of pest and disease pressure are associated with the planting date. The root system and shoot development have a differential contribution to final yield; however, both are highly influenced by planting date. For example, winter wheat will emerge sooner and the shoot develop faster if the soil is warm (75 to 80 degrees °F. In contrast, the root system develops much faster and more extensively if the soil is cool (55 to 60 degrees °F).

The wheat plant develops tillers in the fall, and those will contribute between 60 to 80 percent of the number of harvestable heads. Fall tillers tend to have stronger root systems and most likely have large heads with kernels of high-test weight, which will contribute to increased yield.

While planting too early will cause an increase in development rate, the wheat plant can reach the jointing and heading phase too quickly which might increase the risk for winter kill or freeze damage. Therefore, late maturity varieties should be planted ahead of the early maturity varieties because they most often have the longest vernalization requirements.

Vernalization, a requirement for grain cereals to experience a period of cool temperatures to accelerate flowering, varies with winter wheat varieties mainly because of flowering date. Because wheat begins to vernalize as soon as the seed has absorbed water, temperatures at planting and during early growth will likely influence the subsequent development. Vernalization temperatures are in the 40 to 55 degrees °F range; however, the optimum is around 40 degrees °F. Wheat varieties require specific vernalization days for growth and development. If cold weather does not occur after planting, wheat heading is delayed until the crop has accumulated a particular number of heat units. This delay may result in wheat filling the grain under hot and dry conditions or having reduced grains/head.

Early maturity varieties usually have short vernalization requirements and must be planted late in the season. This strategy will avoid excessive early fall growth. If a wheat variety has long vernalization requirements, early planting dates are recommended.

Planting dates and it relation with the level of maturity of wheat varieties vary for different regions of the state. Preliminary results from a research study conducted in 2010 and 2011 in Alabama showed that wheat yield decrease as planting is delayed (Figure 1). Although the results indicated that yield increases if wheat is planted 15 days earlier than the farmer's planting date, pests such as Hessian Fly and Barley Yellow Dwarf might increase with early planting dates if the climatic conditions favor their reproduction and survival. Yield data from the North Alabama (TVS) location showed that medium or late maturity wheat varieties were the best options when planted early in the season. For the east central location (EVS), medium and late maturity varieties were also the best option for early planting. However, the early maturing variety, presumably due to the low vernalization requirements, yielded higher than the medium and late maturity varieties when planted late in the season (Figure 1). At the southeast location (WGS), medium and late maturing varieties yielded higher than early maturing for most planting dates. Results from this study will be used to revise the traditionally recommended planting dates in Alabama

Table 1. Recommended planting dates for the Winter Wheat planted for Grain in Alabama†.

Region	Planting period
Northern	October 15 - November 10
Central	October 15 - November 15
Southern	November 15 - December 1*

†Although these dates have been traditionally recommended, they are currently under revision through experimentation.

* If short vernalization varieties are planted, then the recommended planting period is: December 1 - December 15

Seed placement

Good establishment of seedling wheat depends on proper seed placement. Because shallow planting can result in uneven germination, winter wheat should be seeded between 1 and 1 ½ inches deep under good soil moisture conditions and up to 2 inches deep if moisture conditions are deficient. Many of the new wheat varieties have semi-dwarf genes with short coleoptiles. If the seed is placed too deep in the soil, the plant will produce the first leaf below ground and die. Other consequences of deep seed placement are delayed emergence, reduced stand, less initial vegetative growth, and reduced tillering. The contrary case occurs when shallow planting, which might result in winter injury, is followed by rains which may allow adequate stands to be achieved.

Under a no-tillage system, additional care is needed to ensure that the seed is placed below the plant residue or mulch and at the proper soil depth. If the residue is evenly distributed on the soil surface, the drills will easily slice through the residue, and the seed can be properly placed in the soil. This practice can improve seedling emergence providing a quick ground cover.

SEEDING RATES

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Although traditionally, farmers use seeding rates based on the volume or weight of the seeds (bushels per acre), the number of winter wheat seeds in one pound can range between 10,000 to 18,0000 depending on the seed size of the variety and the year it was produced. Therefore, seeding rates should be based on the number of seeds per acre rather than volume or weight of the seeds per acre. Seeding rates may vary for different planting methods; however, a rate of 30 to 35 seeds per square foot is desirable for most varieties. Low seeding rates can result in excessive tillering, delay of maturity, increased weed competition, and failure to reach yield potential. Overly high seeding rates produce excessive vegetative growth which can reduce plant water use efficiency. Another aspect is the interplant competition that results in yield reduction caused by a reduced number of tillers and the yield per tiller. These problems are exacerbated under dry conditions because of soil moisture limitations.

Environmental conditions also influence the optimum seeding rate. Farming under limiting environmental conditions may imply a reduction of seeding rate. Favorable environments, especially for moisture, temperature, and nutrients, support higher seeding rates.

Generally, early planting achieves maximum yields with lower seeding rates. However, if planting is delayed, seeding rates should be increased by 15-20 percent. The type of planting equipment used and the consequent row spacing also influence the seeding rate, Table 2.

Table 2. Seeds per row foot needed to reach a specific number of seeds per square foot at different seeding widths.

Row width (in)	Seeds / sq. ft.			
	30	35	40	45
	Seed per linear foot			
6	15	18	20	23
7	18	20	23	26
7.5	19	22	25	28
8	20	23	27	30
10	25	29	33	38

Row width

Although wheat is normally planted at 6 to 8 inches row spacing, several studies have shown that winter wheat yield can be increased 5 to 10 percent if 4-inch row is used versus 8-inch row spacing. The disadvantage of the 4-inch row is that the drills are likely to clog due to excessive surface residue or clods. Contrasting with the yield benefits of 4-inch rows, a row spacing greater than 10-inch could cause significant yield reductions of about 15 to 20 percent when compared to 7.5 inch rows.

FERTILIZATION AND LIMING

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There is no substitute for soil testing in determining how much lime and fertilizer to apply for wheat and small grain production. Most Alabama growers choose to soil sample prior to planting a summer crop (e.g. cotton, corn or soybean) so they can apply lime, phosphorus (P) and potassium (K) to that crop and allow this wheat to utilize the residual P and K. However, some growers have found it just as reasonable and effective to soil test in late summer to early fall so they can apply the lime, P and K to the fall wheat crop. If cotton, corn or soybeans are to follow in the spring, no additional P and K will be needed if the wheat is properly fertilized in the fall and only grain is removed.

Table 3 gives a relative comparison of wheat's ability to survive and produce under extreme nutrient deficiencies. The Cullars Rotation experiment has plots where specific nutrients have never been applied since 1911 and the potential exists for severe deficiencies. Note that soil acidity ("No lime" plots) and "No N" plots produce the most dramatic yield reductions whereas on this particular Coastal Plain soil, "No sulfur" and "No micronutrients" have little effect on wheat grain yields.

Table 4 provides a good background for nutrient recommendations, particularly N which is not held by the soil. Like other grain crops, grain yield and N removal are closely related. This relationship is not as dramatic with other plant nutrients, although K removal can be highly related to straw removal. Also, keep in mind what happens to those nutrients that may be applied in anticipation of a certain yield when that yield is not achieved. In the case of P and K, they remain in the soil.

Lime. Don't plant wheat if the soil pH is below 5.5. As Table 3 indicates, soil acidity can be devastating to wheat yields. Fertilizers cannot make up for acid soils. Soil testing is the only way to know for sure how much ground, agricultural limestone may be needed. Because wheat has been shown to respond to deep tillage (inversion, deep chisel, para-till, etc.) applying the lime and/or fertilizer so they can be incorporated into the soil with tillage is more efficient than applying it ahead of a no-till crop such as cotton, corn, or soybeans.

Nitrogen. Wheat, like corn grain, requires about 1.0 to 1.5 pounds total N per bushel of anticipated yield. Because of its transient nature in the environment, N fertilization of wheat is the most difficult nutrient to manage but also one of the most critical because it is an essential component of protein. Nitrogen produces green, leafy growth. Supplying adequate N in the fall is necessary for good plant establishment. Once the weather becomes cold in December, wheat makes very little green, leafy growth until the weather warms in late winter. Therefore, excess N applied in the late fall is a waste of an expensive resource and can cut into profits. Excessive N in the late fall could be leached from the soil by winter rainfall and could be unavailable in the early spring when the crop needs it for rapid growth.

Fall Nitrogen. Auburn University recommends 20 pounds N per acre at fall planting on Coastal Plain soils if wheat is grown for grain only. Limestone Valley soils are less responsive to fall applied N. If wheat is following a heavily fertilized corn crop, a good peanut or soybean crop, or a drought damaged crop that could not utilize all the fertilizer N applied, often no additional fall N will be needed on wheat for grain. If wheat is to be grazed or if more fall growth is desired and is possible, then up to 100 pounds N per acre should be applied in the fall. Fifty pounds N is enough to produce about a ton of dry matter growth. It takes about a ton of straw to produce about a ton of grain (~30 bushels). Additional information concerning nitrogen management on wheat production with or without fall tillage control can be found in: http://www.ipni.net/ppiweb/bcrops.nsf/$webindex/1E65F014953D3D87852578F1004BB652/$file/Pages+8+to+11+BC+3+2011.pdf

Table 3. Ten years average wheat yields in the Cullars Rotation experiment (circa 1911) at Auburn, AL, the oldest soil fertility study in the South.

Treatment description	10-year average wheat yield (1999-2008)	Relative Yield (%)
Complete fertilization + micronutrients	52	100
No nitrogen	18	35
No phosphorus	21	40
No potassium	40	76
No sulfur	51	98
No micronutrients	51	98
No lime (pH=4.9)	13	25
No lime or fertilizer at all	0	0

Table 4. Estimated nutrient removal by wheat based on yield.

Wheat Yield (bu/acre)	Nutrient Removal (lb/acre)					
	N	P_2O_5	K_2O	Ca	Mg	S
			GRAIN ONLY			
30	34	16	10	0.75	4.5	2
60	68	32	20	1.5	9.0	4
90	103	48	30	2.25	13.5	6
120	138	64	40	3.0	18.0	8
			GRAIN + STRAW			
30	50	20	60	4	9	30
60	100	40	120	8	18	60
90	150	60	180	12	27	90
120	200	80	240	16	36	120

Late Winter/Spring Nitrogen. **Late Winter/Spring Nitrogen**. The complement of the nitrogen (60 to 100 pounds N per acre) should be applied at Feeke's growth stage 4 in south Alabama (Figure 2). In north Alabama, N should be applied between Feeke's stage 4-6. The complement of N can be applied in split applications if desired and a high yield potential exists (80+ bushels per acre). The reason for this relates to Feekes Growth stages. In south Alabama where spring temperatures rise dramatically, wheat develops rapidly from GS 6 to GS 10. Nitrogen must be available during this rapid period of green, leafy growth. Afterwards, heading and ripening also occur quickly and there is not enough time for a split N application. In north Alabama where cooler springs may prevail, wheat develops slower over a longer period of time. This may also be conducive to higher yields if N is available throughout this period. Therefore, split N applications may be desirable for high yielding wheat in North Alabama. A recent summary of three-year research study, found no wheat yield increase to splitting N fertilizer rates when wheat was planted following cotton. The main concern with over application of early spring N is the potential for lodging and possible freeze damage in northern Alabama.

Phosphorus. Lack of adequate P can be devastating to wheat yields as indicated in Table 3. However, this is totally avoidable by soil testing. Once soil test P reaches a "high" level, additional P will not increase yield or quality regardless of the yield potential of the field. There is no yield advantage to applying P fertilizers if the soil test indicates that P is already high in the soil. Keep in mind that P removal in the harvested grain is low compared to N so it is unlikely that one will remove significant P from the soil over several cropping seasons (Table3). Phosphorus fertilizers can be applied prior to or at planting in the fall or to the crop in rotation with wheat.

Potassium. Table 3 indicates that wheat can still produce 76 percent of its yield potential even when soil test potassium (K) is severely deficient. Wheat, being in the grass family with a fibrous root system, is very efficient at getting K from the soil. Soil testing is also the best way to monitor soil K levels and to apply additional K if needed. This can be applied directly to the wheat at or prior to planting in the fall. It can also be applied to the crop in rotation with wheat. If wheat straw if removed, special attention to K fertilization is needed to replace that harvested in the straw. At least 1 pound K_2O is needed per pound N applied to replace that removed in the anticipated yield.

Secondary nutrients, calcium and magnesium. Following a good liming program which maintains the soil pH above 5.5. on clayey soils and 5.8 on sandy soils will assure adequate Ca and Mg for most wheat crops. Use dolomitic limestone to maintain high soil Mg levels (25+ lb/acre soil test Mg on sandy soils and 50+ lb/acre soil test Mg on clayey soils).

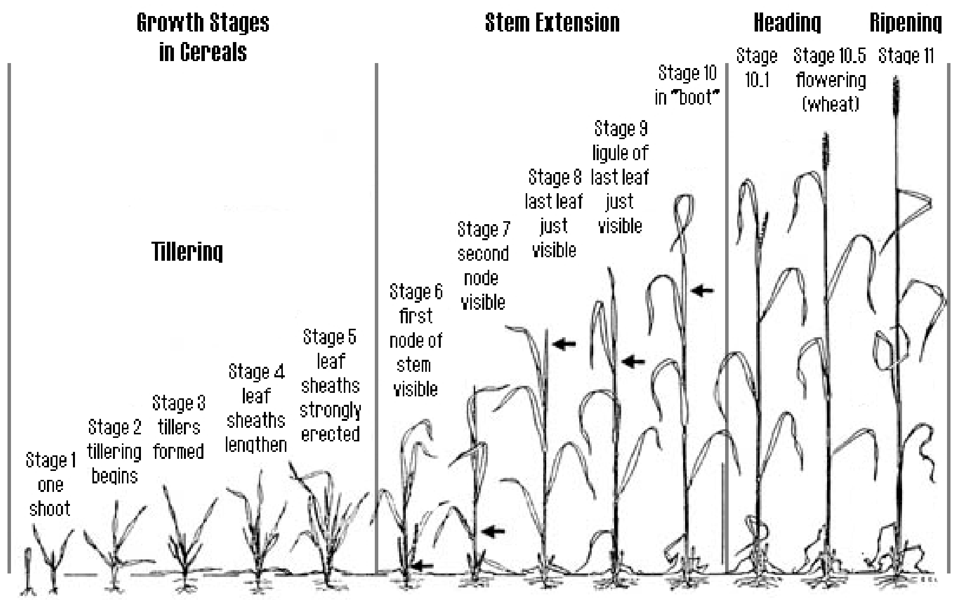
Sulfur. Wheat planted on sandy soils low in organic matter (most of Alabama's Coastal Plain and Sandstone Pleateau soils) can develop S deficiency in early spring if (1) no S has been applied and/or (2) soil or weather conditions limit deep rooting of the wheat crop. Sulfur deficiency of wheat is almost identical to N deficiency. It will be seen as a general yellowing of the crop in late winter and early spring as rapid spring growth occurs and a heavy spring N application has been applied. If diagnosed early enough, a corrective application of about 50 pounds S per acre of a sulfate-sulfur source (ammonium sulfate, ammonium thiosulfate, sulfate of potash magnesia, or agricultural gypsum) can be made prior to GS 9. On soils where S deficiency is likely, a preventative application of at least 20 pounds sulfate-S per acre should be made with the spring N application. Auburn University routinely recommends 10 pounds S per acre for all crops as a precautionary application. Note that many fertilizer blends may contain adequate S. Soil tests for S are not very useful in diagnosing problems. Plant samples, if taken in a timely manner, can help diagnose S deficiencies. A good rule of thumb is to apply about 1 pound S for every 10 pounds of N applied. Sulfur deficiencies are rare on the clayey soils of the Black Belt and Tennessee Valley and on the red soils of the Piedmont and Coastal Plain.

Micronutrients. Micronutrients (zinc, copper, iron, manganese, boron, molybdenum, chlorine) are generally available in Alabama soils in adequate amounts for wheat production. Therefore, routine applications of these nutrients to wheat are not needed and are not recommended. In many cases, micronutrients may be applied to a crop in rotation with wheat e.g., zinc on corn and boron on cotton and peanuts. Table 3 shows that the wheat plots in the 100-year old Cullars Rotation produce 98 percent of the yield of plots receiving a micronutrient mix (no significant difference).

Broiler litter and other organic fertilizers. A ton of poultry broiler litter (annual cleanout or cake) contains around 60+ lb. N, 60+ pounds P_2O_5 and 40 pounds K_2O. If a ton per acre is applied prior to or at planting in the fall, this should be all the fall nutrients needed for most wheat crops (check soil tests). Additional fall applied poultry litter will provide more N. Some growers prefer to apply poultry litter as a topdressing in late winter (after February 15). The total N in poultry litter can be anywhere from 2/3 as available as N fertilizers to almost 100 percent available. Therefore, applying 2 tons litter per acre as a topdressing in February will provide 80 to 120 pounds available N to the wheat crop. Nutrients not removed in the wheat crop or leached in spring rains should be available to the following summer crop. Poultry litter is an economical way to build soil P and K levels when it is used as an N source.

Other organic byproducts are more difficult to predict. In general, municipal biosolids and liquid animal manures can be an effective source of N and P for fall application to wheat. Check with the vendor or supplier to make sure of the nutrient content and rate to be applied. For organically grown wheat, additional restrictions will apply and each producer will have to determine the best source of N to use. Phosphorus and potassium are not major concerns in organic wheat production.

Other small grains. In general, recommendations for wheat are sufficient for cereal rye, oats, and barley. Crop removal by these other small grain crops will also be comparable to those listed in Table 4 for wheat. Rye is a much deeper-rooted grain than wheat and for this reason, sulfur-deficiencies of rye are very rare compared to wheat.



Stage

T I L L E R I N G

1 One shoot (number of leaves can be added) = "brairding"

2 Beginning of tillering

3 Tillers formed, leaves often twisted spirally. In some varieties of winter wheats, plants may be "creeping" or prostrate

4 Beginning of the erection of the pseudo-stem, leaf sheaths beginning to lengthen

5 Pseudo-stem (formed by sheaths of leaves) strongly erected

S T E M E X T E N S I O N

6 First node of stem visible at base of shoot

7 Second node of stem formed, next-to-last leaf just visible

8 Last leaf visible, but still rolled up, ear beginning to swell

9 Ligule of last leaf just visible

10 Sheath of last leaf completely grown out, ear swollen but not yet visible

H E A D I N G

10.1 First ears just visible (awns just showing in barley, ear escaping through split of sheath in wheat or oats)

10.2 Quarter of heading process completed

10.3 Half of heading process completed

10.4 Three-quarters of heading process completed

10.5 All ears out of sheath

F L O W E R I N G (WHEAT)

10.5.1 Beginning of flowering (wheat)

10.5.2 Flowering complete to top of ear

10.5.3 Flowering over at base of ear

10.5.4 Flowering over, kernel watery ripe

R I P E N I N G

11.1 Milky ripe

11.2 Mealy ripe, contents of kernel soft but dry

11.3 Kernel hard (difficult to divide by thumb-nail)

11.4 Ripe for cutting. Straw dead

Reference: Large, E.C. 1954. Growth stages in cereals. Plant Pathology. 3:128-129.

Figure 2. Feekes growth stages for small grain. Source: http://nue.okstate.edu/GSchart.htm

WEED MANAGEMENT IN WHEAT

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Site Preparation Prior to Planting

Preparation of the seedbed prior to crop planting is extremely important with any crop, especially regarding weed control. Any emerged weeds present when wheat is planted will have a distinct advantage over the crop and will be much harder or impossible to control after wheat emerges. Therefore, make sure that all emerged weeds are destroyed prior to wheat planting. This can be done by tillage such as double disking or chisel plowing followed by disking. It can also be done using burndown herbicides like glyphosate (Roundup, Touchdown, etc.) or paraquat (Gramoxone, etc.). Regardless of the method used for site preparation, it is imperative that emerged weeds be destroyed prior to planting wheat. Paraquat only provides burndown of the tops of most perennial weeds, while glyphosate will translocate and provide control some perennial species. Refer to the ACES publication ANR-0500-a for additional information on herbicides used in small grains. Read herbicide label before use.

Herbicide Use During the Growing Season

Several herbicides are registered for use in wheat grown for grain. Currently the majority of these products are applied after wheat emergence for control of emerged weeds. As such, care must be taken to apply the herbicides at the proper growth stage of the crop and the weed to prevent crop injury and hopefully obtain good weed control. The following is a list of herbicides registered for use on wheat in Alabama.

Axiom (flufenacet + metribuzin) from Bayer: used at the rate of 4 to 10 ounces per acre to wheat in the spike stage. DO NOT apply before wheat emerges. Axiom provides control of **wild radish**, **bluegrass**, and **annual ryegrass** if activated prior to weed emergence. Check label for use on cultivars NOT tolerant to Axiom. Corn and soybean may be planted in the spring following application; cotton may be planted 8 months following application.

Prowl H20 (pendimethalin) from BASF: used at the rate of 1.5 to 2.5 pints per acre after the wheat has emerged until flag leaf is visible. Prowl will provide preemergence control of **annual ryegrass** and some other small-seeded broadleaf weeds if activated prior to weed emergence. DO NOT apply until after wheat has emerged. If ryegrass has emerged prior to this application, mixing a postemergence herbicide like Hoelon, Axial, or Osprey with Prowl will be required. Any crop may be planted in the spring following a fall application of Prowl.

Express SG (tribenuron-methyl) from Dupont: used at the rate of 0.25 to 0.5 ounce per acre postemergence from two leaf but prior to flag leaf wheat growth stage. Express will provide control of selected broadleaf weeds including **wild mustard**, **wild radish**, and **common groundsel**. Add a nonionic surfactant at the rate of two pints/100 gallons spray solution. May be applied with liquid nitrogen fertilizer. Any crop may be planted 45 days following application.

Harmony SG (thifensulfuron-methyl) from Dupont: used at the rate of 0.45 to 0.9 ounce per acre postemergence from two leaf but prior to flag leaf wheat growth stage. Harmony will provide control of selected weeds including **wild garlic**. Add a nonionic surfactant at the rate of two pints/100 gallons spray solution. May be applied with liquid nitrogen fertilizer. Any crop may be planted 45 days after application.

Harmony Extra XP (thifensulfuron-methyl + tribenuron-methyl) from Dupont: used at the rate of 0.3 to 0.6 ounce per acre postemergence from two leaf but prior to flag leaf wheat growth stage. This combination product provides control of several **annual broadleaf weeds** including weeds that Express and Harmony control. Add a nonionic surfactant at the rate of 2 pints/100 gallons spray solution. May be applied with liquid nitrogen fertilizer. Any crop may be planted 45 days after application.

Axial (pinoxaden) from Syngenta: used at the rate of 8.2 fluid ounces per acre postemergence from two leaf to pre-boot wheat growth stage. Axial provides control of grass weeds including **annual ryegrass** that has not exceeded the five leaf stage. The label specifies the use of Adigor adjuvant at 9.6 fluid ounces per acre with Axial. May be mixed with liquid nitrogen carrier up to 50 percent N solution. Any crop can be planted four months after application.

Osprey WDG (mesosulfuron-methyl) from Bayer: used at the rate of 4.75 ounces per acre postemergence from emergence to wheat jointing. Osprey provides control of **annual ryegrass**, **bluegrass**, and several small (< 2 inch) annual broadleaf weeds including **wild radish** and **wild mustard** as well as **henbit** and **chickweed**. Osprey also suppresses several Bromus species including downy bromegrass. A nonionic surfactant at 2 quarts per 100 gallons spray solution plus spray grade ammonium sulfate (3 lbs/acre) or ammonium nitrogen fertilizer at 1-2 quarts per acre must be added to Osprey. Cotton, soybean, and peanut may be planted three months following Osprey. DO NOT plant corn for 12 months following Osprey application.

Hoelon (diclofop-methyl) from Bayer: used at the rate of 1.33 to 2.66 pints per acre postemergence from emergence to wheat first node. Hoelon provides control of **annual ryegrass** up to the four leaf stage. May add 1-2 pints crop oil concentrate per acre when ryegrass is larger. DO NOT mix with any broadleaf herbicides or fertilizer. DO NOT mix with an organophosphate insecticide.

ET (pyraflufen-ethyl) from Nichino: used at the rate of 0.5 to 1.0 fluid ounce per acre postemergence on wheat from 6-8 inch tall to jointing. ET provides control of several annual broadleaf weeds including **cutleaf eveningprimrose**, **eclipta**, **chickweed**, **common lambsquarter**, and **shepards-purse**. Add a nonionic surfactant, methylated seed oil, or crop oil concentrate at 0.5 percent by volume (2 qts per 100 gallon spray mix). ET can be mixed with Osprey, Harmony Extra, or 2,4-D. Cotton, corn, or soybeans may be planted 30 days following ET applications.

2,4-D (various trade names): used at the rate of 1.0 to 1.25 pint per acre postemergence after wheat is fully tillered, but before jointing. CAUTION: spraying wheat too young or after jointing may cause yield reductions. Better activity is obtained when air temperatures are in the 60 -70 degree F range at application. 2,4-D may be mixed with other herbicides (check label). 2,4-D provides control of **several annual broadleaf weeds** in wheat and suppresses **wild garlic**. May be mixed in nitrogen fertilizer solutions. Amine and ester formulations are available. Ester forms mix better with nitrogen and may be more effective on larger weeds.

MCPA amine (various trade names): used at the rate of 0.5 to 1.0 pint per acre postemergence after wheat is fully tillered, but before jointing. This product is similar to 2,4-D in its method of killing broadleaf weeds. The same caution for spraying too early or late must be observed with MCPA.

Dicamba (various trade names): used at the rate of 0.25 pint per acre postemergence after wheat is fully tillered, but before jointing. This product is similar to 2,4-D in the way it kills broadleaf weeds. Applying to jointing wheat will result in a yield loss.

Power Flex (pyroxsulam) from DOW: Used at the rate of 3.5 oz per acre post emergence to wheat from three-leaf to joint stage. Control several grasses, **including ryegrass** and **broadleaf**

weeds. DO NOT mix with dicamba or amine formulations of 2,4 D or MCPA. Add a non-ionic surfactant at 2pts per gal spray mix.

Herbicide Mechanism of Action

The mechanism of action of a herbicide is the process in the plant that is affected by the herbicide which results in death of the plant. Different herbicides kill plants by different mechanisms. This is advantageous for the prevention and/or delay of the development of herbicide-resistant weeds.

- Axiom inhibits photosynthesis and cell division in affected weeds and grasses.
- 2,4-D, MCPA, and dicamba are all classified as synthetic auxins. Plants produce natural auxins (hormones) that help regulate their normal growth. These herbicides overload the plant hormone system causing plant growth deformation and/or death.
- Axial and Hoelon inhibit the production of Acetyl CoA Carboxylase (ACCase), the enzyme catalyzing the first step in fatty acid synthesis.
- Express, Harmony, and Osprey are Acetolactate Synthase (ALS) inhibitors, an enzyme needed for production of amino acids.
- Prowl inhibits the process of mitosis (cell division) and therefore restricts the growth of plant roots.
- ET inhibits the production of Protoporphyrinogen (Protox) a compound needed in the process of plant photosynthesis.

Using one class of herbicide exclusively over a period of years in a field can encourage the development of herbicide resistance in a weed species. Therefore, if possible, farmers should rotate the use of herbicides listed above to help prevent or delay resistance.

INSECT PEST MANAGEMENT

Kathy L. Flanders
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Department of Entomology and Plant Pathology

This section provides an overview of the insects that can cause yield losses on wheat. Yield losses can come from the feeding of the insects themselves, or in some cases, from the diseases that they vector.

There is no single magic bullet that we can use to control any of these insects. Instead, we have to use a combination of tactics to keep the insect populations below the point where they cause economic yield loss. This process of periodically checking for the presence of insects, and applying various tactics to control them, is called integrated pest management.

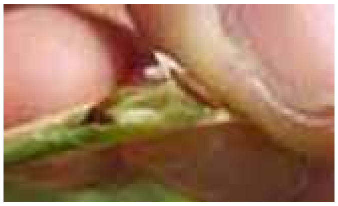
General Scouting Procedure

It is a good management practice to scout fields for damaging infestations of insects. At a minimum, check grain fields in the fall, in late winter before applying nitrogen, and during the boot and heading stages. Scouting during the first 20 to 50 days after planting is especially critical because this is when insect control with a foliar spray can provide greatest economic returns. Check fields as often as possible after this time, particularly before applying fertilizer, herbicides, or fungicides. If insect populations exceed thresholds, it may be possible to apply an insecticide as a tank mix with another chemical.

Check five to 10 spots in the field, examining at least one row-foot at each location. Be sure to include at least two samples near the field edges. Check closely because insects, particularly aphids and pupae of the Hessian fly, can sometimes be found at the base of the plant below ground level. It may be necessary to pull some plants out of the ground in order to sample for insect infestations. For larger plants, slap the plants to jar insects to the ground for counting.

Table 5 summarizes the biology and management strategies for common wheat pests in Alabama. Pictures of the important life stages are included as are references to further information on the particular pest, figure 3. This section is meant to accompany IPM-0458, Small Grains Insect, Disease, and Weed Control, which is updated annually. IPM-0458 includes specific insecticide recommendations and more detailed pest management information. IPM-0458 is part of the Alabama Pest Management Handbook, Volume 1 (http://www.aces.edu/pubs/docs/A/ANR-0500-A/). Another useful reference is the Southern Small Grains Resource Management Handbook, http://pubs.caes.uga.edu/caespubs/pubs/pdf/B1190.pdf

Hessian fly



White and green larvae and brown pupae

Adult

Larvae and pupae exposed by pulling back leaf sheath

Aphids

Greenbug

Bird cherry-oat aphids

Cereal leaf beetle

Adult

Larva

Egg

Feeding damage

Fall armyworm

Mature larva

Small larvae

Armyworm

Mature larva

Green June beetle

Grub (larva)

Adult

Figure 3. Life stages of the most important pest found in the Alabama Wheat fields

Table 5. Quick Guide for Managing Wheat Insect Pests

Potential Insect Pest	Other management tactics	What to look for	When to scout	Threshold for chemical control[1]	Conditions leading to an outbreak, Comments
Hessian fly, *Mayetiola destructor,* maggots (larvae) feed on stems, inside the leaf sheath, causing stunting and death of plants Further information: Biology and Management of Hessian Fly in Wheat, http://www.aces.edu/pubs/docs/A/ANR-1069/ Hessian Fly Scouting Guide, http://www.aces.edu/dept/grain/documents/HessianFlyScoutingGuide.pdf North Carolina Small Grain Production Guide, http://www.smallgrains.ncsu.edu/NCSmallGrains/ProductionGuide.html	Crop rotation Control volunteer wheat Do not plant before the recommended planting date Resistant varieties[2] Insecticide seed treatment Bury wheat debris	Pupae (look like flaxseeds) and maggots (larvae) behind leaf sheaths at the base of the tiller (as stem elongates, look behind each leaf sheath, just above the node). Hessian fly flaxseeds (pupae) are about 3/8 inch long.	January to early March. Spray high risk fields in late winter when adults are emerging. Autumn, before 3 leaf stage – spray high risk fields – see Insect chapter in NC Small Grains Production Guide	20 percent infested stems. The best option is to use a combination of other management tactics to reduce the risk of Hessian fly infestation.	Regional increase in wheat acreage Planting wheat after wheat Volunteer wheat Distance from previous season's wheat stubble Planting of susceptible varieties
Grain aphids[3] siphon plant sap, causing stunted plants in the fall, and spread the viruses causing **yellow dwarf disease** Further information: Barley Yellow Dwarf in Small Grains in the Southeast, http://www.aces.edu/pubs/docs/A/ANR-1082/	Do not plant before the recommended planting date Insecticide seed treatment Use recommended seeding rate	Aphids on leaves or just below soil line at the crown of the plant. Aphids are small – the largest, the English grain aphid, is less than 1/8" long.	Seedling-head emergence	Table 6 includes plant growth thresholds. In North AL an insecticide treatment, seed or foliar, in the first 30 days after planting will likely pay off.	Hot, dry preceding summer Late, warm fall Mild winters

Potential Insect Pest	Other management tactics	What to look for	When to scout	Threshold for chemical control[1]	Conditions leading to an outbreak, Comments
Cereal leaf beetles, *Oulema melanopus,* eat leaves in the spring. Further information: Management of Cereal Leaf Beetles: Pests of Small Grains, http://www.aces.edu/pubs/docs/A/ANR-0984/	n/a	Adults, eggs, larvae on the top side of the leaves. also look for green-black slime that rubs off larvae onto your pants legs. Size: Adults are 3/16" long.	Look for adults in March, eggs and larvae late March-early May	One egg or larva per two stems, spray before 25 percent egg hatch	Found from Autauga Co. north, most often a problem from Talladega Co. north
Fall armyworm caterpillars, *Spodoptera frugiperda,* eat seedling wheat Further information: Management of Fall Armyworm in Pastures and Hayfields, http://www.aces.edu/pubs/docs/A/ANR-1019/	Plant after first frost	Caterpillars (larvae) hiding in litter on the ground during the day, chewed or missing seedlings. Size: fully-grown caterpillars are 1.25-1.5 inches long.	just before planting, then from emergence to 4 weeks after planting	2-3 larvae per linear row foot (three per square foot)	previous months were hot and dry minimum tillage
Armyworm caterpillars, *Pseudaletia unipuncta,* eat leaves and heads in late spring Further information: Featured Creatures: Armyworm, http://www.entnemdept.ufl.edu/creatures/field/true_armyworm.htm	n/a	Caterpillars feeding on plants. Size: Fully grown caterpillars are 1.25-1.5 inches long.	April and May	3-4 larvae per linear row foot is a commonly accepted threshold.	Cool, wet spring esp. following hot, dry summer. This pest often comes in so late that spraying is not economical, unless there is evidence that

Potential Insect Pest	Other management tactics	What to look for	When to scout	Threshold for chemical control[1]	Conditions leading to an outbreak, Comments
					the caterpillars are clipping off the heads.
Green June Beetle, *Cotinis nitida*, destroy seedlings as they look for food Further information: Biology and Control of the Green June Beetle, http://www.aces.edu/pubs/docs/A/ANR-0991/		Look for grubs in the soil. Grubs will crawl on their backs. Size: Fully-grown grubworms are about 1.5-2 inches long when fully grown.	late August up to 1 week before planting	1-2 grubs per square meter of surface area	Broiler litter used as fertilizer in no till or minimum tillage situations. Dig in soil to a depth of 6-8 inches, looking for the grubs (larvae) and the pulverized soil left behind from their feeding activity.

[1]See IPM-0458, Small Grains Insect, Disease, and Weed Control, which is updated annually. IPM-0458 includes specific insecticide recommendations and more detailed pest management information. IPM-0458 is part of the Alabama Pest Management Handbook, Volume 1 (http://www.aces.edu/pubs/docs/A/ANR-0500-A/).

[2]See section on resistance of wheat varieties to Hessian fly.

[3]Greenbug, *Schizaphis graminum*; Bird cherry-oat aphid, *Rhopalosiphum padi*; Rice root aphid, *Rhopalosiphum rufidiabdominale*; English grain aphid, *Sitobion avenae;* Corn leaf aphid, *Rhopalosiphum maidis*; and sugarcane aphid, *Sipha flava*.

Table 6. The number of aphids required to support an insecticide application for management of BYD or direct damage from aphids in Alabama and Georgia.

Growth Stage	North	Coastal Plain
Seedling (to 30 days after planting)	1-2 bird cherry-oat aphids per row-ft 10 greenbugs or sugarcane aphids per row-ft	n/a
6-10 " tall plants	6 aphids per row-ft	6 aphids/row-ft
Stem elongation	2 aphids per stem	2 aphids per stem
Boot/Flag leaf	5 aphids per stem	5 aphids per stem
Head emergence	10 aphids per head	10 aphids per head
Soft/Hard dough	Do Not Treat	Do Not Treat

Information of Hessian fly resistant varieties. Choosing a Hessian fly resistant variety is like shooting at a moving target. Plant breeders incorporate resistance genes into wheat, and then the Hessian flies adapt and overcome that resistance. Based on laboratory testing, all of the populations of Hessian flies in Alabama can overcome the H7H8 resistance gene. In practice, varieties with H7H8 resistance still hold up fairly well in east central and south Alabama, providing the Hessian fly pressure isn't too high. These varieties do not help in the Black Belt and in north Alabama. Based on laboratory testing, varieties with more advanced Hessian fly resistance, usually the H13 gene, will be partially to completely effective in Alabama. We used to refer to this advanced resistance as "Biotype L" resistance. Recent testing of populations from the Southeast have shown that "Biotype L" populations vary in their ability to overcome various plant resistance genes. So now we try to talk about individual plant resistance genes.

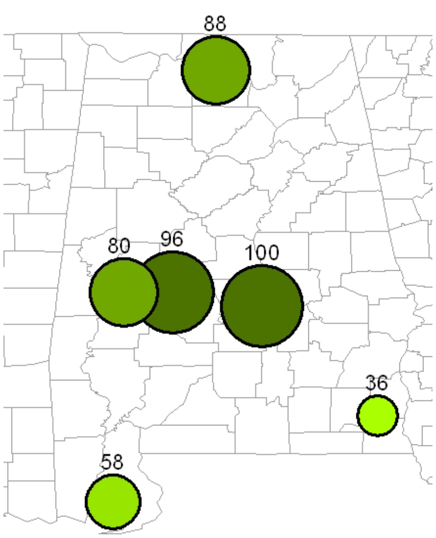


Figure 4. Percent effectiveness of the H13 gene in Alabama.

Figure 4 shows the percent effectiveness of the H13 gene in Alabama, based on laboratory testing at the USDA-ARS lab in West Lafayette, Indiana.

So, what varieties will work? How do you know what resistance gene is in the variety you want to plant? There are several sources of information on resistant varieties. Table 7 shows the relative susceptibility of wheat varieties to Hessian fly in Alabama, 2009. Also, the University of Georgia screens new varieties for resistance to Hessian fly each year, Table 8. The results of their tests in Griffin, Georgia, will be similar (usually) to how a variety will respond in Alabama (see 2009 insects section of "Small Grain Updates" at http://www.swvt.uga.edu/small.html.

Table 7. Relative susceptibility of wheat varieties to Hessian fly in Alabama, 2009

Variety	Percent Infested Stems		
	Belle Mina	Fairhope	Headland
AGS 2010	1	-	-
Pioneer_26R61	9	-	-
SS_8404	28	-	-
Coker_9804	36	-	-
USG_3209	38	-	-
AGS 2060	-	13	43
AGS 2055	-	20	7
Terral TV 8558	-	20	4
Terral TV 8589	-	24	0
AGS 2026	0	32	7
Magnolia	39	36	67
GA 991209-6E33	-	43	7
VA 04W-90	-	43	15
Progeny 166	-	56	7
Terral LA 482	-	56	33
Oglethorpe	1	60	3
Terral TV 8170	-	60	13

Variety	Percent Infested Stems		
	Belle Mina	Fairhope	Headland
Progeny 185	-	64	47
UAP Baldwin (GA 981621-5E34)	-	68	14
GA 991336-6E9	-	68	33
AGS 2020	-	70	7
AGS 2035 (GA 981622-5E35)	-	72	35
Jamestown	-	72	76
VA 04W-259	-	72	50
McNair 701	-	76	12
GA 991371-6E12	-	80	24
Progeny 119	-	80	39
Merl (VA 03W-412)	-	84	63
Progeny 117	32	92	57
Terral LA 841	-	92	50
Progeny 130	-	93	69
AGS 2031	-	97	41
GA Gore	-	100	71
Panola	-	100	75
Progeny 136	-	100	63

Table 8. Hessian Fly Variety Tests, 2009-2011, Belle Mina, AL

Kathy Flanders, Brenda Ortiz, Kathy Glass, Charles Burmester, and Chet Norris

Variety	Yield (bu/a)						Late Spring Hessian Fly (% Infested Stems)			
	2009		2010		2011		2009		2010	
AGS 2010	72.3	c	-		-		1.04	b	-	
AGS 2026	80.4	ab	59.8	a	88.02	abc	0.00	b	0.0%	d
AGS 2035	-		50.3	b	81.93	abc	-		9.3%	bc
AGS 2060	-		51.6	b	66.43	e	-		7.1%	cd
Baldwin	-		-		78.06	cd	-		-	
Coker 9553	-		-		71.83	de	-		-	
Coker 9804	73.3	c	-		-		35.60	a	-	
Magnolia	72.8	c	-		-		39.16	a	-	
Oglethorpe	83.7	a	54.9	ab	75.97	cd	1.23	b	0.0%	d
Pioneer 26R22	-		55.8	ab	88.84	ab	-		12.1%	abc
Pioneer_26R61	77.3	abc					8.89	b	-	
Progeny_117	73.7	c					32.00	A	-	
SS 8404	76.4	bc	51.5	b	-		28.27	a	18.6%	a
Terral 8861	-		-		90.31	a	-		-	
USG 3120	-		-		80.82	bc	-		-	
USG 3209	60.4	d	50.4	b	-		37.51	a	12.9%	abc
USG 3251	-		-		88.79	ab	-		-	
USG 3295	-		53.2	b	-		-		16.4%	ab
USG 3555	-		59.9	a	-		-		13.6%	abc

Plots were 5X20 feet. Yields adjusted to 13.5% 60 lb/bu. Tukey's LSD. Alpha=0.05. Yellow highlights= tolerance to "Biotype L"

Table 9. Hessian Fly Variety Tests, 2009-2011, Prattville, AL

Kathy Flanders, Brenda Ortiz, Kathy Glass, Charles Burmester, and Don Moore

Variety	Yield (bu/A)						Late Spring Hessian Fly Percent Infested Stems	
	2009		2010		2011		2010	
AGS 2010	69.0	ab	-		-		-	
AGS 2020	48.3	bc	-		-		-	
AGS 2026	60.0	abc	56.9	abc	82.53	a	1.4%	c
AGS 2035	-		63.5	a	-	-	10.0%	ab
AGS 2060	-		53.8	c	76.61	bc	6.4%	bc
Baldwin	-		-		78.81	abc	-	
Coker 9553	49.8	bc	56.1	abc	79.79	abc	10.0%	ab
Georgia Gore	43.8	c	-		-		-	
Oglethorpe	56.6	abc	54.5	bc	80.68	abc	0.0%	c
Pioneer 26R22	-		59.4	abc	83.47	a	13.9%	a
Pioneer_26R61	54.8	abc	-		-		-	
SS 8641	-		61.6	ab	-		9.4%	ab
Terral 841	-		-		75.26	c	-	
Terral 8861	-		-		81.72	ab	-	
USG 3120	-		-		-		-	
USG 3209	41.7	c	59.0	abc	-		11.4%	ab
USG 3251	-		-		83.07	a	-	
USG 3555	-		53.8	c	82.43	a	11.6%	ab
USG 3592	69.9	a	-		-		-	

Yields adjusted to 13.5% 60 lb/bu. Tukey's LSD. Alpha=0.05. Yellow highlights=tolerant to Biotype L.

Table 10. Resistance of Wheat Varieties to Hessian Fly, primarily based on ratings from David Buntin, University of Georgia

Varieties susceptible to most southern strains of Hessian flies	Varieties with fair resistance (non-Biotype L Hessian fly)	Varieties with good resistance to Hessian fly
AGS 2031, 2020 **AgriPro** Panola, Savage Chesapeake **Coker 9184, 9295,** 9511, 9553, 9663, 9700, 9835 **DynaGro** 9053, 9171 Fleming, Gore, McCormick, Merl, Neuse **Pioneer Brand** 26R12, 26R15, 26R22, 26R24, 26R87 **Progeny** 117, 119, 125, 127, 130, 136, 145, 166, 185 Roberts **SS** 520, 560, 8404 **Terral** LA821, LA841, LA842, TV8525, TV8626 **USG** 3209, 3251, 3295, 3438, 3452, 3665, 3477, 3555, 3592, 3770, 3725, 3910 **Agrium/CPS** Dominion, McIntosh, Tribute	**AGS** 2000, 2055 **AgriPro** Magnolia Jamestown **Novartis NK-Coker** 9152 **Pioneer Brand** 26R31, 26R38 **Progeny** 122, 166 **SS** 8308 **Terral** TV8589, TV8170 **USG** 3350	***non-Biotype L Hessian flies*** Arcadia **AGS** 2485, 2035, 2060 **Dyna-Gro** Baldwin **Pioneer Brand** 2580, 26R38 Roane **SS** 8641 **Terral** TV8558, TV8848, TV8861 **USG** 3120 ***Biotype L flies*** **Agrium/CPS** Oglethorpe* AGS 2010*, 2026* Pioneer Brand 26R61 Crop Land 8302 *believed to have H13 resistance

Notes on the performance of the "Biotype L" resistant varieties in Alabama. Oglethorpe (H13) has been highly resistant in trials in Belle Mina, Prattville, and Headland (Tables 7-9). In 2009, under extremely heavy insect pressure it was heavily infested with Hessian flies in Fairhope. AGS 2026 has been highly resistant in Belle Mina and Prattville and resistant in Headland. It was moderately infested with Hessian flies in Fairhope in 2009. AGS 2010 (presumed H13) was highly resistant in replicated plots in Belle Mina, but a nearby commercial field planted to this variety was heavily infested. Pioneer Brand 26R61 was highly resistant in a trial in Belle Mina.

Other insects that cause problems in wheat. Grasshoppers sometimes invade wheat in the spring. They are particularly common in dry weather. Economic threshold for grasshoppers is 3-5 per square yard. Scout in the field, not just on the field borders where populations may be higher. Lesser cornstalk borers can attack early planted wheat (September-October). The moth larvae bore into the stem at or below the soil surface, and frequently kill the plant. Chinch bugs and stink bugs may occasionally invade wheat in the spring. Winter grain mites can invade small grains and ryegrass planted into perennial grass forage. Scout for this mite between Thanksgiving and Christmas.

DISEASE MANAGEMENT IN WHEAT

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A description of most of the diseases likely to occur in Alabama's wheat crop as well as their distribution, factors that contribute to disease development, suggested control procedures, and listing of cultivar reaction to diseases are included in this publication.

Disease	Symptoms	Distribution and Occurrence	Risk Factors	Control Procedures
Glume and Leaf Blotch	Lens-shaped, reddish brown spots on leaves and leaf sheaths with yellow border which often merge into irregular blotches. Diseased leaves wither and die. On the seed head, glume blotch appears as a gray to brown discoloration of the outer seed cover. Pycnidia of causal fungus are black for leaf blotch and light brown for glume blotch.	Glume Blotch – Statewide, common. Leaf Blotch – Tennessee Valley, unusual.	• Wheat monoculture. • Volunteer wheat. • No-till. • Overcast, wet weather patterns in late winter and early spring.	•Rotate to other winter cereal crops like rye or oats, legume, crucifer, or clean fallow. •Resistant wheat variety. •Fungicide seed dressing. •Foliar fungicides.
Rust Diseases	Rust appears as early as tillering as small circular yellow to orange pustules on the upper leaf surfaces and leaf sheaths that contain a mass of powdery, orange to red-orange spores. With stripe rust, long rows of yellow pustules containing yellow-orange spore mass form on the leaves and leaf sheaths. Diseased leaves often turn bright yellow to give field a yellow-green cast.	Leaf Rust – Statewide, common. Stripe Rust- Tennessee Valley, unusual. Stem Rust – Statewide, rare.	•Volunteer wheat. • Early planting. • Overcast, mild, wet weather patterns in late winter and early spring.	•Resistant wheat variety. •Timely planting. •Systemic fungicide seed dressing. •Foliar fungicides.

Disease	Symptoms	Distribution and Occurrence	Risk Factors	Control Procedures
Powdery Mildew	Appears at any growth stage as discrete, cottony white patches on leaves and leaf sheaths, which turn tan to gray as they age. On heavily diseased leaves, individual cottony patches merge and cover large areas of the leaf surface. Cottony fungal growth may be seen on seed heads. Diseased fields have 'yellow' color.	Statewide, common.	• High seeding rates. • Excessive nitrogen. • Cool, drier weather patterns.	•Resistant wheat variety. •Timely planting. •Recommended seeding rate. •Recommended nitrogen rate at planting and topdressing. •Systemic fungicide seed dressing. •Foliar fungicides.
Scab (Fusarium Head Mold)	Disease appears at flowering as a bleaching of one to all spikelets on a seed head. Healthy spikelets below and above the nearly white or bleached diseased spikelets are green. Later, masses of slimy pink to orange spores and mycelia of the causal fungus develop along the margin of the blighted spikelets. Small, round, black fruiting bodies of the fungus may be clustered along the edge of the dead glumes. Scaby seed are shriveled, chalky white to pink in color, often will not germinate, and contains mycotoxins toxic to livestock.	Statewide, common in TN Valley but less so in South AL.	• Wheat monoculture. • Wheat after no-till corn. • Sowing *Fusarium*-infested seed. • Heavy /frequent rainfall at flowering.	•Avoid wheat after no-till corn. •Periodic deep tillage. •Clean seed and apply a fungicide seed dressing. •Foliar fungicides.

Disease	Symptoms	Distribution and Occurrence	Risk Factors	Control Procedures
Loose Smut	Smutted heads emerge several days early and are black, in contrast to the normal green color of healthy seed heads. The delicate seed membrane ruptures shortly after head emergence, exposing masses of dark brown to black spores. Yield loss is directly related to percentage of smutted seed heads. Spores are spread to nearby healthy seed heads by wind currents. Common on bin-run seed.	Statewide, common.	• Failure to apply systemic fungicide seed dressing.	•Clean seed and apply a systemic fungicide seed dressing.
Take-All	Appears as scattered circular patches of stunted, yellow to white plants with few tillers. In some cases, entire portions of a field yellow and die. Stem base and roots are blackened due to the growth of the take-all fungus. Black growth may extend 1 to 2 inches above the soil line.	Tennessee Valley, common but otherwise uncommon.	• Wheat monoculture, including planting wheat as winter cover for cotton or soybean no-till. • Volunteer wheat. • Wet weather in late winter and early spring. •Excess nitrogen.	•Rotate to other winter cereal crops like rye or oats, legume, crucifer, or clean fallow. •Fertilize according to soil test recommendations. •Systemic fungicide seed dressing.
Black Chaff (Bacterial Stripe)	Long reddish to dark brown spots with a yellow halo that are bordered by large veins are found on the leaves. Some 'water soaking' of tissues surrounding the spots may be seen. Brown blotches or stripes are seed on diseased glumes. Easily confused with glume blotch.	Statewide, uncommon.	• Wet weather in late winter and early spring. • Volunteer wheat.	•Avoid overwatering irrigated wheat. •Clean seed.

Disease	Symptoms	Distribution and Occurrence	Risk Factors	Control Procedures
Barely Yellow Dwarf	Fall infections usually result in stunting and red-purple to yellow flag leaves in the spring; whereas, spring infections tend to result in discolored, usually yellowish, erect flag leaves without plant stunting. Leaf yellowing progresses from the tip to its base and is easily mistaken for a nutrient deficiency. Symptoms are highly variable and depend on variety, virus strain, weather, soil fertility, soil compaction, and stage of the plant at the time of infection.	Statewide, common.	• Volunteer wheat. • Early planting. • Non-insecticide treated seed.	•When possible, plant after first hard frost. •Systemic insecticide seed dressing. •Recommended seeding rate. •Foliar insecticides.
Soilborne Wheat Mosaic (SBWM)	A mild green to distinct yellow mosaic or mottling patterns are most apparent in early spring. Unfurling leaves appear mottled due to the development of parallel dashes and streaks. Some stunting of the shoots may also be seen. Symptoms are often suppressed by warming temperatures in the spring.	South Alabama, rare.	• Wheat monoculture. • Early planting. • Wet winter weather.	•Rotate to other winter cereal crops like rye or oats, legume, crucifer, or clean fallow. •Timely planting. •Resistant varieties.
Wheat Spindle Streak (WSSMV)	Yellow-green mottling or streaking parallel to the leaf veins which tapers to form chlorotic spindles appears on the lower leaves. Yellowed, stunted plants are usually most apparent in low or wet areas in late winter. As the weather warms, symptoms on the new leaves are very faint. If	Statewide, rare.	• Wheat monoculture. • Early planting. • Wet winter weather.	•Rotate to other winter cereal crops like rye or oats, legume, crucifer, or clean fallow. •Timely planting. •Resistant varieties.

	temperatures remain cool, reddish streaking or dead spots may occur on the upper leaves.			

Additional information concerning diseases of wheat and their control can be found in ANR-543 'Wheat Diseases and Their Control' (http://www.aces.edu/pubs/docs/A/ANR-0543/) and fungicide recommendations are listed in the ANR-500 'Alabama Pest Management Handbook' Volume 1 (http://www.aces.edu/pubs/docs/A/ANR-0500-A/). A detailed description of Barley Yellow Dwarf and recommended control practices can be found in ANR-1082 'Barley Yellow Dwarf in Small Grains' (http://www.aces.edu/pubs/docs/A/ANR-1082/) .

Table 11. Effectiveness of selected management inputs for controlling wheat diseases.

Disease	Management Inputs[1]								
	Planting Date	Balanced Fertility	Seeding Rate	Resistant Varieties	Crop Rotation	Tillage	Seed Dressing[2]	Foliar Fungicide	Foliar Insecticide
Foliar									
Glume Blotch	3	3	--	2	2	2	3	1	--
Leaf Blotch	--	--	--	2	2	2	3	1	--
Leaf Rust	2	2	--	1	--	--	3	1	--
Stripe Rust	2	2	--	1	--	--	--	1	--
Stem Rust	3	3	--	1	--	--	--	1	--
Powdery Mildew	2	2	2	1	--	--	3	1	--
Black Chaff	--	--	--	3	2	3	--	--	--
Inflorescence									
Scab	--	--	--	--	2	2	2	2	--
Loose Smut	--	--	--	--	--	--	1	--	--
Soil									
Take-All	2	3	--	--	1	--	3	--	--
Virus									
Barley Yellow Dwarf	2	--	3	2	--	--	2	--	2
Wheat Spindle Streak	--	--	--	2	2	--	--	--	--
Soilborne Wheat Mosaic	2	--	--	2	3	--	--	--	--

[1]Numerical rating for relative effectiveness of management inputs: 1 = highly effective, 2 = moderately effective, and 3 = slightly effective, -- = not applicable.
[2]Refers to the use of either fungicide and/or insecticide seed dressing.

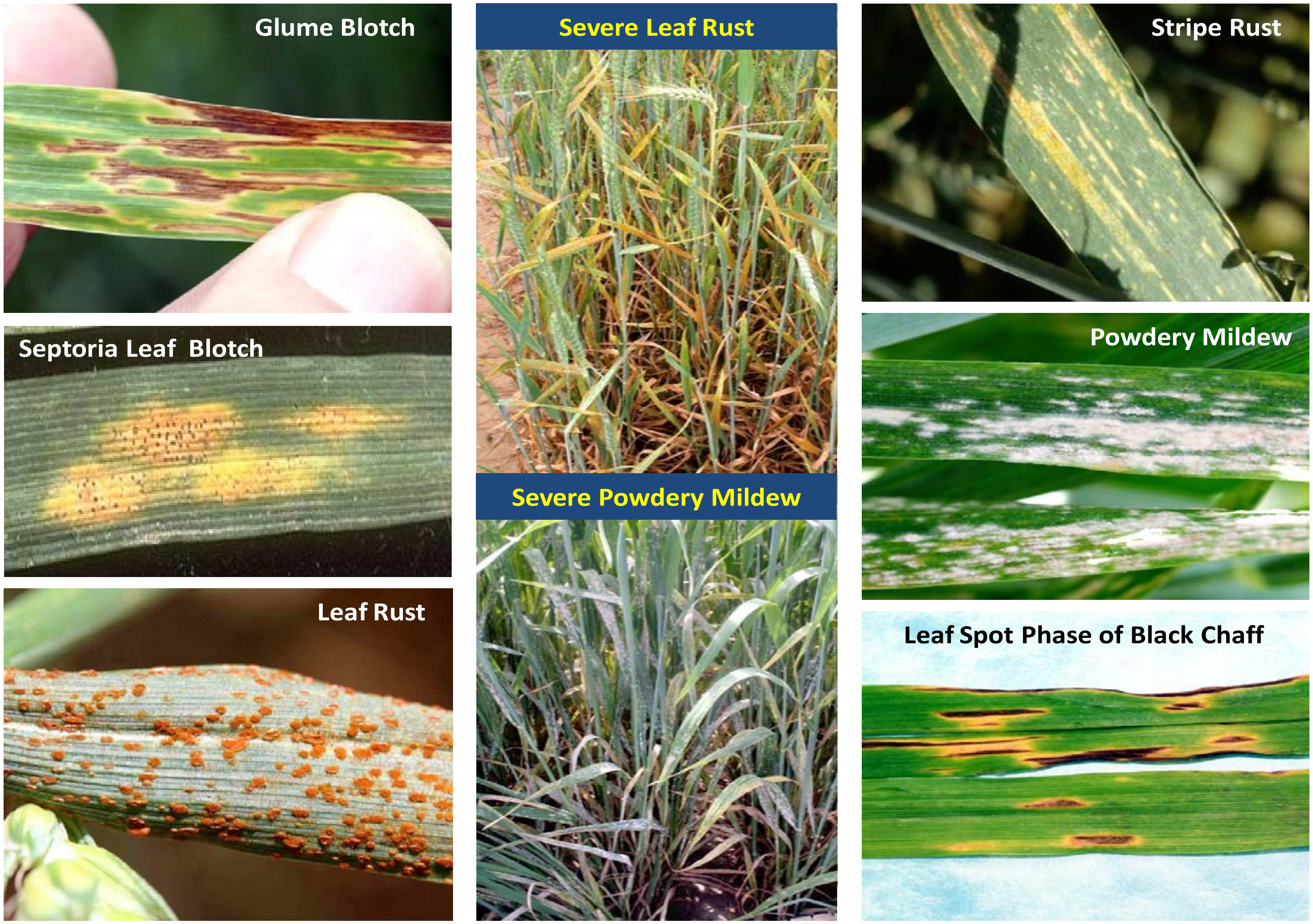

Figure 5. **Visual symptoms of some of the most common wheat diseases.**

Figure 5. Visual symptoms of some of the most common wheat diseases.

Table 12. Reaction of recommended wheat varieties to diseases.

Wheat Variety	Powdery Mildew	Glume Blotch	Leaf Rust	Stripe Rust	SBWM
AGS 2000	Fair	Fair	Fair	Poor	Poor
AGS 2010	Good	Good	Good	Good	Good
AGS 2020	Good	Good	Good	Good	Very Good
AGS 2026	Good	Good	Good	Good	Good
AGS 2031	Fair	Good	Good	Good	Good
AGS 2035	Fair	Fair	Good	Good	Good
AGS 2060	Fair	Fair	Good	Good	Good
Baldwin	Fair	Good	Good	Good	Good
Coker 9553	Good	Fair	Fair	Good	Fair
Dominion	Good	Good	Good	Good	Good
Fleming	Good	Fair	Good	Good	Poor
Jamestown	Good	Fair	Poor	Good	Good
Magnolia	Poor	Fair	Poor	Good	--
Oglethorpe	Fair	Good	Good	Good	Good
Pioneer 26R15	Good	Good	Good	Good	Good
Pioneer 26R22	Fair-Good	Fair-Good	Fair	Good	Good
Pioneer 26R61	Poor	Fair	Fair	Good	Good
Pioneer 26R87	Good	Fair	Good	Fair	Fair
Roberts (Forage only)	Good	Good	Poor	Poor	Good
SS 8308	Fair	Good	Poor	Fair	Good
SS 8641	Good	Fair	Good	Good	Good
USG3021	Good	--	Good	Good	--
USG 3209	Good	Fair	Poor	Good	Good
USG 3592	Good	Good	Good	Poor	Good
USG 3295	Good	Fair	Good	Good	Good

GRAIN COMBINE MAINTENANCE

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Pre- and In-Season Combine Maintenance

As fall harvest nears, it is time to start thinking about getting the combine out and ready. Combine performance depends upon several factors but proper maintenance both before but during harvest is critical to ensure maximum performance. The following information provides suggested pre- and in-season checks and maintenance for grain combines.

Pre-Season Checklist

- Lubricate (grease and oil) the entire combine per the operator's manual.
- Make sure the air filters and radiator are clean.
- Ensure all fluid levels (engine, hydraulic, etc.) are checked and filled to the appropriate level.

Check the following:

- Chain wear and belt cracks
- Feeder house chains and elevator chains
- All bearings for signs of fatigue
- Feeder house floor for wear
- Concave for excess wear
- Inspect the cylinder or rotor for wear and damage
- Fountain and unloading augers for wear
- Straw walkers and bearings for cracks, wear, or fatigue.
- Straw chopper and parts for wear, cracks, and damage.

Harvest Maintenance

Here is a simple checklist to follow during harvest:

- Check engine and hydraulic oil levels on a daily basis.
- Check the radiator water level and ensure it is clean of debris and dirt.
- Visually inspect for bearing and sprocket wear when greasing the combine.
- Check air filters for cleanliness
- Check the tension of chains.
- Check and empty the rock trap on a routine basis.

Remember, the most important steps in maintenance are greasing, chain lubrication, checking the air filters for cleanliness and adjusting chain and belt tension. The operator's manual provides detail information on the location of grease fittings and the frequency of greasing different components on the combine.

Proper Field Adjustments

One the most important tasks during harvest is to check for too much harvest loss due to improper combine settings and adjustments. While harvest losses are unavoidable, the difference between acceptable and excessive losses is small. Therefore, periodically checking for harvest loss is highly recommended; if possible, check when changing fields, harvest conditions, or varieties. Many times, one or two quick adjustments can address excessive harvest loss. ***Follow the operator's manual*** (most combine manufacturers provide a small quick guide or cheat sheet) but make sure to makes changes in individual increments versus making several adjustments at one time.

Minimize Grain Damage

Cylinder or rotor operation impacts grain damage more than any other machine setting. Therefore, combine operators need to be mindful of speed and clearance settings for the rotor / cylinder to minimize damage and ultimately net returns; follow manufacturers' recommendations on combine settings the operator's manual. Grain moisture can also influence damage so ensure you are harvesting at the appropriate grain moisture level. Damage can vary between varieties so settings may need to be changed to minimize damage. Lastly, avoid over threshing the crop which can increase grain damage producing excess fines while also increasing power and fuel consumption.

YIELD MONITOR: MAINTENANCE AND CALIBRATION

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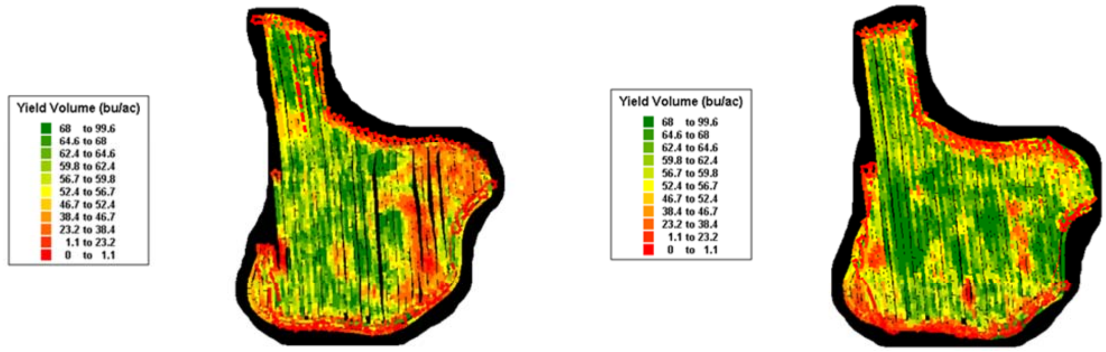
Yield monitoring on grain combines has increased over the past 10 to 15 years providing farmers additional information during harvest about crop yield and grain moisture content (Figure 6). When a GPS/GNSS receiver is used in conjunction with a yield monitor, yields maps can be generated after harvest depicting crop performance across fields. In return, farmers can use yield data and maps to refine management and business decisions to maximize return (Figure 7). However, the accuracy of yield map data is dependent upon one's ability to maintenance and properly calibrate grain yield monitors. Poorly maintained and calibrated yield monitors can lead to inaccurate data and thereby improper management decisions. This point is especially important for farmer's conducting on-farm research. Remember, yield maps are only as accurate as the data collected to generate them.
While you are conducting pre- and in-season harvest checks on your combine, make sure to also routinely check yield monitor components

Figure 6. Example yield monitor display mounted in the combine cab.



(a) Wheat yield prior to variable-rate lime application.

(b) Wheat yield after the application of lime

Figure 7. Example how yield maps can be used to identify issues the modify management in wheat production. In this example, pH levels varied significantly across this field with low (4.7 to 5.8) pH areas across the North and along the east to central part. Variable-rate liming was able to correct these areas while maintaining the optimal pH levels in the other parts.

Here are some considerations for yield monitor maintenance and calibration:

Maintenance
Both pre- and in-season maintenance is important for proper yield monitor operation. Here is a maintenance list which should be covered prior to harvest and calibration of your yield monitor.

Pre-Harvest Checks:

- Data card:
  - Make sure all data from the previous season(s) has been backed up.
  - Cleanup the data card and delete old data to provide sufficient space for the upcoming season.
- Display:
  - Turn-on yield monitor display to ensure it working properly and all components are connected properly.
  - Check all cabling and connections.
- GPS receiver:
  - Make sure it is working properly and the display indicates GPS data is being received and that it is differentially corrected (DGPS).
  - Ensure any correction subscriptions have been renewed or will cover the entire harvest
  - Inspect that it is securely mounted
- *Moisture sensor:
  - Clean sensor of debris, dirt, and grain.
  - Insect for excessive wear of plates / fins

- *Mass flow sensor:
  - Make sure there is no material built up on impact plate
  - Inspect for excessive wear and replace impact plate if needed.
- *Cables:
  - Check all cabling and connections for wear or damage
  - Ensure all cables are properly secured; especially in areas where moving combine components
- *Clean grain elevator:
  - Check for excessive wear of the elevator chain and paddles; replace if needed.
  - Ensure the elevator chain tension is adjusted properly.
  - Is possible, engage separator to ensure the system is reading elevator speed
- Header Switch
  - Make sure it is operating correctly to start and stop data collection by raising and lowering header.
  - Inspect that it is securely mounted.
- Ground Speed Radar - if using a ground speed radar for speed measurements, make sure to properly calibrate.

* Periodically check these components throughout the season. It is suggested to check them weekly but most can be checked when conducting routine combine maintenance. Check both sensors frequently if running in weedy or dirty conditions especially when harvesting soybeans.

Calibration

Each yield monitor manufacture has a different method of calibration. So it is important to understand the procedure and make sure you are familiar with all yield monitor components.

Pre-Calibration

- Review the operator's manual to familiarize yourself with the proper calibration procedure prior to harvest; make a cheat sheet if necessary.
- Having a notebook to document all settings during any calibration procedure is recommended. This information can provide start settings for future calibration or reference. It can be helpful.
- Make sure all yield monitor settings for the combine have been entered properly:
  - Type of header
  - Header width or number of rows
  - Grain type
  - Etc. (see operator's manual)
- Determine how you will check both moisture and mass flow sensors:
  - Moisture Sensor:
    - It is recommended to use a certified grain moisture sensor or analyzer.
    - Hand-held moisture sensors provide a ballpark estimate but can vary too much
    - If you do not have a certified moisture sensor, check with you local elevator or Extension office for access to one.
  - Mass Flow Sensor:
    - Use a weigh wagon or buggy if accessible

        - Or, use either your own certified truck scales or elevator scales to weigh grain used during calibration.

During Calibration

- Follow all the manufacturer's procedures especially for varying the flow rate and ground speed.
- Moisture sensor calibration should be conducted for each grain type. A representative sample(s) of grain can be obtained from the grain tank during calibration.
- A new mass flow calibration is needed each year. Some considerations:
    - Calibrate for every grain type (corn, soybeans, sorghum, etc.)
    - Have a different calibration curve for:
        - High (>20%) and low (<=20%) moisture corn
        - Different types of a specific grain (i.e. high oil versus regular)
        - If the physical properties change of the grain (test weight, surface texture, etc.)
- Calibration loads should be over 5000 lbs; if possible, a half to full tank is preferred.
- Conduct calibration is representative portions of a field with uniform yield; avoid infested (weedy) portions of the field;
- Maintain a uniform ground speed for each calibration load.
- Avoid calibrating in short or point rows.

During Harvest

- Make sure the yield monitor is logging data. It is recommended to download and view data after the first harvest day to ensure data is being logged and archived correctly.
- Calibration should be checked periodically throughout the season to ensure system accuracy. Combine component wear and changing operating conditions can require an updated calibration.
- If any combine parts such as the clean grain elevator chain, fountain auger, or elevator paddles. Any changes in the elevator chain tension will require re-calibration.
- Backup data periodically to your laptop or desktop computer to minimize any yield data loss.
- Minimize sudden changes in ground speed during harvest.
- Adjust the width of harvest when needed especially when operating in point rows.

2011-2012 WHEAT ECONOMIC CONSIDERATIONS

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Wheat Basics

Alabama grows a soft red winter wheat, typically planted in the fall and harvested in late spring. This wheat has medium protein content and is used to make cakes, flat breads, pastries and crackers as well as being utilized as livestock feed. Pricing for soft red winter wheat is based on the Day Wheat Futures market traded on the CME Group (formerly Chicago Mercantile Exchange) sometimes listed as Chicago Wheat. The wheat price paid to farmers is usually based on the July contract month less the basis and any discounts. Table 13 shows the mid-month wheat basis and futures price as well as the corresponding net price For the last two years, the basis (difference in futures market price and cash price) in Alabama has averaged $-.79/bushel. The smallest basis the last year was in June 2011, and the highest future price and net price was February 2011.

Table 13. Mid-month wheat basis and future prices.

	Sep-10	Oct-10	Nov-10	Dec-10	Jan-11	Feb-11	Mar-11	Apr-11	May-11	Jun-11
Futures	7.39	7.51	7.08	7.99	8.45	8.98	7.91	7.88	7.59	7.08
Basis	-1.08	-0.85	-0.85	-0.85	-0.8	-0.88	-0.77	-0.68	-0.67	-0.48
Net	6.32	6.66	6.23	7.14	7.65	8.11	7.15	7.21	6.93	6.61

Stocks to Use Ratio

The stocks-to-use ratio shows the carryover stock for a commodity as a percentage of the total use for that commodity. The lower the stocks-to-use ratio typically indicates a tight market and higher prices. U.S. Stocks to use ratio and average prices for all wheat is shown Figure 8. Wheat price tends to be higher when the stocks-to-use ratio is lower.

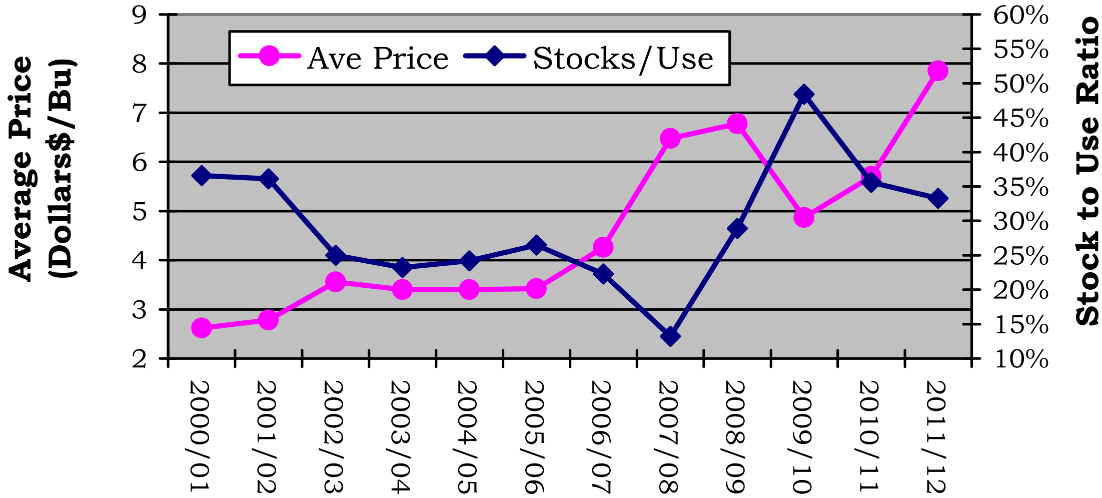

Figure 8 .Changes of stocks-to-use ratio.

Yields

Figure 9 shows the yield trend for Alabama and U.S wheat yields. Alabama average wheat yield of 73 bushels per acre harvested in 2011 set a new record yield beating the old mark set three years ago of 71 bushels per acre.

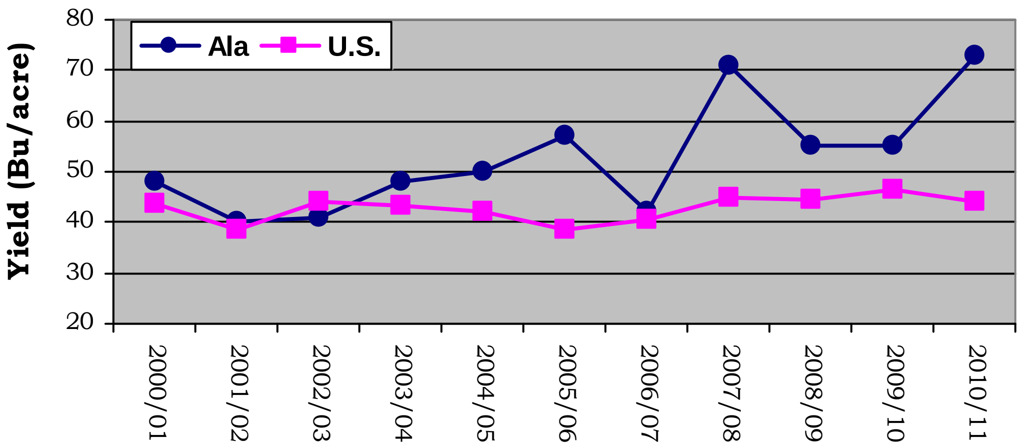

Figure 9. Alabama wheat yield fluctuations for the period 2000-2010.

Wheat for Grain Budget

The 2011/2012 wheat budget for grain shows a projected cash costs of roughly $300 per acre and fixed costs of about $50 per acre. In order to cover all costs of $350 per acre a price of $5.00 per bushel would require a yield of 70 bushels per acre. Or a price of $7.00 bushel would necessitate a yield of 50 bushels per acre.

This budget assumes a land rental rate of $20.00 per acre. This is assuming that the land will be doubled cropped. Also there is no charge for management. It is recommended that you download a copy of the wheat for grain budget to your computer and use the number that best represent your operation.

The easiest way to find the Alabama Enterprise Budgets is to visit:

www.alabamcrops.com, then **select** Enterprise Budgets above the graphics.

The wheat budgets can be found in the 2011/2012 Fall Forages and Wheat Budgets link.

Other Considerations

Crop rotations have always been important and that is no exception in today's environment. With herbicide resistance becoming more prevalent, rotations that utilize different crops, chemistry, and tillage methods may become more important for certain situations. Look at your operation to see what changes or adjustments can be made to your operation to get the greatest benefits crop rotation.

ALABAMA, 2011-2012

WHEAT FOR GRAIN

ESTIMATED ANNUAL COSTS PER ACRE:

FOLLOWING RECOMMENDED MANAGEMENT PRACTICES

ITEM	UNIT	QUANTITY	PRICE OR COST/UNIT	TOTAL PER ACRE	YOUR FARM
1. GROSS RECEIPTS					
WHEAT*	BU.	69.00	7.50	517.50	
2. VARIABLE COSTS					
SEED (CERTIFIED)	BU.	2.00	20.00	40.00	
FERTILIZER					
NITROGEN	LBS.	100.00	0.71	71.00	
PHOSPHATE	LBS.	60.00	0.52	31.20	
POTASH	LBS.	60.00	0.54	32.40	
CROP INS. (Wheat)	ACRE	1.00	0.00	0.00	
LIME (PRORATED)	TONS	0.33	35.00	11.55	
HERBICIDES	ACRE	1.00	15.00	15.00	
INSECTICIDES	ACRE	1.00	12.00	12.00	
FUNGICIDES	ACRE	0.50	16.00	8.00	
NEMATICIDES	ACRE	1.00	0.00	0.00	
IRRIGATION	AC-IN	0.00	9.00	0.00	
AERIAL APPLICATION	APPL	0.00	9.00	0.00	
DRYING	BU.	69.00	0.00	0.00	
HAULING	BU.	69.00	0.30	20.70	
LABOR (WAGES & FRINGE)	HOUR	1.58	8.25	13.07	
LAND RENT	ACRE	1.00	20.00	20.00	
TRACTOR/MACHINERY	ACRE	1.00	20.23	20.23	
INTEREST ON OP. CAP.	DOL.	120.69	0.0700	8.45	
TOTAL VARIABLE COSTS				303.60	
3. INCOME ABOVE VARIABLE COSTS				213.90	
4. FIXED COSTS					
TRACTOR/MACHINERY	ACRE	1.00	21.89	21.89	
IRRIGATION	ACRE	0.00	75.00	0.00	
GENERAL OVERHEAD	DOL.	303.60	0.07	21.25	
TOTAL FIXED COSTS				43.14	
5. TOTAL COSTS				346.74	
6. NET RETURNS ABOVE EXPENSES				170.76	

WHEAT PER PLANTED ACRE:

BREAKEVEN YIELD(BU.) TO COVER:		BREAKEVEN PRICE($/BU.) TO COVER:	
VARIABLE COSTS	40.48	VARIABLE COSTS	4.40
ALL SPECIFIED COSTS	46.23	ALL SPECIFIED COSTS	5.03

*TEN-YEAR ALABAMA AVERAGE WHEAT YIELDS ADJUSTED PLUS 35 PERCENT WERE USED IN THE BUDGET.

*THE JULY 2012 WHEAT FUTURES PRICE WAS USED IN THE BUDGET (ADJUSTED FOR BASIS).

CURRENT MARKET PRICES WERE USED FOR PRODUCTION INPUTS.

FERTILIZER RATES USED (100-60-60) BASED ON MED. LEVEL OF SOIL FERTILITY

SOIL TESTING IS RECOMMENDED ON INDIVIDUAL FIELDS;

FERTILIZER AND LIME COSTS REFLECT CUSTOM SPREADING.

THESE ESTIMATES SHOULD BE USED AS GUIDES FOR PLANNING PURPOSES ONLY.

Alabama
Winter Wheat Production Guide

2011-2012

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*Use pesticides **only** according to the directions on the label. Follow all directions, precautions, and restrictions that are listed. Do not use pesticides on plants that are not listed on the label.*

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*The pesticide rates in this publication are recommended **only** if they are registered with the Environmental Protection Agency and the Alabama Department of Agriculture and Industries. If a registration is changed or cancelled, the rate listed here is no longer recommended. Before you apply any pesticide, fungicide or herbicide, check with your county Extension agent for the latest information.*

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*Trade names are used **only** to give specific information. The Alabama Cooperative Extension System does not endorse or guarantee any product and does not recommend one product instead of another that might be similar.*

***For more information,** call your county Extension office. Look in your telephone directory under your county's name to find the number.*

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