EC 589
Rev. April 2017

South Carolina Cotton Growers' Guide

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Issued in Furtherance of Cooperative Extension Work in Agriculture and Home Economics, Acts of May 8 and June 30, 1914
Public Service Activities

CONTENTS

GOOD MANAGEMENT:
THE KEY TO PROFITABLE COTTON PRODUCTION

Good managers readily adopt the latest production technology, while recognizing the impact of limiting factors such as poorly distributed and inadequate rainfall, low soil fertility, or disease problems. In these situations, growers must adjust production practices to maximize profit and fit cotton into the total farm program to use land, labor, and equipment most efficiently. Examine all alternatives to determine the most profitable cotton practices for the farm. The following recommendations are suggested as a guide for 2017.

SOILS

Select fertile, well-drained soils that are capable of producing high yields. Select fields with long rows, ample access, and few obstacles, such as trees, stumps, and rocks, for efficient mechanical operations.

Most South Carolina soils rapidly develop plow pans (hardpans), which limit the depth of cotton rooting. Access to subsoil water and nutrients is reduced by these hardpans unless they are broken by deep tillage. Broadcast deep tillage, with implements such as the Paratill or Terramax for example, or in-row subsoiling should be performed annually. Bedding 2 to 3 weeks before planting when in-row subsoiling is necessary to allow soil to firm in the subsoil slit and provide a suitable seedbed for germination and seedling establishment.

LIME AND FERTILIZER

Lime and fertilizer recommendations are based on soil sampling and analysis. See Clemson University Extension Circular EC 476, Nutrient Management for South Carolina, for more details if needed (http://virtual.clemson.edu/groups/agsrvlb /myweb10/index.htm).

SOIL SAMPLING

Plant nutrient applications through fertilizer and/or lime are based on representative soil sampling techniques and subsequent lab analysis of soil pH and nutrient levels. Clemson University's Agricultural Services Lab provides a quick turnaround for soil analyses and nutrient recommendations on a fee basis. Soil sample boxes, submission forms, and advice on taking samples can be obtained from the local county Extension office or at the web site http://virtual.clemson.edu/groups/agsrvlb/#Soil Testing. The County office will also mail your samples to the lab.

The first step in obtaining a representative soil sample is to separate each field into sample areas of similar management history and soil characteristics. Areas of 2 to 3 acres are considered large enough to justify sampling, but a sample should not

represent over 20 acres. A difference in surface color is the most evident feature separating soil types, indicating possible variability in texture, organic matter content, and drainage.

Cropping history is another important factor to consider when defining a sample area. High value crops such as cotton, peanuts, or tobacco may receive high rates of fertilizer, whereas corn, soybeans, wheat, or pasture crops usually receive lesser amounts. Nutrient removal rates by a crop are also important in determining residual soil fertility levels. Therefore, soil sampling across cropping histories will not result in cost-effective use of fertilizer.

Once each sampling area is identified, 10 to 20 soil cores (brush away surface plant residue material) to a 4- to 6-inch depth should be obtained in a zigzag pattern throughout the area to ensure good representation. The soil cores should be placed in a clean plastic bucket and mixed thoroughly, and a subsample should be taken to fill a one-pint sample container (obtain containers from County agents). It would be helpful to construct an accurate map of the field so that soil samples can be obtained from the same areas in subsequent years. Soils samples can be taken any time of the year but sampling at a consistent time of the year, preferably in the fall after harvest, enhances the relevance of annual comparisons.

In most sandy Coastal Plain soils where deep tillage is practiced to break root-restrictive hardpans, a sample of the top 4 inches of subsoil can be used to determine the availability of potassium, sulfur, and magnesium. These nutrients readily leach through the sandy surface layer but are retained in the upper part of the subsoil. The results of subsoil samples can be used to adjust fertilizer recommendations made from the analysis of the A horizon sample (see http://hubcap.clemson.edu/~blpprt/bobweb/ and page 10 of the Introduction posted on http://soils.clemson.edu/476e.pdf for more details).

Soil samples are analyzed for pH and the plant-available contents of potassium, phosphorus, calcium, magnesium, zinc, copper, boron, and manganese. Recommendations to correct soil pH and provide sufficient levels of each nutrient for top yield performance are made on the soil test report.

Fertilizer recommendations are based on several years of soil test calibration research conducted in South Carolina and neighboring states. Soil analysis procedures determine the amount of each nutrient available for crop uptake. Nutrient levels on the soil test report are indexed into the following categories:

VL (very low): Soil is deficient and applied nutrient will significantly increase yields.
L (low): Nutrient addition will be required for maximum yields.
M (medium): There will be a response to nutrient application approximately 50 percent of the time.
H (high) or VH (very high): Nutrient supply in the soil sufficient for top yield performance and nutrient addition is not likely to increase yields.

SOIL pH and LIMING

Optimum soil pH for cotton production is between 5.8 and 6.5 for most soils in South Carolina. Soil pH, either too low or too high, can be detrimental to cotton growth. If soil tests show a low pH, lime can be applied to enhance yield potential by reducing the toxicity of soil aluminum and/or manganese, improving the availability of phosphorus and potassium, and increasing the supply of calcium, and magnesium (with dolomitic lime). High pH conditions in most South Carolina soils are a result of overliming and are costly and difficult to remedy. However, following the lime recommendation from a representative soil sample should be sufficient to avoid excessively high pH situations.

Soil pH and the buffer pH value are needed to make a reliable lime rate recommendation. Lime should be applied as many weeks prior to planting as possible. Thorough mixing of the lime into the plow layer maximizes its rate of reaction and distribution in the root zone. Using dolomitic limestone to maintain soil pH in the recommended range will provide adequate levels of calcium and magnesium for optimum crop growth. Using calcitic limestone when soil magnesium is low will likely result in magnesium deficiency of the crop, however, calcitic limestone can be used to increase soil pH when soil magnesium is adequate.

It is advisable to incorporate lime prior to establishment of no-till cropping because surface-applied lime is slow to increase soil pH. Once no-till is established, frequent low rate lime applications will be more effective than infrequent high rate applications at maintaining proper pH throughout the rootzone. Soil sampling in two depth increments (0-3” and 3-6” for instance) rather than the traditional single depth (0-6”) may be warranted to track stratified pH changes (see http://hubcap.clemson.edu/~blpprt/bobweb /BOBWEB1.HTM for more details).

CALCIUM AND MAGNESIUM

When pH is in the adequate range but the soil test recommends adding calcium, use gypsum or a fertilizer that will supply 100 pounds of calcium per acre. If magnesium is recommended when pH is adequate, use a fertilizer such as sulfate-of-potash-magnesia or magnesium sulfate that will supply 20 pounds of magnesium per acre.

NITROGEN

The most profitable nitrogen rate is determined by the interaction of many factors; such as soil type, tillage, rainfall and irrigation, temperature, sunlight, length of season, insect and weed control, and other management practices. The optimum nitrogen rate likely differs each year and is often dependent on unpredictable factors, particularly rainfall and length of season. Therefore, nitrogen rate recommendations on soil test reports should only be used as a guide and adjusted through experience to local conditions.

The optimum rate of nitrogen for dryland cotton is approximately 70 pounds of nitrogen per acre, and for irrigated cotton, the optimum rate is approximately 100 pounds of nitrogen per acre. On land where excessive growth has caused problems with late maturity, reduce the nitrogen rate 20 to 30 pounds per acre. Where vegetative growth has been inadequate, increase the nitrogen rate 20 to 30 pounds per acre. Total nitrogen may be reduced 20 to 30 pounds per acre when cotton is grown following peanuts, soybeans, or other legumes in rotation. Band 25 to 33 % of the nitrogen by the row at planting and apply the balance at sidedressing. Sidedressing should be applied by June 15. If it is necessary to apply nitrogen after July 1, use low rates (10 to 15 pounds per acre).

If nitrogen is applied to the soil surface and a component of the nitrogen is in the urea form then some nitrogen can be lost to the air as ammonia (http://hubcap.clemson.edu/~blpprt/bobweb/BOBWEB4.HTM for more details). Losses from urea can range from 30 to 50% of the nitrogen content if conditions are favorable for loss. Liquid N sources are typically about half urea and losses in the 10 to 20% range may occur. Placement or incorporation into the soil eliminates loss. Dribbling or banding the nitrogen results in less loss than broadcast application. Losses are greater when the urea is in contact with crop residues rather than in contact with soil.

The lint and seed of two-bale-per-acre cotton will remove 65 pounds of nitrogen from the field.

PHOSPHORUS AND POTASSIUM

The application rate for phosphorus and potassium are determined by a soil test (see Table 1 below). The supply of phosphorus and potassium does not limit cotton yields when soil test levels are high. Increased yield with phosphorus and potassium application is expected about 50% of the time when soil test levels are medium and most of the time when soil test levels are low.

The recommended rate of phosphorus should be broadcast and incorporated into the top 6 to 8 inches of soil at medium soil test levels. If the soil test for phosphorus is low, 20 to 30 pounds per acre of P_2O_5 should be banded 2 inches below and 2 inches to the side of the seed, and the remainder broadcast. Adequate soil phosphorus will improve early seedling growth and hasten maturity. Since phosphorus is immobile in the soil, it is essential that it be incorporated into or placed below the soil surface to be readily available to the crop. Soil phosphorus should be raised to a high soil test level prior to establishment of no-till.

Potassium will leach into most soils with rainfall and through the root zone of coarse sandy soils. Potassium loss from sandy soils does not occur with a single heavy rain (like the leaching of nitrate nitrogen may), but can easily occur within a season. Many soils used for cotton production have a clay subsoil that will stop the potassium from

leaching. When the clay layer is within 15 inches of the soil surface, has a pH value of 5.0 or higher and in-row subsoiling is used to permit root development into the subsoil, the plants will utilize the subsoil potassium.

The lint and seed of two-bale-per-acre cotton will remove 25 pounds of P_2O_5 and 30 pounds of K_2O from the field.

Table 1. Phosphorus and potassium recommendations for cotton based on soil test rating.

Soil phosphorus rating	**SOIL POTASSIUM RATING**		
	Low	Medium	High
	lb P_2O_5 – lb K_2O		
Very Low	140 – 140	140 – 60	140 – 0
Low	100 – 100	100 – 60	100 – 0
Medium	60 – 90	60 – 60	60 – 0

SULFUR

It is generally recommended that 10 pounds of sulfur per acre be added with the fertilizer annually to ensure an adequate supply for maximum cotton production. Special consideration should be given to the crop's sulfur requirement when the subsoil is greater than 15 inches deep. Sulfur leaches readily from the sandy surface soil and accumulates in the clay subsoil. If the clay is within 15 inches of the soil surface, cotton roots may grow into it and absorb adequate sulfur as long as subsoil pH is greater than 5.0 and deep tillage allows rooting below the hardpan. When leaching of sulfur below the rootzone is suspected, apply 10 pound sulfur per acre or 1 pound of sulfur for every 10 to 15 pounds of nitrogen applied.

BORON

Boron is essential to cotton growth and development, especially pollination and fruit development. It is not transferred from old to new plant parts when deficient; therefore, when soil boron becomes low, boron deficiency will occur.

The increased yield from the use of boron on cotton has ranged from 50 to 1,000 pounds of seed cotton per acre. The greatest response has been obtained on sandy, acid soils and soils which have been recently limed to a high pH and calcium level. Since boron is leached from the soil and can usually increase yields, it is recommended that it be applied every year. Apply 0.5 to 1.0 pound of boron per acre with the fertilizer or preemergence herbicides. If it is not applied with these two materials or a higher rate is desired, use two foliar applications. Apply 0.2 pounds per acre at early bloom and a second application two weeks later. The foliar application may be applied with insecticides.

MANGANESE

Manganese (Mn) deficiency in cotton is not widespread, however it may occur. Fields where Mn deficient cotton is possible are those where deficiency has occurred in previous soybean, wheat, or corn crops or those with low available soil Mn. Soil pH as well as extractable Mn are necessary to determine if soil Mn availability is adequate. As soil pH increases the amount of soil test Mn needed for adequacy also increases (see Table 2). When liming a low pH soil use the target pH, not the actual soil pH, to assess soil Mn levels. These guidelines can be used for soil test reports from any laboratory using the Mehlich I or dilute acid extractable soil testing method. Manganese deficiency is most likely on the following poorly drained soils: Chewacla, Coosaw, Lynchburg, Myatt, Ocilla, Ogeechee, Pelham, Rains, Wadmalaw, Wehadkee, Williman, Yemassee or Yonges especially when soil pH is above 6.2.

No visible symptoms of Mn deficiency will be seen in the cotton unless the deficiency is severe. Tissue testing of the cotton leaf can be used to determine whether Mn is deficient. Manganese levels less than 25 ppm in the most recent fully expanded leaf (petiole discarded) are deficient.

Fertilization strategies for overcoming Mn deficiency are dependent on soil pH and available methods of fertilizer application. In soils where pH is marginally high (no greater than 6.2 in poorly drained soils and no greater than 6.5 in well drained soils) Mn fertilizers can be applied broadcast, banded, or foliar and residual Mn will be available in future seasons. At higher pH levels soil applications lose effectiveness, particularly when broadcast, and residual value will be negligible. In high pH soils banded and foliar applications are preferred and any soil applications should be made as close to planting time as possible. Rates of Mn application differ for each application method – 10-15 lb Mn/acre broadcast to the soil, 3-5 lb Mn/acre banded near the crop row, or 1 to 2 lb Mn/acre applied to the foliage. Water-soluble Mn fertilizers are good sources of Mn when applied to the soil or the foliage, but limited solubility Mn sources (like oxides or oxysulfates) should only be used for soil applications and when finely ground to particle sizes less than 0.1-0.15 mm.

Planned applications of foliar Mn should be made before first bloom. Earlier foliar applications to limited leaf area and mixing Mn fertilizers with glyphosate should be avoided. Foliar applications should be made immediately if deficiency symptoms appear and again if symptoms reappear. Several inorganic ($MnSO_4$, $MnCl_2$, and $Mn(NO_3)_2$) and chelated (MnEDTA, MnDTPA, and Mn-lignin sulfonate) sources of Mn are available for foliar application. All are equally effective at correcting Mn deficiency. Chelated Mn sources should be applied at the same rate as soluble inorganic Mn sources.

Table 2. Guidelines for assessing available soil manganese (Mn) based on soil pH and soil test Mn using the Mehlich I or dilute acid extractable soil test method.	
SOIL TEST MN, LB/A	**Soil- or foliar-applied Mn will probably be needed if the soil pH or target pH is equal to or greater than the following:**
4.0 - 4.9	5.6
5.0 - 5.9	5.7
6.0 - 6.9	5.8
7.0 - 7.9	5.9
8.0 - 8.9	6.0
9.0 - 9.9	6.1
10.0 - 10.3	6.2
10.4 - 10.9	6.3
11.0 - 11.9	6.4
12.0 - 12.9	6.5
13.0 - 13.9	6.6
14.0 - 14.9	6.7
15.0 - 15.9	6.8
16.0 - 16.9	6.9
17.0	7.0

PRECAUTIONS FOR MIXING MANGANESE FERTILIZERS WITH GLYPHOSATE

Foliar Mn fertilization of cotton prior to the 4-leaf stage is not recommended because of the limited leaf area available for Mn absorption. However, if one does attempt to apply Mn early, be forewarned that extensive research in Michigan and Virginia has shown that Mn fertilizers tank-mixed with glyphosate reduce the effectiveness of glyphosate. The amount of reduction in weed control is dependent on the weed, Mn fertilizer, glyphosate formulation, and adjuvant. Weed control decreases may be as great as 50%. Reductions in control of common lambsquarter, large crabgrass, morningglory spp., smooth pigweed and velvetleaf were documented in these studies. Recent studies from Indiana have shown negative effects of foliar Mn applications on glyphosate effectiveness when foliar Mn was applied within 10 days of a separate glyphosate application. Furthermore, the application of glyphosate caused a transient

Mn deficiency lasting 5 to 12 days in soybean and corn. Glyphosate resistant soybean and corn varieties had reduced Mn uptake and use than conventional varieties. These comments are only precautionary for cotton growers because none of this research was conducted with cotton.

OTHER MICRONUTRIENTS

There is no evidence that iron, zinc, copper, or molybdenum should be a part of routine cotton fertilization programs in South Carolina.

PLANT ANALYSIS

A good way to check on the success of a soil fertility program is to determine the nutrient status of the plant. Plant sample submission forms and advice on proper sampling technique, can be obtained from your County Agent. Mailing of the samples to the Clemson Agricultural Service Laboratory will also be provided by the County Extension office. Generally within one week of submission the tissue will be analyzed and the results returned. The Agent is available at this time for discussing the analysis and recommendations.

For routine nutrient monitoring purposes samples should be taken only from representative areas of the field. This may be accomplished by taking the youngest recently matured leaves (usually the 3rd or 4th from the uppermost leaf) on the main stem until 25 have been collected. Be sure the leaf surfaces are free from fertilizer and pesticide residues. Leaf petioles should be removed and discarded or sent sample to the laboratory as a separate sample. The samples can be air-dried or oven dried (170 ^{o}F). Extremely moist samples should be air-dried at least one day prior to mailing. Plastic bags are not recommended because moist samples will decompose in route to the laboratory.

The dried and ground leaf sample can be analyzed for most essential plant nutrients and results compared to established sufficiency ranges. Dried and ground petiole samples are analyzed for nitrate-nitrogen (to assess the nitrogen status of the cotton crop) as well as phosphorus. The sufficiency ranges based on petiole analysis are referred to as the "Georgia" interpretation and are considered suitable for the sandy soils of the Coastal Plain of South Carolina.

A word of caution for interpreting sufficiency ranges from C.C. Mitchell and W.H. Baker, authors of REFERENCE SUFFICIENCY RANGES FIELD CROPS – Cotton (Tables 3 and 4, below), http://www.clemson.edu/sera6/scsb394notoc.pdf:

"SUFFICIENCY RANGES FOR COTTON HAVE OFTEN BEEN USED BASED UPON OBSERVATIONS AND RANGES OF ANALYSES OF PLANT TISSUE FROM HEALTHY OR NORMAL COTTON CROPS. FOR THIS REASON, RANGES MAY BE BROAD AND TOO INCLUSIVE. THEREFORE, USE OF A SUFFICIENCY RANGE FOR COTTON AND THE IMPLIED CRITICAL CONCENTRATION (LOWER END OF SUFFICIENCY

RANGE) OF A NUTRIENT FOR DEFICIENCIES OR TOXICITIES ARE NOT ABSOLUTE". SUFFICIENCY RANGES THEREFORE ARE BEST REGARDED AS GUIDELINES.

TABLE 3. NUTRIENT SUFFICIENCY RANGES FOR COTTON LEAVES AT EARLY BLOOM ANDLATE-BLOOM/MATURITY.SEE: HTTP://WWW.CLEMSON.EDU/SERA6/SCSB394NOTOC.PDF

GROWTH STAGE	N	P	K	Ca	Mg	S
	---------- % ----------					
Early bloom	3.0-4.5	0.2-0.65	1.5-3.0	2.0-3.5	0.3-0.9	0.25-0.80
Late bloom/ maturity	3.0-4.5	0.15-0.6	0.75-2.5	2.0-4.0	0.3-0.9	0.3-0.9
GROWTH STAGE	**MICRONUTRIENTS**					
	Fe	**Mn**	**Zn**	**Cu**	**B**	
Early bloom	50-250	25-350	20-200	5-25	20-80	
LATE BLOOM/ MATURITY	50-300	10-400	50-300	-----	15-200	

TABLE 4. "GEORGIA" INTERPRETATION OF THE NITRATE-NITROGEN AND PHOSPHORUS CONCENTRATION OF DRIED AND GROUND COTTON PETIOLES. SEE: HTTP://WWW.CLEMSON.EDU/SERA6/SCB394NOTOC.PDF

Time of sampling	Nitrate nitrogen, ppm	Phosphorus, ppm
Week before first bloom	7,000-13,000	>800
Week of bloom	4,500-12,500	>800
Bloom + 1 week	3,500-11,000	*
Bloom + 2 weeks	2,500-9,500	*
Bloom + 3 weeks	1,500-7,500	*
Bloom + 4 weeks	1,000-7,000	*
Bloom + 5 weeks	1,000-6,000	*
Bloom + 6 weeks	500-4,000	NA
Bloom + 7 weeks	500-4,000	NA
Bloom + 8 weeks	500-4,000	NA

*** A DECREASE IN P CONCENTRATION OF MORE THAN 300 PPM FROM THE PREVIOUS WEEK USUALLY INDICATES MOISTURE STRESS.**
NA – CRITICAL LEVELS NOT AVAILABLE FOR THESE GROWTH STAGES.

VARIETY SELECTION

Variety selection is one of the first and most critical decisions a cotton producer makes each season. This decision is now more complex since numerous new varieties continue to be introduced to the market every year. Many factors govern the choice of cotton varieties, and one major factor or varietal trait that growers must now consider when choosing varieties is the addition of "value-added" transgenic traits. The number of varieties offered by seed companies containing "value-added" transgenic traits (Bollgard II, Widestrike/Widestrike 3, Roundup Ready Flex, Glytol, Liberty-Link, Twinlink, Enlist and Xtend) for insect and herbicide resistance and the resulting planted acreage (approximately 99% of acreage in 2016) has increased dramatically over the last decade. The value of these transgenic traits is an extremely important consideration for growers when selecting varieties. However, the "value-added" technology is not the most important trait to consider. Yield potential has always been the most important factor to consider in the selection of a good variety and is still the number one factor today. Without good genetics and high yield potential, any benefit obtained from the transgenic traits is negated. In addition to yield potential and transgenic traits, other important characteristics to consider when choosing a variety are yield stability, maturity, fiber quality, lint turnout percentage, leaf pubescence, stormproofness, growth and fruiting habit, and insect and disease resistance. In many situations, growers can use variety selection (maturity) and planting dates to decrease production risks associated with drought, pest infestations, inclement weather during harvesting, etc. (i.e. an earlier-maturing variety will bloom and develop bolls during a different period of the season than a full-season variety).

Whatever the criteria used by growers in selecting varieties, sound information is needed to make good decisions. A good source for variety information is The South Carolina Official Variety Test (http://www.clemson.edu/public/vt/cotton/.html), which is available from Clemson University and the Cooperative Extension Service. This information is available yearly and is an unbiased, reliable source in making variety selections. **Confidence in the relative merits of varieties increases with an increase in the number of locations and years tested**. However, data from a single year, but multiple locations, can somewhat substitute for multiple-year data. It should be recognized, however, that a high-performing variety at one location might perform poorly at another location due to some specific climatic or environmental condition (e.g., a variety could produce the highest yield at Florence, but perform poorly at Blackville due to above-threshold levels of a nematode). Other good sources of variety information include other nearby states' variety trial results (Georgia Variety Trial website - http://www.ugacotton.com and the North Carolina Variety Trial website - http://swvt.caes.uga.edu/pct-tests.html), seed company variety trials, other growers' experiences with varieties in your growing area, and your own experiences on your farm. In fact, the best method for measuring and selecting varieties is personal experience with a variety. Growers are encouraged to try new varieties and technologies on their farms, but plantings should be done conservatively on a small scale first before devoting a large number of acres into one variety. There is no substitute for variety evaluation over several years on your soils and under your

management practices. A summary table of the lint yield performance of selected cotton varieties in Southeast University (North Carolina, South Carolina, and Georgia) variety trials from 1998 to 2016 is shown in Table 5.

FIBER QUALITY

Knowledge of cotton lint quality is essential for growers to successfully market their cotton. Cotton buyers and manufacturers make wide use of various fiber tests to determine the value and end usage of a particular bale or lot of cotton. Sensitive laboratory instruments are now used to determine the quality and subsequent value of raw cotton fiber. High Volume Instrumentation (HVI) classification includes the traditional classer's grade along with HVI color and trash, HVI-UHM length, HVI strength, and micronaire.

Some fiber quality parameters are controlled more by variety, and others are more influenced by the environment. In general, length and strength are greatly influenced by variety. Micronaire is affected by climatic and environmental conditions, especially during bloom and boll development periods. Color grade and trash content are predominantly affected by weed control, defoliation, and harvest conditions.

The following discussion describes some fiber quality parameters and provides some explanatory terms for their respective readings.

UHM Length. Upper half mean (UHM) length is the average length of the longest one-half of the fibers. HVI systems are calibrated to report staple length in one-hundredths of an inch. The HVI staple length should closely approximate the classer's manual staple length, and can be converted to 32nds by multiplying HVI length in inches by 32 and rounding to the nearest whole number.

Uniformity Index. HVI systems determine the length uniformity by dividing the mean fiber length (M) by the upper half mean (M/UHM); therefore, uniformity is the ratio of the average length of all the fibers to the average length of the longer half of the fibers. Uniformity above 85% is considered very high.

Descriptive Designation	*Uniformity Index*
Very High	above 85
High	83-85
Average	80-82
Low	77-79
Very Low	below 77

Strength. Fiber strength is an important factor in determining yarn strength. HVI machinery determines fiber strength in a manner similar to the Stelometer or "1/8 gauge" used by conventional systems. The measurement is made on the same

sample that is tested for length. Descriptive designations are similar to those used for 1/8-inch gauge strength, but strictly comparable. The following chart shows the strength readings and descriptive terms for HVI measurements.

Strength Rating	*1/8-inch gauge (grams/tex)*
Weak	23 & below
Intermediate	24-25
Average	26-28
Strong	29-30
Very Strong	31 & above

Micronaire. The micronaire test is a measure of maturity and fineness of cotton fibers. Micronaire readings are used extensively in the areas of cotton buying and manufacturing to aid in cotton evaluation. Micronaire is a part of the official cotton HVI classification for upland cotton along with grade and HVI measurements of color, trash content, fiber length, and strength.

Fineness is a relative measure of the diameter of individual cotton fibers or the weight per unit length. Fine cottons produce stronger yarns, tend to increase neppiness, and require a reduced rate of processing.

Fiber maturity is a relative measure of the cell-wall development throughout the entire length of the cotton fiber. Immature fibers result in decreased rates of processing, dyeing problems, and the production of yarns and fabrics with a low appearance grade. The following chart shows micronaire readings and corresponding descriptive terms.

Explanation	*Micronaire*
Very Fine	below 3.0
Fine	3.0-3.9
Medium	4.0-4.9
Coarse	5.0-5.9
Very Coarse	6.0 and above

Micronaire is influenced more by the environment than by variety. Environmental conditions leading to poor boll set, including hot, dry conditions, heavy insect pressure, or nematode infestations, can result in high micronaire values. The premium range of micronaire is 3.7 to 4.2, and the discount range is below 3.0 or above 5.0 (although this will vary with each loan schedule). Since environmental and climatic conditions influence micronaire greatly, producers should not select a variety strictly based on micronaire data. However, examining a variety's performance with regard to micronaire in a range of environmental conditions (i.e., multiple years and

locations) can provide some insight concerning the expected range of micronaire for a given variety.

VARIETY TESTING

Variety Testing in 2016 included four small-plot replicated variety trials conducted on Clemson University research stations and three small-plot replicated variety trials conducted on growers' farms across South Carolina. The research station variety trials consisted of four separate trials: a dryland trial planted at the Pee Dee Research and Education Center located in Florence; an irrigated trial planted at the Pee Dee Research and Education Center; a dryland trial planted at the Edisto Research and Education Center located in Blackville; and an irrigated trial planted at the Edisto Research and Education Center in Blackville. The three on-farm variety trials were conducted at Minturn (Dillon County), at St. Charles (Lee County), and at St. Matthews (Calhoun County). All seven variety trials were split into two maturity classifications to provide improved information on variety maturity. The decision on where to place a variety with respect to maturity is left to the breeder or originator and/or the variety trial director. In 2016, four large-plot replicated variety trials were also conducted at the Florence County, Dillon County, Lee County, and Calhoun County locations.

Table 5. Lint Yield Rankings of Selected Varieties in Southeast University Variety Trials (North Carolina, South Carolina and Georgia) - 1998 to 2016 (data compiled by Mike Jones, Clemson University).

Variety	# of Southeast Variety Trials	% of Trials Ranked in Top 25% in Yield				% of Trials Ranked in Top 50% in Yield				% of Trials Ranked in Top 75% in Yield			
		SE	NC	SC	GA	SE	NC	SC	GA	SE	NC	SC	GA
PHY 499WRF	209	**65**	58	62	70	**89**	73	93	90	**97**	94	99	97
DP 1028B2RF	80	**58**	48	49	79	**81**	76	74	96	**94**	95	89	100
ST 5020GLT	19	**58**	83	46	-	**79**	100	69	-	**95**	100	92	-
DP 1646B2XF	28	**57**	67	55	40	**86**	75	100	80	**100**	100	100	100
DP 1522B2XF	28	**57**	58	58	50	**75**	75	75	75	**89**	92	92	75
PHY 333WRF	109	**53**	60	49	55	**80**	76	80	82	**94**	92	92	97
NG 3522B2XF	21	**52**	50	57	50	**86**	83	86	100	**100**	100	100	100
DP 1558NRB2RF	36	**50**	50	45	54	**67**	67	64	69	**86**	83	82	92
PHY 495W3RF	61	**48**	39	47	64	**64**	61	63	73	**90**	94	88	91
DP 1538B2XF	28	**46**	25	64	60	**79**	67	82	100	**96**	92	100	100
NG 1511B2RF	142	**46**	56	37	53	**70**	81	68	72	**91**	94	89	94
DP 1252B2RF	112	**46**	43	44	49	**64**	52	71	63	**87**	76	90	88
DP 1639B2XF	27	**44**	50	55	0	**81**	83	91	50	**96**	92	100	100
DP 1137B2RF	140	**44**	46	43	44	**72**	63	76	73	**94**	92	96	94
PHY 444WRF	80	**44**	39	30	68	**60**	50	49	84	**86**	89	76	100
ST 4946GLB2	105	**43**	48	36	49	**60**	60	51	71	**86**	92	80	89
DP 1050B2RF	95	**42**	33	46	43	**71**	44	70	83	**85**	67	84	95
DG 2570B2RF	68	**41**	58	42	30	**66**	74	68	60	**90**	100	84	87
NG 5007B2XF	22	**41**	33	45	40	**50**	33	64	40	**95**	83	100	100
DG 3526B2XF	20	**40**	50	17	50	**75**	92	33	100	**100**	100	100	100
DP 1034B2RF	98	**38**	19	32	53	**68**	57	70	73	**89**	86	89	90
BX 1739GLT	8	**38**	-	33	50	**50**	-	50	50	**88**	-	100	50
PHY 312WRF	59	**37**	28	38	75	**76**	72	76	100	**92**	83	95	100

Table 5. Lint Yield Rankings of Selected Varieties in Southeast University Variety Trials (North Carolina, South Carolina and Georgia) - 1998 to 2016 (data compiled by Mike Jones, Clemson University). (Continued)

Variety	# of Southeast Variety Trials	% of Trials Ranked in Top 25% in Yield				% of Trials Ranked in Top 50% in Yield				% of Trials Ranked in Top 75% in Yield			
		SE	NC	SC	GA	SE	NC	SC	GA	SE	NC	SC	GA
DP 1555B2RF	66	**35**	18	52	33	**67**	59	74	67	**85**	77	91	86
DP 1614B2XF	26	**35**	42	33	0	**50**	58	50	0	**81**	83	83	50
DP 1747NRB2XF	6	**33**	-	33	-	**100**	-	100	-	**100**	-	100	-
CG 3787B2RF	42	**33**	0	-	46	**76**	30	-	91	**93**	90	-	94
NG 1602B2XF	12	**33**	50	17	-	**50**	67	33	-	**83**	100	67	-
PHY 496W3RF	12	**33**	-	20	100	**42**	-	30	100	**50**	-	40	100
PHY 339WRF	62	**32**	33	36	33	**68**	62	68	71	**92**	85	88	100
DP 1133B2RF	76	**32**	53	26	25	**68**	76	67	66	**89**	94	96	81
DP 1553B2XF	28	**32**	17	45	40	**46**	33	54	60	**50**	42	54	60
PHY 487WRF	86	**31**	32	21	50	**63**	59	62	68	**90**	86	93	86
DG 3757B2XF	20	**30**	42	0	50	**85**	75	100	100	**95**	92	100	100
DP 1725B2XF	14	**29**	33	33	0	**43**	50	33	50	**57**	67	50	50
DP 1612B2XF	11	**27**	17	40	-	**73**	67	80	-	**91**	83	100	-
ST 4747GLB2	83	**27**	9	26	41	**55**	50	50	67	**88**	77	91	93
ST 4848GLT	37	**27**	25	30	0	**49**	42	52	50	**86**	92	83	100
DP 1518B2XF	11	**27**	17	40	-	**36**	17	60	-	**55**	50	60	-
CG 3428B2RF	12	**25**	0	-	38	**25**	0	-	38	**58**	50	-	63
DP 1321B2RF	63	**24**	38	23	17	**65**	69	58	71	**86**	100	77	88
MN 15R513B2XF	21	**24**	17	40	25	**57**	67	40	50	**95**	95	100	75
ST 6182GLT	41	**24**	17	39	0	**56**	33	72	100	**80**	67	80	100
NG 3405B2XF	34	**24**	17	35	0	**44**	42	47	40	**87**	97	71	100
PHY 575WRF	61	**23**	22	18	29	**51**	33	46	63	**77**	56	79	83
DP 1044B2RF	9	**22**	25	20	-	**44**	75	20	-	**67**	100	40	-

Table 5. Lint Yield Rankings of Selected Varieties in Southeast University Variety Trials (North Carolina, South Carolina and Georgia) - 1998 to 2016 (data compiled by Mike Jones, Clemson University). (Continued)

Variety	# of Southeast Variety Trials	% of Trials Ranked in Top 25% in Yield				% of Trials Ranked in Top 50% in Yield				% of Trials Ranked in Top 75% in Yield			
		SE	NC	SC	GA	SE	NC	SC	GA	SE	NC	SC	GA
NG 3406B2XF	36	**22**	25	24	14	**42**	58	35	29	**67**	75	71	43
BX 1776GLTP	19	**21**	33	15	-	**42**	50	38	-	**58**	50	62	-
FM 1944GLB2	64	**19**	25	25	31	**53**	56	50	56	**80**	75	81	81
DG 2285B2RF	18	**17**	30	-	0	**56**	80	-	25	**78**	100	-	50
NG 4601B2XF	12	**17**	33	0	-	**50**	50	50	-	**75**	83	67	-
DG 3445B2XF	6	**17**	17	-	-	**17**	17	-	-	**33**	33	-	-
SSG HQ212	6	**17**	-	0	50	**17**	-	0	50	**33**	-	25	50
ST 5115GLT	46	**15**	6	17	40	**54**	39	65	60	**85**	78	91	80
ST 6448GLB2	86	**15**	5	18	17	**42**	21	39	59	**70**	53	63	90
ST 4949GLT	27	**15**	17	11	50	**37**	50	32	50	**59**	83	47	100
SSG AU222	46	**11**	0	0	13	**41**	0	40	63	**72**	25	50	100
ST 5289GLT	32	**9**	8	8	13	**31**	50	17	25	**66**	67	50	88
NITRO44B2RF	24	**8**	0	0	13	**25**	0	40	25	**67**	33	80	69
SSG HQ210CT	68	**7**	0	5	8	**27**	0	23	28	**57**	25	50	56
DG 2355B2RF	14	**7**	17	-	0	**14**	17	-	13	**36**	33	-	38
BX 1775GLTP	19	**5**	17	0	-	**26**	33	23	-	**68**	67	69	-
BX 1737GLT	19	**5**	17	0	-	**26**	17	31	-	**53**	33	62	-
DG 3385B2XF	15	**0**	0	0	0	**33**	50	14	50	**80**	83	86	50
NGX 1604B2XF	12	**0**	0	0	-	**8**	17	0	-	**42**	33	50	-

Table 6. Lint Yield, Gin Turnout, and Fiber Quality of Early-Maturing Cotton VarietiesGrown at PDREC located in Florence, SC, in 2016. Early-Maturity Dryland OVT. M. Jones.

Variety	Lint Yield	Gin Turnout	Fiber Length	Fiber Uniformity	Fiber Strength	Elongation	Micronaire
	lb/acre	%	in.	%	g/tex		
NG 3405B2XF	**766**	41.6	1.07	81.9	28.5	7.4	4.0
ST 4848GLT	**735**	41.6	**1.16**	**84.2**	32.7	6.9	4.4
ST 4946GLB2	**714**	40.1	1.14	**85.0**	**35.4**	**8.6**	4.3
PHY 333WRF	**712**	42.5	1.14	**84.9**	**33.7**	6.6	4.1
ST 5020GLT	**709**	40.2	1.15	**84.0**	**33.9**	7.5	4.2
PHY 495W3RF	**708**	41.6	1.08	**84.8**	**35.4**	8.1	4.2
NG 3406B2XF	**705**	41	1.08	81.7	30.8	8.4	4.1
ST 4949GLT	**694**	**44.2**	1.09	82.3	30.9	7.6	**4.5**
PHY 444WRF	**672**	**42.8**	**1.20**	**84.8**	**34.6**	7.4	3.8
ST 5115GLT	**653**	41.2	1.11	82.7	33.1	6.7	4.3
BX 1737GLT	**648**	40.2	1.15	**83.2**	32.0	7.0	4.0
PHY 499WRF	641	**43.1**	1.09	**84.0**	**35.9**	8.4	**4.5**
ST 4747GLB2	613	41	1.15	82.8	29.5	5.4	4.3
BX 1776GLTP	608	38.5	1.15	**83.8**	31.0	7.3	3.8
NG 3522B2XF	603	40.8	1.08	82.6	28.9	6.6	4.1
DP 1522B2XF	598	40.1	1.11	82.8	32.4	**9.3**	4.4
ST 6182GLT	591	**44.3**	1.12	**83.3**	30.8	7.0	4.2
PHY 312WRF	587	40.8	1.13	**84.2**	33.2	6.9	4.0
PHY 487WRF	586	40.7	1.08	82.3	31.1	7.8	4.3
BX 1775GLTP	576	39.8	1.13	**83.4**	31.4	7.7	3.8
DG 3385B2XF	566	40.1	1.11	82.2	30.9	7.9	4.1
DP 1252B2RF	515	**43.8**	1.10	82.8	31.4	8.1	**4.6**
DP 1321B2RF	504	40.3	1.10	81.8	33.5	**9.2**	4.2
DP 1614 B2XF	489	**43.5**	1.14	**83.5**	**33.8**	7.9	**4.7**
DP 0912B2RF	474	40	1.06	81.5	32.2	7.8	**4.6**
SSG HQ210CT	460	38.6	1.12	82.6	**34.5**	6.7	4.4
SSG UA-222	431	39.3	1.12	**84.7**	**35.5**	8.2	**4.6**
MN 16R229B2XF	377	42.4	1.07	82.3	32.1	7.7	**4.6**
LSD (0.05)	124	1.7	0.05	2.1	2.4	0.9	0.3
C.V. (%)	14	2.9	2.91	1.8	5.3	8.2	4.8
Trial Mean	605	41.2	1.11	83.2	32.5	7.6	4.2

Bold numbers are not statistically different at the 0.05 level of probability.
Harvested: October 14, 2016

Table 7. Lint Yield, Gin Turnout, and Fiber Quality of Late-Maturing Cotton Varieties Grown at PDREC located in Florence, SC, in 2016. Late-Maturity Dryland OVT. M. Jones.

Variety	Lint Yield	Gin Turnout	Fiber Length	Fiber Uniformity	Fiber Strength	Elongation	Micronaire
	lb/acre	%	in.	%	g/tex		
NG 5007B2XF	**875**	43.7	1.12	81.6	27.9	8.3	4.2
PHY 495W3RF	**848**	43.4	1.08	83.1	**34.9**	7.4	4.3
DP 1555B2RF	**822**	**45.1**	1.14	**83.4**	31.9	7.0	4.5
ST 6448GLB2	**820**	40.9	**1.17**	**83.5**	30.3	5.6	4.5
ST 5020GLT	**817**	41.1	**1.17**	**84.7**	**34.6**	7.8	4.3
DP 1646B2XF	**797**	**45.4**	**1.17**	83.2	32.1	8.3	4.4
PHY 333WRF	**786**	43.3	1.13	83.2	31.2	6.8	4.1
DP 1558NR B2RF	**765**	43.8	1.11	82.9	**33.9**	7.0	**4.8**
ST 6182GLT	**764**	**46.2**	1.12	82.5	29.6	7.0	4.6
NG AMX 1602 B2XF	**754**	41.8	1.07	82.6	28.9	8.3	4.2
BX 1739GLT	**749**	**44.7**	**1.19**	**85.5**	**34.7**	5.5	**4.6**
DP 1538B2XF	**729**	**44.4**	1.08	82.2	31.0	7.8	4.5
ST 5115GLT	**729**	42.2	1.10	82.3	32.7	6.6	4.3
DP 1747NRB2XF	717	**45.8**	1.11	82.0	**34.3**	7.2	**4.9**
NG 4601B2XF	711	43.7	1.12	83.2	**34.8**	7.1	**4.7**
DG 3757B2XF	707	43.6	1.12	82.7	30.9	7.3	4.5
BX 1737GLT	706	40.7	1.13	**83.5**	31.9	7.3	4.2
PHY 487WRF	704	42.1	1.09	**83.4**	31.0	7.0	4.5
DP 1639B2XF	700	44	1.10	**83.5**	**33.3**	7.1	**4.7**
BX 1776GLTP	689	40.5	1.11	83.0	29.6	7.1	3.9
DG 3526B2XF	687	**45.9**	1.11	83.1	31.4	8.3	4.5
SSG HQ210CT	677	41.8	1.11	**84.0**	**34.8**	6.8	4.5
ST 4946GLB2	630	40.2	1.11	82.6	**34.2**	7.3	4.3
MN 16R251B2XF	630	**44.4**	1.13	81.8	32.0	7.2	4.6
PHY 499WRF	629	43.2	1.07	83.3	**34.7**	7.9	4.3
PHY 444WRF	622	43.8	**1.19**	**85.2**	**33.4**	6.9	4.0
NG AMX 1604B2XF	609	40.6	1.12	83.0	31.2	5.1	4.2
BX 1775GLTP	593	39.7	1.12	81.2	29.6	8.1	3.8
DP 1252B2RF	588	44.2	1.10	81.6	30.6	**8.7**	4.6
ST 4949GLT	571	43.8	1.07	83.3	30.3	7.1	4.5
SSG UA-222	559	39.9	1.14	**83.8**	**33.5**	8.3	4.5
ST 4848GLT	551	42.3	1.13	**84.9**	31.7	7.2	4.4
PHY 312WRF	544	42.1	1.12	83.0	31.2	6.2	4.2
DP 1725B2XF	530	44.2	1.11	81.9	28.2	6.2	4.1
DP 1553B2XF	508	41.8	**1.15**	**84.1**	32.6	8.2	4.4
DP 1321B2RF	418	42.4	1.08	81.5	**33.1**	**9.2**	**4.8**
LSD (0.05)	155	1.9	0.05	2.1	2.0	0.9	0.2
C.V. (%)	16	3.2	3.06	1.8	4.6	8.3	4.0
Trial Mean	682	43.0	1.12	83.1	32.0	7.3	4.4

Bold numbers are not statistically different at the 0.05 level of probability.

Table 8. Lint Yield, Gin Turnout, and Fiber Quality of Early-Maturing Cotton Varieties Grown at PDREC located in Florence, SC, in 2016. Early-Maturity Irrigated OVT. M. Jones.

Variety	Lint Yield lb/acre	Gin Turnout %	Fiber Length in.	Fiber Uniformity %	Fiber Strength g/tex	Elongation	Micronaire
PHY 495W3RF	**1370**	**44.4**	1.13	**85.0**	**35.1**	7.1	4.1
ST 5020GLT	**1307**	40.8	**1.24**	**86.3**	33.1	7.4	4.0
DP 1252B2RF	**1304**	**43.8**	1.14	84.8	31.3	**8.1**	4.2
ST 6182GLT	**1300**	**44.6**	1.16	**85.2**	29.4	6.6	4.0
BX 1776GLTP	**1252**	42.3	1.19	**85.0**	30.3	7.1	3.9
NG 3522B2XF	**1232**	40.1	1.11	83.0	26.9	6.5	4.0
DP 1614 B2XF	**1217**	**43.8**	1.17	84.3	31.9	7.5	**4.6**
ST 4946GLB2	1187	40.3	1.12	84.1	33.0	7.3	4.2
DP 1522B2XF	1186	41.9	1.14	84.1	32.7	**8.7**	4.3
DP 0912B2RF	1161	39.5	1.13	84.6	31.8	6.9	4.4
PHY 499WRF	1154	**43.2**	1.14	**85.0**	**34.4**	**8.1**	**4.5**
PHY 487WRF	1150	**42.9**	1.12	83.2	31.7	7.6	4.2
PHY 312WRF	1150	42.1	1.17	84.9	31.7	6.4	4.0
BX 1737GLT	1143	40.1	1.21	86.0	30.7	7.1	3.9
PHY 333WRF	1129	41.9	1.19	84.8	31.1	6.8	3.8
ST 4747GLB2	1086	40.7	1.20	**85.0**	29.4	5.0	4.1
ST 5115GLT	1059	40.6	1.15	83.1	32.5	6.0	4.0
ST 4848GLT	1053	42.2	1.15	84.6	32.4	7.0	3.9
NG 3406B2XF	1049	40.3	1.15	84.4	30.7	7.6	3.9
DG 3385B2XF	1043	40.7	1.14	84.3	31.0	**8.3**	4.1
BX 1775GLTP	1024	39.9	1.19	84.5	30.0	7.7	3.9
NG 3405B2XF	1014	40	1.12	83.8	27.4	6.6	4.1
DP 1321B2RF	989	37.9	1.14	84.5	**33.7**	**8.4**	4.2
MN 16R229B2XF	988	41.7	1.12	83.7	32.1	7.1	4.1
ST 4949GLT	969	**43.1**	1.11	83.4	29.7	7.0	3.9
PHY 444WRF	963	42.1	**1.26**	**86.2**	31.5	6.1	3.5
SSG UA-222	803	41.3	1.21	**85.0**	**33.4**	7.6	4.2
SSG HQ210CT	759	38.5	1.14	84.2	32.5	6.5	4.3
LSD (0.05)	163	2.2	0.04	1.4	1.8	0.8	0.2
C.V. (%)	10	3.8	2.19	1.2	4.1	7.6	3.7
Trial Mean	1109	41.4	1.16	84.5	31.5	7.1	4.1

Bold numbers are not statistically different at the 0.05 level of probability.

Table 9. Lint Yield, Gin Turnout, and Fiber Quality of Late-Maturing Cotton Varieties Grown at PDREC located in Florence, SC, in 2016. Late-Maturity Irrigated OVT. M. Jones.

Variety	Lint Yield	Gin Turnout	Fiber Length	Fiber Uniformity	Fiber Strength	Elongation	Micronaire
	lb/acre	%	in.	%	g/tex		
DP 1646B2XF	**1511**	44.4	1.22	84.7	31.1	7.6	4.3
NG 5007B2XF	**1416**	42.2	1.18	85.0	29.3	7.3	4.2
ST 6182GLT	**1409**	**45.8**	1.16	84.3	30.5	6.4	4.3
ST 5020GLT	**1406**	41.0	1.22	85.2	32.7	7.2	4.2
DP 1639B2XF	**1385**	45.4	1.14	84.4	**34.7**	7.1	**4.5**
DP 1555B2RF	1291	42.9	1.17	84.6	**34.9**	6.5	4.2
PHY 312WRF	1276	42.1	1.16	**85.3**	31.9	6.5	4.1
DG 3526B2XF	1270	43.6	1.11	82.7	31.7	**8.9**	4.3
PHY 495W3RF	1269	43.8	1.12	84.8	**34.6**	7.4	4.2
DP 1538B2XF	1249	44.2	1.08	83.1	30.2	7.1	**4.4**
MN 16R251B2XF	1243	43.9	1.19	84.7	32.6	6.5	4.3
NG AMX 1602 B2XF	1239	40.6	1.13	84.3	30.3	8.0	4.0
DG 3757B2XF	1232	43.2	1.16	84.0	30.8	7.7	4.3
BX 1776GLTP	1228	41.0	1.17	85.0	29.8	7.4	3.9
BX 1737GLT	1221	40.4	1.17	84.0	31.3	7.1	4.0
PHY 499WRF	1218	42.7	1.15	**86.3**	**35.1**	7.9	4.3
ST 6448GLB2	1218	40.0	1.21	84.6	30.1	6.0	4.1
PHY 333WRF	1206	42.4	1.18	85.0	31.4	7.0	4.0
DP 1747NRB2XF	1202	44.3	1.15	83.8	32.8	6.6	**4.6**
BX 1775GLTP	1197	40.5	1.17	83.5	29.3	**8.2**	3.8
BX 1739GLT	1195	**45.0**	1.22	**85.6**	32.5	5.2	**4.4**
DP 1252B2RF	1186	43.4	1.13	84.7	30.7	8.0	4.2
NG AMX 1604B2XF	1150	40.7	1.15	85.3	32.4	5.8	4.3
PHY 487WRF	1147	41.2	1.14	84.3	33.2	6.9	4.1
PHY 444WRF	1145	43.3	**1.27**	**86.7**	32.4	6.7	3.7
DP 1725B2XF	1145	44.3	1.13	83.6	30.2	6.1	4.1
ST 4946GLB2	1096	40.2	1.14	84.6	32.0	7.8	4.3
ST 4848GLT	1093	42.0	1.12	84.0	30.7	6.4	4.2
ST 5115GLT	1091	41.2	1.14	82.5	32.3	6.2	4.0
DP 1558NR B2RF	1090	42.5	1.15	**85.4**	**34.4**	6.6	**4.6**
DP 1321B2RF	1059	41.3	1.12	83.6	32.9	8.1	**4.4**
NG 4601B2XF	1035	43.1	1.17	85.3	**34.4**	6.9	**4.4**
DP 1553B2XF	1005	42.9	1.17	84.2	30.9	8.0	4.2
ST 4949GLT	983	42.6	1.11	83.8	30.6	7.3	4.0
SSG UA-222	775	39.0	1.22	85.1	**33.8**	8.0	**4.4**
SSG HQ210CT	766	36.9	1.15	83.7	32.2	6.9	**4.5**
LSD (0.05)	158	1.2	0.04	1.4	1.9	0.7	0.3
C.V. (%)	10	2.1	2.42	1.1	4.2	7.1	4.3
Trial Mean	1185	42.3	1.16	84.5	32.0	7.1	4.2

Table 10. Lint Yield, Gin Turnout, and Fiber Quality of Early-Maturing Cotton Varieties Grown in Dillon County at Minturn, SC, in 2016. Early-Maturity Dryland OVT. M. Jones.

Variety	Lint Yield	Gin Turnout	Fiber Length	Fiber Uniformity	Fiber Strength	Elongation	Micronaire
	lb/acre	%	in.	%	g/tex		
DP 1614 B2XF	**1290**	45.9	1.19	**85.6**	32.0	7.8	4.7
DP 1321B2RF	**1228**	42.7	1.16	84.7	32.2	**8.6**	4.5
NG 3522B2XF	**1158**	43.0	1.08	82.9	27.7	6.5	4.4
NG 3406B2XF	**1144**	42.8	1.12	84.0	30.1	7.9	4.6
PHY 333WRF	**1140**	43.8	1.17	**85.4**	30.5	6.4	4.3
PHY 487WRF	**1121**	43.3	1.13	83.4	30.3	7.5	4.5
PHY 312WRF	1099	43.3	1.17	84.8	31.9	6.9	4.3
PHY 495W3RF	1037	44.8	1.13	84.5	**34.3**	7.5	4.4
ST 4946GLB2	1028	42.4	1.15	84.7	32.3	7.6	4.6
BX 1776GLTP	994	43.2	1.17	83.6	28.9	7.3	4.2
PHY 444WRF	993	44.5	**1.25**	**85.5**	30.8	6.4	3.8
ST 5020GLT	983	42.5	1.21	**85.2**	**33.2**	7.4	4.5
PHY 499WRF	977	**46.0**	1.14	85.0	**32.9**	7.8	4.6
ST 5115GLT	964	42.1	1.13	82.4	30.9	6.8	4.2
ST 4949GLT	956	45.6	1.14	**85.1**	30.0	7.5	4.5
DG 3385B2XF	932	43.9	1.13	83.5	29.7	8.0	**4.8**
BX 1737GLT	897	42.5	1.16	84.8	30.3	7.4	4.2
MN 16R229B2XF	887	45.6	1.11	83.1	30.6	6.7	4.6
DP 1252B2RF	880	**47.7**	1.15	83.4	31.4	**8.6**	4.5
ST 4848GLT	875	45.3	1.14	84.6	30.4	6.9	4.4
ST 4747GLB2	872	42.7	1.21	84.2	28.4	5.2	4.4
BX 1775GLTP	872	42.0	1.17	83.7	29.3	**8.2**	4.1
NG 3405B2XF	867	42.5	1.10	82.5	28.1	6.6	4.3
DP 1522B2XF	859	43.7	1.14	84.3	31.5	**9.0**	4.7
ST 6182GLT	802	**47.6**	1.14	84.1	28.0	7.1	4.4
DP 0912B2RF	773	42.2	1.12	84.5	31.0	7.4	**5.0**
AM 1511B2RF	590	41.6	1.15	83.5	32.5	8.1	4.7
DP 1048B2RF	419	44.0	1.19	**86.7**	31.7	**8.7**	4.1
LSD (0.05)	182	1.7	0.03	1.6	1.7	0.8	0.2
C.V. (%)	14	2.7	2.11	1.4	3.8	7.8	3.7
Trial Mean	951	43.8	1.15	84.3	30.7	7.4	4.4

Bold numbers are not statistically different at the 0.05 level of probability.

Table 11. Lint Yield, Gin Turnout, and Fiber Quality of Late-Maturing Cotton Varieties Grown in Dillon County at Minturn, SC, in 2016. Late-Maturity Dryland OVT. M. Jones.

Variety	Lint Yield	Gin Turnout	Fiber Length	Fiber Uniformity	Fiber Strength	Elongation	Micronaire
	lb/acre	%	in.	%	g/tex		
DP 1538B2XF	**1088**	46.0	1.11	83.0	28.9	8.0	4.6
ST 4946GLB2	**1081**	41.2	1.15	**85.0**	32.3	7.9	4.7
NG 5007B2XF	**1066**	44.4	1.17	83.9	28.4	7.9	4.4
DP 1252B2RF	**1030**	46.2	1.14	83.7	30.0	**8.7**	4.7
DP 1639B2XF	**974**	**46.9**	1.13	**84.7**	**32.8**	7.8	**4.9**
DP 1646B2XF	**969**	46.2	**1.20**	**84.2**	29.3	**9.0**	4.5
DP 1747NRB2XF	**965**	**48.3**	1.13	83.4	30.0	7.0	4.7
BX 1776GLTP	**952**	42.4	1.15	83.0	28.7	7.6	4.2
DP 1725B2XF	**941**	**47.2**	1.15	83.8	29.7	6.1	4.5
PHY 312WRF	**938**	43.5	1.16	**85.4**	32.0	7.0	4.4
NG 4601B2XF	**921**	44.8	1.16	**84.8**	**33.3**	7.2	4.7
DG 3757B2XF	**920**	45.8	1.16	**85.6**	29.3	7.9	4.5
PHY 487WRF	**908**	43.1	1.13	**84.2**	31.0	7.5	4.7
MN 16R251B2XF	893	45.8	1.19	83.8	30.9	7.6	4.5
ST 6182GLT	887	**48.0**	1.13	83.5	29.3	7.0	4.6
PHY 499WRF	884	43.5	1.13	**85.0**	**33.1**	**8.5**	4.6
DP 1555B2RF	881	**46.7**	1.16	83.8	32.0	6.7	4.5
DP 1321B2RF	876	42.5	1.13	83.6	31.3	**8.6**	4.7
BX 1739GLT	863	**46.8**	**1.21**	**85.5**	31.3	5.0	4.7
ST 4949GLT	859	45.1	1.12	**84.6**	30.0	7.3	4.6
BX 1775GLTP	858	42.8	1.19	83.9	29.6	7.7	4.3
NG AMX 1604B2XF	852	42.5	1.14	84.0	31.0	5.5	4.4
DG 3526B2XF	839	**47.3**	1.12	83.2	28.4	**9.2**	4.6
ST 5020GLT	838	41.3	1.18	**85.1**	**33.1**	7.1	4.6
ST 4848GLT	836	44.4	1.13	84.0	30.7	6.6	4.5
BX 1737GLT	830	43.6	1.19	**85.2**	30.3	7.4	4.4
DP 1553B2XF	826	44.5	1.18	84.0	30.4	8.2	4.3
ST 6448GLB2	822	42.1	**1.22**	**84.7**	28.4	6.0	4.6
NG AMX 1602 B2XF	816	41.4	1.15	**85.3**	29.8	**8.6**	4.4
PHY 333WRF	784	42.4	1.18	**85.5**	30.8	6.6	4.4
ST 5115GLT	777	42.1	1.12	82.7	30.8	6.8	4.4
PHY 495W3RF	772	44.9	1.12	**84.5**	**34.1**	7.7	4.6
DP 1558NR B2RF	731	45.7	1.15	84.0	**33.2**	7.2	**4.8**
PHY 444WRF	700	44.3	**1.23**	**85.2**	30.6	6.8	4.0
LSD (0.05)	182	1.6	0.04	1.5	1.6	0.8	0.2
C.V. (%)	15	2.6	2.22	1.3	3.7	7.7	3.7
Trial Mean	877	44.5	1.15	84.3	30.7	7.5	4.5

Bold numbers are not statistically different at the 0.05 level of probability.

Table 12. Lint Yield, Gin Turnout, and Fiber Quality of Early-Maturing Cotton Varieties Grown in Lee County at St. Charles, SC, in 2016. Early-Maturity Dryland OVT. M. Jones.

Variety	Lint Yield	Gin Turnout	Fiber Length	Fiber Uniformity	Fiber Strength	Elongation	Micronaire
	lb/acre	%	in.	%	g/tex		
PHY 444WRF	**1094**	43.9	**1.24**	**85.8**	33.0	7.5	4.0
ST 4946GLB2	**1068**	39.3	1.17	**85.9**	**35.8**	7.7	4.7
PHY 499WRF	**1021**	42.8	1.14	85.0	**35.7**	**9.5**	**5.0**
ST 6182GLT	**998**	**46.4**	1.15	84.5	30.9	7.7	4.7
NG 3522B2XF	**985**	41.8	1.10	83.3	27.7	7.7	4.8
DP 1252B2RF	**976**	42.8	1.16	84.3	32.3	**9.8**	4.6
DP 1522B2XF	**974**	40.9	1.16	84.8	32.8	**9.8**	**4.9**
PHY 333WRF	**967**	42.8	1.16	84.8	32.2	7.0	4.6
PHY 495W3RF	**966**	41.7	1.11	85.0	**37.1**	8.7	4.7
PHY 487WRF	**963**	41.2	1.13	83.5	32.4	8.6	**4.9**
ST 4848GLT	951	42.9	1.14	**85.4**	32.4	7.2	**5.0**
ST 4949GLT	949	44.2	1.14	**85.1**	32.1	8.2	**4.9**
PHY 312WRF	947	42.2	1.17	**86.4**	32.5	7.9	4.7
ST 4747GLB2	921	40.3	1.20	84.8	29.7	5.9	4.6
ST 5115GLT	910	42.1	1.12	84.2	32.5	8.3	4.7
DP 0912B2RF	899	40.0	1.09	84.2	31.9	7.8	**5.0**
DP 1321B2RF	896	40.3	1.14	83.7	32.4	**10.2**	**5.0**
MN 16R229B2XF	895	43.8	1.10	83.3	31.9	8.2	**4.9**
ST 5020GLT	873	40.2	1.20	**85.4**	33.5	8.9	4.8
DG 3385B2XF	865	41.4	1.12	83.7	31.4	**9.4**	4.7
NG 3405B2XF	861	40.1	1.11	83.6	27.8	7.6	4.5
NG 3406B2XF	853	40.4	1.11	83.6	30.1	**9.8**	4.5
BX 1775GLTP	835	40.8	1.17	83.6	31.4	9.4	4.4
DP 1614 B2XF	834	43.7	1.19	**85.9**	31.9	9.3	**5.2**
DP 1048B2RF	829	42.3	1.15	**85.1**	30.6	9.0	4.5
BX 1737GLT	819	39.2	1.17	**86.2**	31.4	7.8	4.5
AM 1511B2RF	786	42.3	1.15	84.0	32.4	**9.7**	**5.0**
BX 1776GLTP	771	40.2	1.16	84.4	30.6	8.7	4.3
LSD (0.05)	138	1.3	0.03	1.4	1.9	0.9	0.3
C.V. (%)	11	2.2	2.07	1.2	4.1	7.6	5.0
Trial Mean	918	41.8	1.15	84.6	32.0	8.5	4.7

Bold numbers are not statistically different at the 0.05 level of probability.

Table 13. Lint Yield, Gin Turnout, and Fiber Quality of Late-Maturing Cotton Varieties Grown in Lee County at St. Charles, SC, in 2016. Late-Maturity Dryland OVT. M. Jones.

Variety	Lint Yield	Gin Turnout	Fiber Length	Fiber Uniformity	Fiber Strength	Elongation	Micronaire
	lb/acre	%	in.	%	g/tex		
BX 1739GLT	**1148**	**43.8**	**1.23**	**85.2**	33.1	6.3	4.6
DP 1558NR B2RF	**1090**	41.9	**1.21**	**85.0**	**34.9**	8.3	**4.9**
DP 1646B2XF	**1065**	42.1	**1.23**	**84.7**	29.6	8.7	4.6
DP 1555B2RF	997	**44.2**	1.14	84.5	32.5	8.8	**4.8**
NG 5007B2XF	973	40.6	1.14	83.3	28.8	9.0	4.4
MN 16R251B2XF	971	42.7	**1.21**	**84.8**	33.2	8.9	**4.8**
PHY 499WRF	961	41.3	1.12	84.3	**34.8**	**9.6**	**4.8**
PHY 495W3RF	944	41.0	1.11	84.4	**35.7**	**9.2**	4.6
ST 4946GLB2	940	38.7	1.16	**85.6**	33.5	8.8	4.7
DP 1747NRB2XF	940	42.8	1.16	84.3	33.5	8.1	**4.9**
DP 1252B2RF	936	41.9	1.17	**85.2**	30.4	**9.9**	4.3
DP 1538B2XF	935	42.7	1.08	82.6	30.5	**9.2**	4.7
ST 6182GLT	931	**44.6**	1.14	**85.1**	29.8	7.8	**4.8**
PHY 444WRF	929	41.2	**1.21**	**85.7**	31.2	7.7	4.1
DG 3757B2XF	908	41.1	1.15	**85.4**	31.4	8.6	4.5
DP 1639B2XF	905	43.4	1.17	**84.9**	**33.7**	8.8	**4.8**
ST 5115GLT	879	39.3	1.13	82.8	31.5	8.6	4.6
PHY 312WRF	878	41.4	1.16	**85.2**	31.5	8.3	4.7
ST 4949GLT	867	42.7	1.14	**85.2**	31.2	8.1	**4.9**
PHY 333WRF	861	40.7	1.15	**85.2**	31.3	8.0	4.5
PHY 487WRF	858	39.6	1.11	83.2	31.3	8.6	**4.8**
BX 1776GLTP	829	40.1	1.14	83.5	30.6	8.7	4.4
NG AMX 1602 B2XF	827	40.2	1.12	83.8	30.7	9.3	4.6
NG 4601B2XF	822	42.4	1.16	84.5	33.1	8.3	**4.9**
DG 3526B2XF	821	42.1	1.13	84.6	31.1	**10.1**	4.7
DP 1321B2RF	815	39.6	1.12	83.5	31.3	**10.0**	**4.9**
DP 1725B2XF	797	43.3	1.16	84.6	30.0	7.1	4.7
ST 6448GLB2	782	39.3	**1.22**	**85.2**	28.8	6.7	**4.7**
ST 5020GLT	782	38.8	**1.20**	**86.1**	**34.5**	8.8	**4.7**
ST 4848GLT	776	41.9	1.14	83.8	31.4	7.5	**4.7**
NG AMX 1604B2XF	743	38.1	1.16	**85.0**	32.5	6.0	4.6
BX 1775GLTP	741	39.5	1.15	84.4	30.6	**9.3**	4.4
BX 1737GLT	726	38.3	1.13	83.6	30.3	8.5	4.6
DP 1553B2XF	657	40.9	1.16	**84.7**	30.1	**9.5**	4.4
LSD (0.05)	148	1.2	0.04	1.4	2.1	1.0	0.3
C.V. (%)	12	2.0	2.42	1.2	4.7	8.7	4.0
Trial Mean	881	41.2	1.15	84.5	31.7	8.6	4.6

Table 14. Lint Yield, Gin Turnout, and Fiber Quality of Early-Maturing Cotton Varieties Grown in Calhoun County at St. Matthews, SC, in 2016. Early-Maturity Dryland OVT. M. Jones.

Variety	Lint Yield	Gin Turnout	Fiber Length	Fiber Uniformity	Fiber Strength	Elongation	Micronaire
	lb/acre	%	in.	%	g/tex		
DP 1522B2XF	**1181**	41.1	1.16	83.6	31.9	**9.7**	**4.7**
DP 1614 B2XF	**1168**	**42.8**	1.20	**85.7**	32.6	8.8	**4.6**
MN 16R229B2XF	**1166**	**42.8**	1.11	82.0	31.9	8.4	**4.7**
ST 4946GLB2	**1140**	39.0	1.20	**84.8**	**34.3**	8.2	4.3
ST 5115GLT	**1134**	40.4	1.18	83.3	33.1	7.6	4.1
PHY 499WRF	**1106**	40.5	1.17	**85.3**	**35.0**	8.6	**4.4**
DP 1252B2RF	**1097**	**41.6**	1.19	**85.0**	32.2	**9.5**	4.3
NG 3405B2XF	**1097**	39.1	1.14	83.2	29.8	7.9	4.0
NG 3406B2XF	**1075**	41.0	1.17	**85.0**	32.0	**9.5**	4.2
DG 3385B2XF	**1052**	41.3	1.17	**84.9**	30.8	**9.7**	4.3
BX 1775GLTP	**1038**	40.3	1.17	83.1	31.4	8.6	3.8
DP 1321B2RF	**1026**	41.4	1.20	**84.4**	33.3	**9.4**	**4.6**
DP 0912B2RF	**1023**	40.0	1.12	**84.2**	32.5	8.7	**4.5**
PHY 487WRF	**1009**	39.4	1.16	82.8	32.0	7.6	**4.6**
ST 5020GLT	**1004**	40.4	1.22	**85.4**	33.6	8.5	4.3
ST 4747GLB2	**995**	39.4	**1.22**	**84.1**	29.2	6.1	4.3
PHY 444WRF	979	41.4	**1.27**	**85.7**	32.2	7.5	3.9
NG 3522B2XF	957	39.9	1.17	84.0	29.7	7.9	4.0
BX 1737GLT	949	39.4	1.21	**84.9**	32.2	7.9	4.3
PHY 312WRF	948	40.2	1.20	**85.2**	32.8	7.7	4.1
PHY 333WRF	947	40.9	1.19	**85.1**	32.6	7.3	4.0
ST 6182GLT	932	**42.9**	1.19	**85.7**	30.5	8.3	4.3
ST 4848GLT	932	**42.1**	1.18	**84.2**	31.6	7.9	4.1
ST 4949GLT	922	**42.5**	1.19	83.6	32.3	8.4	4.2
PHY 495WRF	909	40.8	1.14	**85.4**	**36.1**	8.7	**4.5**
BX 1776GLTP	904	40.5	1.18	83.5	31.3	8.0	4.3
AM 1511B2RF	590	41.4	1.16	**84.3**	32.9	**9.2**	**4.6**
DP 1048B2RF	438	39.3	1.21	**85.4**	31.8	**9.9**	4.1
LSD (0.05)	197	1.5	0.04	1.7	1.9	1.0	0.3
C.V. (%)	14	2.5	2.69	1.4	4.1	8.2	5.3
Trial Mean	990	40.8	1.18	84.4	32.2	8.4	4.3

Bold numbers are not statistically different at the 0.05 level of probability.

Table 15. Lint Yield, Gin Turnout, and Fiber Quality of Early-Maturing Cotton Varieties Grown at EREC located in Blackville, SC, in 2016. Early-Maturity Dryland OVT. B. Stancil.

Variety	Lint Yield	Gin Turnout	Fiber Length	Fiber Uniformity	Fiber Strength	Elongation	Micronaire
	lb/acre	%	in.	%	g/tex		
ST 5020GLT	**1514**	**49.8**	**1.18**	**85.1**	**32.4**	7.6	4.6
ST 4848GLT	**1381**	**48.7**	1.12	**83.4**	30.5	6.9	4.5
NG 3522 B2XF	**1376**	**48.7**	1.06	81.7	26.5	6.8	4.3
PHY 499 WRF	**1349**	**46.9**	1.08	82.3	**31.4**	**8.7**	4.5
PHY 495 W3RF	**1338**	**47.4**	1.08	**83.5**	**33.0**	7.7	4.4
PHY 333 WRF	**1331**	**48.3**	1.14	**83.6**	29.6	5.8	4.2
UA-222	**1319**	**45.5**	1.15	**83.5**	30.7	7.9	4.5
BX 1775GLTP	**1301**	**50.3**	1.13	82.8	27.9	**8.6**	4.1
PHY 487 WRF	1277	**46.1**	1.08	82.0	29.3	8.1	**4.7**
PHY 312 WRF	1266	**46.7**	1.12	82.8	29.1	7.5	4.5
ST 6182GLT	1242	**49.0**	1.09	82.0	26.8	7.2	4.6
MN 16R229B2XF	1237	**50.5**	1.08	82.7	30.5	7.1	**4.7**
ST 4747GLB2	1230	44.6	**1.16**	**84.4**	28.5	5.2	4.3
DP 1522 B2XF	1227	**48.0**	1.12	82.4	30.2	**9.3**	**4.8**
PHY 444 WRF	1226	45.1	**1.20**	**84.2**	29.9	6.6	4.0
ST 4946GLB2	1226	42.5	1.11	**83.2**	**31.0**	7.3	**4.7**
DP 1614 B2XF	1223	**48.8**	1.16	**84.9**	**31.5**	8.0	**4.9**
ST 5115GLT	1204	**46.3**	1.10	82.0	28.6	7.1	4.2
BX 1776GLTP	1149	42.3	1.15	**83.9**	29.1	6.7	4.2
BX 1737 GLT	1140	42.4	1.14	**83.4**	29.6	6.7	4.3
NG 3405 B2XF	1090	42.0	1.06	81.7	26.3	6.7	4.3
NG 3406 B2XF	1077	42.1	1.09	83.1	27.9	**8.4**	4.5
DG 3385 B2XF	1070	**47.9**	1.12	**84.0**	28.1	**8.3**	4.6
HQ 210 CT	1032	42.6	1.07	81.8	30.0	6.8	**4.7**
Trial Mean	1243	46.4	1.12	83.1	29.5	7.4	4.4
L.S.D. (.10)	217	5.3	0.04	2.0	2.1	0.9	0.2
C.V. (%)	14.8	9.8	2.4	1.7	5.0	9.1	3.4

Bold numbers are not statistically different

Table 16. Lint Yield, Gin Turnout, and Fiber Quality of Later-Maturing Cotton Varieties Grown at EREC located in Blackville, SC, in 2016. Late-Maturity Dryland OVT. B. Stancil.

Variety	Lint Yield	Gin Turnout	Fiber Length	Fiber Uniformity	Fiber Strength	Elongation	Micronaire
	lb/acre	%	in.	%	g/tex		
PHY 333 WRF	**1468**	49.6	1.13	**84.1**	29.6	7.2	4.3
BX 1738GLT	**1406**	48.4	**1.16**	**83.9**	**32.0**	7.4	**4.6**
DP 1725B2XF	**1384**	**53.8**	1.11	81.9	29.1	7.3	**4.5**
PHY 444 WRF	**1376**	50.3	**1.18**	**84.1**	31.6	7.0	3.9
ST 6182GLT	**1374**	**53.7**	1.12	**83.3**	29.2	7.0	**4.5**
BX 1739GLT	**1363**	**55.3**	1.12	**82.8**	30.5	6.3	**4.7**
ST 4848GLT	**1363**	48.7	**1.14**	**84.0**	31.0	7.1	**4.5**
PHY 312 WRF	**1361**	49.0	1.12	**84.1**	31.2	7.2	4.4
DP 1558NR B2RF	**1355**	50.1	1.09	81.6	**32.4**	7.5	**5.0**
PHY 495 W3RF	**1344**	50.1	1.08	**83.0**	**33.8**	8.4	**4.5**
MN 16R251B2XF	**1338**	**53.2**	**1.15**	**82.8**	31.4	7.7	**4.9**
DP 1646 B2XF	**1335**	49.6	**1.15**	**83.6**	29.1	8.3	**4.5**
ST 5115GLT	1330	48.4	1.11	82.0	31.4	7.3	4.1
DP 1747NR B2XF	1325	**53.8**	1.07	81.9	31.6	7.4	**5.0**
DP 1639 B2XF	1323	51.4	1.09	**83.7**	**32.4**	**8.7**	**4.7**
DG 3757 B2XF	1320	50.2	1.09	82.5	29.4	**8.7**	**4.5**
AMX 1601 B2XF	1320	51.6	1.12	**83.0**	**32.0**	7.7	**4.9**
DP 1555 B2RF	1310	51.9	1.11	**82.5**	31.5	7.5	**4.5**
UA-222	1301	48.6	1.06	81.8	30.8	7.2	**4.7**
PHY 487 WRF	1295	47.7	1.09	82.1	31.6	7.9	**4.6**
DP 1538 B2XF	1294	49.9	1.06	82.5	29.1	**9.3**	**4.6**
DG 3526 B2XF	1281	50.7	1.07	81.5	28.4	**9.5**	**4.7**
NG 5007 B2XF	1248	47.1	1.12	82.2	27.6	**9.0**	4.4
ST 4946GLB2	1236	46.2	1.10	**82.7**	31.2	8.1	**4.6**
BX 1737 GLT	1218	47.1	1.13	**83.7**	28.5	7.9	4.4
ST 6448GLB2	1213	48.4	1.13	82.4	27.5	6.6	**4.5**
PHY 499 WRF	1203	47.8	1.06	**82.8**	**33.0**	**8.9**	**4.5**
DP 1553 B2XF	1195	50.2	1.11	**83.6**	29.9	**9.0**	3.6
210 CT	1180	46.2	1.13	**83.2**	29.5	**8.9**	4.3
BX 1775GLTP	1170	48.9	1.10	80.7	28.7	**8.7**	4.3
BX 1776GLTP	1137	45.3	1.12	**82.5**	28.3	7.9	4.2
AMX 1602 B2XF	1123	48.6	1.11	**82.5**	28.3	**9.4**	4.3
AMX 1604 B2XF	1066	50.0	1.08	82.4	27.5	6.7	**4.5**
Trial Mean	1286	49.6	1.11	82.8	30.3	7.9	4.5
L.S.D. (.10)	136	2.9	0.04	1.6	2.0	0.8	0.5
C.V.(%)	9.0	5.0	2.5	1.4	4.6	7.6	7.8

Table 17. Lint Yield, Gin Turnout, and Fiber Quality of Earlier-Maturing Cotton Varieties Grown at EREC located in Blackville, SC, in 2016. Early-Maturity Irrigated OVT. B. Stancil.

Variety	Lint Yield	Gin Turnout	Fiber Length	Fiber Uniformity	Fiber Strength	Elongation	Micronaire
	lb/acre	%	in.	%	g/tex		
ST 6182GLT	**1862**	**45.5**	1.18	84.8	30.6	7.9	4.3
PHY 444 WRF	**1756**	**43.3**	**1.25**	**85.9**	32.6	7.4	3.8
PHY 487 WRF	**1737**	42.3	1.13	84.3	33.3	8.0	4.2
PHY 312 WRF	**1692**	42.4	1.18	**86.7**	33.3	7.3	4.3
ST 4848GLT	**1673**	42.3	1.19	**85.7**	33.0	7.7	4.4
MN 16R229B2XF	**1665**	41.2	1.14	84.0	32.5	8.2	**4.5**
DP 1522 B2XF	**1653**	41.2	1.19	84.8	33.2	**9.3**	**4.8**
PHY 499 WRF	**1640**	42.0	1.15	**85.2**	34.3	**8.6**	**4.5**
NG 3522 B2XF	**1631**	41.1	1.13	84.3	29.5	7.5	4.1
NG 3406 B2XF	**1629**	40.1	1.15	83.3	30.3	**9.1**	4.3
ST 5020 GLT	**1622**	39.6	**1.23**	**85.6**	33.9	7.4	4.4
BX 1775GLTP	1610	40.0	1.21	84.7	30.2	**8.4**	3.9
ST 5115GLT	1601	40.3	1.21	84.4	32.4	6.6	4.2
DP 1614 B2XF	1580	40.2	1.17	84.1	32.0	**8.9**	**4.6**
PHY 495 W3RF	1573	40.8	1.15	84.6	**36.7**	**8.6**	**4.5**
ST 4946GLB2	1560	40.3	1.19	**85.4**	33.9	7.7	4.3
UA-222	1545	36.3	**1.23**	**85.6**	33.7	**8.9**	4.2
DG 3385 B2XF	1500	40.6	1.15	84.0	30.5	**9.2**	**4.6**
PHY 333 WRF	1489	41.7	**1.23**	**86.3**	**34.7**	7.6	4.3
HQ 210 CT	1470	35.7	1.14	84.2	32.2	7.9	**4.5**
ST 4747GLB2	1455	38.6	**1.23**	**85.7**	31.5	5.5	**4.5**
NG 3405 B2XF	1398	40.3	1.13	84.9	29.0	7.4	4.1
BX 1776GLTP	1352	36.5	1.18	84.5	31.7	7.6	4.0
BX 1737 GLT	1143	36.1	1.16	85.0	30.1	**8.4**	4.3
Trial Mean	1576	40.3	1.18	84.9	32.3	8.0	4.3
L.S.D. (.10)	247	2.8	0.03	1.7	2.0	1.1	0.3
C.V.(%)	13.3	6.0	1.9	1.4	4.4	9.8	5.1

Bold numbers are not statistically different

Table 18. Lint Yield, Gin Turnout, and Fiber Quality of Later-Maturing Cotton Varieties Grown at EREC located in Blackville, SC, in 2016. Later-Maturity Irrigated OVT. B. Stancil.

Variety	Lint Yield	Gin Turnout	Fiber Length	Fiber Uniformity	Fiber Strength	Elongation	Micronaire
	lb/acre	%	in.	%	g/tex		
PHY 444 WRF	**1704**	**46.9**	**1.21**	84.3	31.2	8.0	4.1
DP 1747NR B2XF	**1663**	**46.1**	1.15	84.4	**33.6**	8.0	**4.7**
ST 5115GLT	**1624**	**46.6**	**1.17**	83.7	30.7	**8.6**	4.2
MN 16R251B2XF	**1600**	**46.2**	**1.20**	**84.8**	32.5	**8.3**	**4.6**
DP 1646 B2XF	**1591**	**45.1**	**1.21**	**85.1**	31.5	**8.2**	4.2
ST 4946GLB2	**1574**	40.6	1.16	**85.3**	**34.9**	**8.9**	**4.6**
NG 5007 B2XF	**1530**	**44.4**	**1.19**	**85.4**	32.5	**8.6**	**4.4**
DP 1639 B2XF	**1505**	**47.5**	**1.17**	**85.5**	**33.4**	**8.7**	**4.5**
DP 1553 B2XF	**1504**	**45.0**	**1.17**	83.8	31.1	**9.4**	**4.5**
ST 6182GLT	1482	**47.1**	**1.17**	**84.6**	30.4	**8.2**	4.3
DG 3757 B2XF	1459	**47.0**	**1.17**	**85.1**	31.9	**8.4**	4.3
DP 1558NR B2RF	1441	**45.7**	1.15	84.2	**34.1**	**8.1**	**4.7**
PHY 333 WRF	1421	**47.7**	**1.18**	**85.2**	32.2	6.7	4.2
PHY 312 WRF	1412	**44.3**	**1.17**	**85.3**	32.7	**8.7**	**4.4**
PHY 499 WRF	1404	**45.1**	1.12	**84.5**	32.8	**9.4**	**4.5**
DG 3526 B2XF	1401	**47.0**	1.15	84.0	32.3	**9.6**	**4.8**
ST 4848GLT	1359	**45.4**	1.16	**85.2**	31.0	**8.7**	**4.6**
DP 1538 B2XF	1353	**44.7**	1.15	83.8	31.7	**9.3**	**4.4**
PHY 495 W3RF	1353	43.7	1.11	83.1	**35.2**	**9.2**	**4.5**
ST 5020 GLT	1342	43.6	**1.19**	**85.2**	32.6	**9.4**	**4.6**
UA-222	1340	40.3	1.13	84.1	32.4	7.9	**4.7**
BX 1739GLT	1329	**47.1**	**1.18**	**86.1**	**34.6**	**8.9**	**4.4**
PHY 487 WRF	1317	42.3	1.08	83.4	32.1	**8.4**	4.3
DP 1555 B2RF	1301	**45.1**	**1.17**	**84.9**	**34.2**	**8.1**	**4.6**
AMX 1602 B2XF	1293	42.2	1.15	**84.6**	30.3	**9.6**	**4.7**
BX 1737 GLT	1282	**44.9**	1.15	**85.2**	32.1	**8.8**	**4.6**
DP 1725 B2XF	1277	**46.5**	1.14	83.1	30.7	7.6	**4.5**
AMX 1604 B2XF	1240	42.8	1.14	83.9	**33.4**	6.1	**4.5**
ST 6448GLB2	1215	41.6	**1.19**	**84.9**	30.9	7.5	**4.4**
BX 1776GLTP	1164	42.5	**1.20**	**84.6**	**33.1**	7.4	4.2
AMX 1601 B2XF	1163	43.6	**1.19**	**85.2**	**33.7**	7.7	**4.4**
210 CT	1160	39.2	**1.22**	**86.1**	32.5	**9.5**	**4.6**
BX 1775GLTP	1120	41.4	**1.19**	**84.5**	31.2	**9.0**	4.1
Trial Mean	1392	44.5	1.16	84.6	32.4	8.4	4.4
L.S.D (.10)	204	3.6	0.05	1.7	2.4	1.4	0.4
C.V.(%)	12.5	6.9	3.0	1.4	5.3	12.3	5.7

PLANTING AND STAND ESTABLISHMENT

Optimum seed germination and seedling emergence depends on warm temperatures, adequate moisture, absence of disease organisms and no physical barriers (surface soil crust). The seedbed should be firm and have enough moisture to facilitate emergence and early seedling growth. Raised beds provide more moisture, drain quickly and warm faster than flat beds. To be most effective, raised beds should be prepared at least two to three weeks prior to planting. Raised beds, when maintained during cultivation, facilitate mechanical harvest.

PLANTING DATE AND TEMPERATURE

Soil temperatures and the five-day weather forecast should be used to determine when to plant. The following may serve as a planting guide:

Coastal Plain - After April 1 and when the soil temperature at the 6-inch depth reaches 60 °F (or above) at 10 a.m. for three consecutive days.

Piedmont - After April 15 and when the soil temperature at the 6-inch depth reaches 60 °F (or above) at 10 a.m. for three consecutive days.

Typically, the temperature of the top 1 to 1.5 inches of soil will be within 3 °F of the air temperature at dawn, and temperatures at this depth can change very quickly based on air temperatures. Therefore, it is extremely important to watch the five-day weather forecast. The next five days after planting should accumulate 25 degree-days, base 60 °F (DD60s). To calculate DD60s, add the high and low temperature of a 24-hour period, divide the sum by 2, then subtract 60 from the result. For example, if the high for the day was 80 °F, and the nighttime low was 60 °F, 10 DD60s will be accumulated for that day:

$$\frac{80 + 60}{2} - 60 = 10 \text{ DD60s}$$

Additionally, the two days following planting should not have nighttime lows below 50 °F, since chilling injury occurs below this threshold. If temperatures at seeding depth are below 41 °F when the seed is imbibing moisture that seed will likely die.

PLANT SPACING

Plant for a uniform stand. An ideal stand for our region is two to three plants per foot of row on 38-inch row spacing. Reduce the stand to 1 to 2 plants per foot of row on droughty soils, where boll rot may be a problem, and for irrigated cotton. Thick stands (greater than three to four plants per foot of row) in droughty soils tend to cause greater drought stress, particularly when a drought occurs during the bloom period. Thick stands where drought does not occur can delay maturity, and can contribute to insect problems and boll rot.

Soil crusting can result in a reduction in stand. Planting two to three seed in hills spaced 10 to 14 inches apart can offer some improvement on stand, since two or three seedlings emerging in one area exert more energy than if planted separately. A second measure (to be used only in extreme cases) is to lightly run a rotary hoe over the seedbed to break up the crust; while a small percentage of seedlings will be damaged, this uniform loss will not likely affect yield. Another option that could help minimize soil crusting problems is using reduced tillage. Surface residues tend to prevent a thick crust buildup after a few seasons (this option has not been fully investigated, and should be used on a trial basis only).

Skippy stands will invariably be a problem for South Carolina cotton production. Although no firm recommendations can be made at this time, *preliminary information* suggests that any adjacent skips 6 feet or more in length occurring at the rate of one skip per 15 to 20 feet of row will cause yield losses. Nonadjacent 6-feet skips at the rate of one per 15 to 20 feet of row will not likely reduce yield. Again this information on skippy stands is preliminary, and should be used cautiously.

PLANTING DEPTH

Plant acid-delinted seed 0.75 to 1 inch deep. The proper planting depth varies with soil type, soil moisture conditions, and the weather expected. A firm seedbed, achieving good seed-to-soil contact, is essential for uniform planting depth and seedling emergence.

GERMINATION TESTS

For early plantings, when temperatures may be cooler, planting seed that has high vigor as demonstrated by cool germination test results will provide more vigorous seedlings. Warm germination test results are available for every seed lot from your seed dealer (the seed bag will typically have the standard 80 percent printed on it). Cool test results can be obtained from any seed laboratory for a fee. Get your planting seed early to ensure an adequate supply of high-quality planting seed.

DISEASE CONTROL

SEEDLING DISEASE - Seedling diseases occur on cotton in South Carolina every year. *Rhizoctonia solani* is the most widespread pathogen with *Pythium* spp. occurring primarily on early-planted cotton or cotton planted on heavy or cool-wet soils. One or both of these seedling pathogens are present in almost every cotton field. Damage to plants may vary from barely detectable to death. The seedling disease complex reduces yields 3 to 5 percent in South Carolina every year. The costs to growers increase when the costs of replanting and delayed maturity in the second crop are included. Disease incidence and severity in a given field are determined by environmental factors such as soil temperature and moisture and by other factors such as seed quality and vigor. Stresses on the plant such as pesticide phytotoxicity, fertilizer burn, sand blasting or damage from other pathogens such as nematodes will increase the incidence and severity of seedling diseases.

Cotton seedling diseases can occur as: 1) a seed rot, which occurs prior to germination, 2) a pre-emergence damping off that occurs between germination and emergence, 3) a post-emergence damping off and 4) sore shin, which occurs on plants greater than 8 inches tall and is generally non-lethal. Post-emergence damping off is the most common "seedling" disease in South Carolina and normally is caused by *Rhizoctonia solani*.

Seedling disease management relies on the integration of cultural practices and prudent use of fungicides. There are no varieties available with resistance to seedling diseases. Crop rotation is ineffective since *Rhizoctonia solani* and *Pythium* spp. are capable of infecting most common rotation crops such as corn, peanuts and soybean. Even when a susceptible host is not present, both fungi are capable of surviving saprophytically on soil organic matter such as dead weeds or residue from winter cover crops. The most important cultural practice limiting seedling disease severity is to delay planting until soil temperatures at the 4-inch depth are above 68^{o} F for three consecutive days. Planting on beds allows better drainage and creates higher soil temperatures. Other cultural practices include: 1) the use of high quality seed; 2) avoiding low pHs (less than 6.0) which favor disease development and suppress plant growth; and 3) avoiding injury from pre-emergence and early season herbicides, as well as fertilizer burn.

FUNGICIDES: Fungicides are often applied as a base seed treatment by the seed company. Fungicides can also be applied as additional commercial seed treatments, hopper box treatments, or as in-furrow applications of granular or liquid materials. Fungicides used as seed treatments and in-furrow sprays or granular materials can effectively reduce infections and stand problems due to *Rhizoctonia solani* or *Pythium* spp. However, **most fungicides control only one of the two fungi**. **To control both fungi, combinations of fungicides must be used.**

Base Seed Treatments: Almost all commercial seed sold in South Carolina is treated by the seed company with combinations of fungicides that can help control

multiple species of seedling disease fungi. The efficacy of the fungicides used has improved greatly over the last 10 years and is often sufficient to allow excellent stands; especially if weather conditions are not extreme. These treatments will vary greatly both between and within companies. In some cases, the fungicides used vary significantly depending upon the insecticides and nematicides also applied to the seed. All pesticides applied to the seed are listed on the tag. Remember, in South Carolina to be safe we need to control *Rhizoctonia solani* and *Pythium* species. The earlier you plant and the heavier your soils the more risk you run of infections by *Pythium* species. The later you plant, typically after May 10th, the greater the risk of *Rhizoctonia solani* being the problem fungus. Unlike many areas of the Mid-South *Thielaviopsis basicola* is not a problem in South Carolina and we do not need the specific fungicides required for its control.

Hopper Box Treatments: If additional disease control is needed hopper box treatments offer the cheapest alternatives. Some products combine fungicides to control *Rhizoctonia solani* and *Pythium* spp. Compared to additional commercial seed treatments or in-furrow fungicides hopper box treatments offer the least potential for increased seedling disease control. The key to getting the most activity from a hopper box treatment is to thoroughly mix the fungicide with the seed.

In-Furrow Fungicides: In-furrow fungicides can be formulated as liquids or granules. The liquids provide better seedling disease control than the granules. Both granules and liquids provide better seedling disease control than hopper box treatments or additional seed treatments. In general, they are also more expensive. Like the other options, they contain combinations of fungicides for *Rhizoctonia solani* and *Pythium* spp.

Additional Commercial Seed Treatments: Seed can be ordered with additional seed treatments to help control seedling diseases without the grower needing to apply the fungicides. Two basic types of commercial seed treatments are available: those that contain only fungicides and those that contain fungicides plus insecticides and/or nematicides.

CONCLUSIONS: *Rhizoctonia solani* and *Pythium* spp. are the most common causes of seedling disease in South Carolina. In general, fungicides that control *R. solani* do not control *Pythium* spp. and the fungicides which control *Pythium* spp. do not control *R. solani*. Therefore, using a combination of fungicides which control both fungi will provide the highest probability of limiting damage from seedling diseases. If higher levels of protection are desired than are provided by the base treatments provided by seed companies, in-furrow fungicides will provide the highest levels of control. Liquid in-furrow fungicides are more effective than granular in-furrow fungicides. Commercially applied additional seed treatments are normally effective except under extremely high disease pressure. Grower-applied seed treatments or hopper-box treatments provide the lowest levels of additional control. Fungicides must be thoroughly mixed with the seed to achieve disease control. Seed treatment products

that contain insecticides are available (see Cotton Insect Control). Always read the label. Do not use treated seed for feed or food.

Table 19. Fungicides available for commercial seed treatments, including combinations of fungicides, insecticides and nematicides.

Fungi controlled	Product	Application method	Re-entry interval	Comments
Pythium spp.	Apron XL	Commercial seed treatment	48 hrs.	Must be applied by commercial seed treaters.
R. solani	EverGol Prime	Commercial seed treatment	12 hours (see label exceptions)	Must be applied using commercial slurry or mist-type seed treatment equipment
Fusarium spp. + *Pythium* spp. + *R. solani*	Seed Shield Cotton	Commercial seed treatment	See Label	Must be applied by commercial seed treaters.
Fusarium spp. + *Pythium* spp. + *R. solani*	Trilex Advanced	Commercial seed treatment	See label	Must be applied by commercial seed treaters.
Fusarium spp. + *R. solani*	Vortex	Commercial seed treatment	See label	Must be applied by commercial seed treaters.

Table 20. Available hopper box or seed treatments.

Fungi controlled	Product	Application Method	Rate per 100 lb. seed	Re-entry interval	Comments
Pythium spp.	Allegiance-FL	Seed Treatment	0.75 – 1.5 oz.	24 hrs.	See label for specific directions on applying this product
Pythium spp.	Allegiance-LS	Seed Treatment	1.2 - 2.4 fl. oz.	24 hrs.	See label for specific directions on applying this product
Pythium spp. + *R. solani*	Dynasty CST	Seed treatment	3.1 – 3.95 fl. oz.	48 hrs.	Be sure to thoroughly mix product with seed. Always use high-quality planting seed.
Fusarium spp. + *R. solani*	Kodiak HB	Hopper box	4.0 – 8.0 oz.	Not applicable	This is a biological control agent (*Bacillus subtilis* GB03) which is best used in combination with chemical seed treatments. See label for application instructions
See Label	Manzate Pro-Stick	Hopper box	3.0 oz	24 hours	See label
See Label	Manzate Max	Hopper box	4.8 fl. oz.	24 hrs.	See label
Fusarium spp. + *R. solani*	Maxim 4FS	Hopper box	0.08 – 0.16 fl. oz.	12 hrs.	Be sure to thoroughly mix product with seed. Always use high-quality planting seed
See label	Penncozeb 80WP	Hopper box	3.0 oz.	24 hrs.	See label
See label	Penncozeb 75DF	Hopper box	3.2 oz.	24 hrs.	See label
Pythium spp. + *R. solani*	Prevail	Hopper box	8.0 – 16.0 oz.	Not Applicable	Be sure to thoroughly mix product with seed. Always use high-quality planting seed.

Table 20. Available hopper box or seed treatments. (Continued)

Fungi controlled	Product	Application Method	Rate per 100 lb. seed	Re-entry interval	Comments
R. solani	Spera 240 FS	Commercial or Hopper box	1.25 – 4.0 fl. oz.	48 hrs.	Available for commercial or hopper box treatments. See label for directions
Pythium spp. + *R. solani*	Trilex 2000	Seed treatment	2.0 fl. oz.	24 hrs.	Be sure to thoroughly mix product with seed. Always use high-quality planting seed.
R. solani	Vibrance	Seed treatment	0.08 – 0.60 fl. oz.	12 hrs.	Be sure to thoroughly mix product with seed. Always use high-quality planting seed.

Table 21. In-furrow fungicides.

Fungus controlled	Product	Application Method	Rate per 1,000 row ft.	Re-entry interval	Comments
Pythium spp.	Reason 500 SC Fungicide	In-furrow liquid spray	0.45 fl. oz.	12 hrs.	Apply in a spray volume of 3 to 5 gal per acre. Direct the spray in-furrow behind seed drop but before furrow closure
Pythium spp.	Ridomil Gold GR	In-furrow granular	1.5 – 3.0 oz.	48 hrs.	Controls only seed rots caused by *Pythium* spp.
Pythium spp.	Ridomil Gold SL	In-furrow liquid spray	0.075 - 0.15 oz.	48 hrs.	For use primarily in early-planted cotton with cool, wet soils
Pythium spp.	Terramaster 4EC	In-furrow liquid spray	4.0 to 8.0 fl. oz. per acre based on 40 inch rows.	12 hrs.	Mix with 5 to 15 gallons of water.
R. solani	Headline SC fungicide	In-furrow	0.1 – 0.8 fl. oz.	12 hrs.	Use a minimum of 2.5 gallons of water per acre. Apply into the furrow before the seed is covered.

Table 21. In-furrow fungicides. (Continued)

Fungus controlled	Product	Application Method	Rate per 1,000 row ft.	Re-entry interval	Comments
R. solani	Meteor	In-furrow liquid spray	0.25 to 0.5 fl. oz.	24 hrs.	Apply in at least 2.5 gal. water per acre to deliver in an open seed furrow
R. solani	Priaxor	In-furrow liquid spray	0.2 to 0.6 fl. oz.		Apply in at least 2.5 gal. water per acre into an open seed furrow
R. solani	Rovral 4 Flowable Fungicide	In-furrow	0.25 – 0.5 fl. oz.	4 hrs.	Apply at planting as a banded spray over the seed and covering soil
R. solani	Headline	In-furrow liquid	0.4 - 0.8 fl. oz. /1000 row ft.	12 hrs.	Spray a 4-8 inch band over seed prior to covering with soil
R. solani + *Pythium* spp.	Quadris Flowable	In-furrow liquid	0.40 - 0.80 oz. /1000 row ft.	4 hrs.	Apply as a spray in 5 to 15 gal. of water over the open furrow at planting to the soil around the seed and covering soil.
R. solani + *Pythium spp.*	Ridomil Gold PC GR	In-furrow granular	8.6-12.3 oz. /1000 row ft.	48 hrs.	Apply product at planting over the seed and to covering soil.
Fusarium spp. + *R. solani* + *Pythium* spp.	Terraclor Super X 18.8G	In-furrow	6.7 - 12.3 oz. /1000 ft. row	12 hrs.	Apply product at planting over the seed and to covering soil.
R. solani + *Pythium* spp.	UNIFORM	In-furrow spray	0.32 - 0.48 fl. oz. /1000 ft. row	0 hrs.	Apply as an in-furrow spray in 5 to 15 gallons of water per acre at planting.

LEAF SPOTS AND BOLL ROTS

FOLIAR DISEASES AND BOLL ROTS: Many leaf spots are caused by fungi. Leaf spots that occur in South Carolina that may be controlled by applications of a fungicide include Alternaria leaf spot, Ascochyta blight, Cercospora leaf spot, Phoma blight, and Stemphyllium leaf spot. In many cases, these fungal leaf spots are occurring in areas of the field that are deficient in potash. The fungicides may control the leaf spots, but the yield losses will continue until the potash deficiency is corrected. Boll rots caused by fungi that may be controlled by a fungicide include Alternaria boll rots, Anthracnose boll rot, Ascochyta boll rot, Diplodia boll rot, and Phoma boll rot. In general, boll rots are very difficult to control with fungicides since timing of the fungicide application(s) would need to occur several times to protect all bolls when they are young. Many other organisms cause boll rots including bacteria. Non-fungal boll rots may still occur even when fungicides are applied. Control of either cotton leaf spots or boll rots with fungicides is difficult to achieve.

In 2012 Target leaf spot was observed extensively in South Carolina, especially in Orangeburg, Barnwell, and Bamberg Counties. It is caused by a fungus, *Corynespora cassiicola*. Leaf lesions are prominent and defoliation in the lower two-thirds of the plant can be extensive. This disease has been occurring for several years in Southwest Georgia and Southeastern Alabama; however, researchers there have had a very difficult time identifying the proper time to spray a fungicide to control the disease. In some cases multiple sprays beginning at early flowering have failed to prevent the disease from developing. Target spot appears to need very wet conditions to develop extensively. Severity appears to be worst in very tall, rank cotton where early morning dews extend into the late morning. This favors reproduction and spread of the fungus. One suggested control method is to keep cotton relatively short through variety selection and the use of growth regulators. Avoid planting cotton continuously in fields where Target spot has been severe as the fungus overwinters on plant litter on the soil surface. Deep tillage may help control the disease.

Table 22. Fungicides for foliar applications on cotton.

Diseases controlled	Product	Application method	Rate	Re-entry interval	Comments
Numerous leaf spots and boll rots: see label for specific fungi	Elatus	Foliar spray	5.0 – 7.3 fl. oz. per acre	12 hrs.	45 day preharvest interval. Only two applications are allowed.
Numerous leaf spots and boll rots: see label for specific fungi	Headline fungicide	Foliar spray	6.0 – 12.0 fl. oz. per acre	12 hrs.	30 day preharvest interval. Two applications are allowed
Numerous leaf spots and boll rots: see label for specific fungi	Headline SC fungicide	Foliar spray	6.0 – 12 fl. oz. per acre	12 hrs.	30 day preharvest interval. Two applications are allowed
Numerous leaf spots and boll rots; see label for specific fungi	Priaxor	Foliar spray	4.0 – 8.0 fl. oz. per acre	12 hrs.	30 day preharvest interval. Maximum application of 24 fl. oz. per acre per season. Maximum 3 applications per season.
Numerous leaf spots and boll rots: see label for specific fungi	Quadris	Foliar spray	6 – 9 fl. oz. per acre	12 hrs.	45 day preharvest interval. Maximum application of 27 fl. oz./acre/season
Numerous leaf spots and boll rots: see label for specific fungi	Topguard	Foliar spray	7 to 14 oz. per acre	12 hrs.	30 day preharvest interval. Only 2 applications allowed per year.
Numerous leaf spots and boll rots: see label for specific fungi	TwinLine	Foliar spray	7 - 8.5 fl. oz. per acre	12 hrs.	30-day preharvest interval. Three applications are allowed.

NEMATODE CONTROL

Columbia lance, reniform and Southern root-knot nematodes pose serious threats to cotton production in South Carolina. Each year nematodes claim over 5 percent of the possible cotton production in South Carolina. Not every field is infested with damaging levels of nematodes. However, in the fields that are infested, yield losses range from barely detectable to over 50 percent. Each year, over 90 percent of South Carolina cotton fields have at least one species of nematode present in the field. Almost half of all fields have at least one of the species over damage threshold levels. Columbia lance nematode is the primary nematode pest in most areas of the state. Management tools for all of the three nematode species are limited. Deep tillage is useful in managing all three species. Management tactics by species are as follows.

Columbia lance nematode management relies heavily on the use of nematicides. There are **no resistant or tolerant varieties** available. **Crop rotation is of limited value** in South Carolina since corn, grain sorghum and soybean are hosts. Peanut is a good non-host. **Many weeds are hosts** for Columbia lance nematode making the fallowing of fields ineffective as a rotation strategy. The effects of planting date are unknown. Conservation tillage practices in general have little effect on Columbia lance nematode as long as some form of in-furrow deep tillage is maintained. Most winter cover crops are hosts of this nematode and may increase populations of Columbia lance nematodes if the cover crop is planted prior to November and harvested after March. Cover crops planted after October and harvested prior to April probably will not affect nematode numbers since the nematode is inactive at low soil temperatures.

Root-knot nematode management is very similar to that of Columbia lance nematode in that it relies heavily on the use of nematicides. Commercial cultivars with moderate levels of **resistance** to root-knot nematode are now available. This year Phytogen 487, Stoneville 4946 GLB2, Deltapine 1454 NR B2RF and Deltapine 1558 NR B2RF will be available and have at least moderate resistance to root-knot nematode in South Carolina. Damage from the Fusarium wilt fungus is not commonly seen on modern varieties, but even low levels of root-knot nematode in combination with Fusarium wilt can cause severe yield losses. **Crop rotation is of limited value** in controlling root-knot nematode in South Carolina. Root-knot nematode populations will maintain or increase on corn without damaging the corn. Soybean varieties vary greatly in their levels of resistance to root-knot nematode. In general, cotton grown after a resistant soybean variety will still need a nematicide. Peanut is a good non-host. Grain sorghum appears to be a good nonhost in South Carolina. Conservation tillage practices in general have little effect on root-knot nematode as long as some form of in-furrow deep tillage is maintained. With the exception of 'Cahaba' vetch, most legume winter cover crops are hosts of root-knot nematode and may increase populations if the cover crop is planted prior to November and harvested after March. Cover crops planted after October and harvested prior to April will probably not affect nematode numbers since the nematode is inactive at low soil temperatures. Rye may

help decrease root-knot nematode population densities; however, this effect is not well documented.

Reniform nematode management also relies heavily on nematicides. There are no cotton cultivars currently available that are resistant or tolerant to reniform nematode. **Crop rotation is possible as a management tool** as corn, grain sorghum and some soybean varieties are resistant to reniform nematode. In general, cotton grown after a resistant soybean variety will still need a nematicide. Peanut is a non-host for reniform nematode. However, reniform nematode can migrate deep into the soil profile where its survival rate is high even under a nonhost.

Nematicide Usage: Nematicides are broken out into two major groups. The first group is for use in fields with high nematode population levels. Telone II is the only "stand alone" nematicide for fields with heavy nematode pressure. It is applied as a preplant fumigant. Other treatments for fields with heavy nematode pressure include Velum Total, Temik 15G or AgLogic 15G applied in-furrow at-plant plus a post emergence application of Temik 15G or AgLogic 15G side-dressed or Vydate C-LV sprayed over the top. Treatment options for fields with low to moderate nematode pressure include Velum Total, Temik 15G or AgLogic 15G in-furrow at-planting or commercial seed treatments which include AVICTA Duo Cotton, Avicta Duo COT202, AERIS Seed Applied Insecticide/Nematicide, and Poncho/VOTiVO.

Counter 20G no longer has a label for use in-furrow in cotton. This label was only for the 2014 growing season.

Velum Total is now available for use in-furrow, at plant. At a high application rate, 18 oz./acre it will control low to moderate levels of nematodes. Copeo has the same active ingredient as Velum, fluopyram, and may be used extensively as a commercial seed treatment on Stoneville cottonseed in 2017.

Table 23. Fumigant, granular, and liquid nematicides available in South Carolina for control of nematodes. See labels for specific species controlled by each product.

Nematode level	Product	Rate/acre for 38 inch rows	Application Method	Re-entry interval	Comments
High	Telone II	3.0 – 5.0 gal.	Pre-plant fumigant	5 days	Should be injected under the row so that after bedding there are at least 14-inches between the release point and the soil surface. A minimum waiting period of 10 to 14 days is needed prior to planting. Additional materials are needed for thrips control.
High	Temik 15G	3.0 - 6.0 lbs.	Post-emergence side-dressed	48 hrs.	Always use in combination with an at-plant or pre-plant nematicide. Apply after 1st square. Side-dress granules 8 to 16 inches to one side of the plant row and 2 to 6 inches deep.
High	AgLogic 15G	5.0 lbs	Post – emergence side-dressed	48 hours	To control high levels of nematodes, apply as a split application, in-furrow + side dress. Apply side dress in a furrow that is 6 to 12 inches to one or both sides of the plant row to a depth of 2 to 3 inches.
High	K-Pam	6.0 – 12.0 gal.	Pre-plant fumigant	5 days (see label)	Inject 12 inches below planting depth and seal immediately. Wait 7-14 days before planting
High	Vapam HL	6.0 - 12.0 gal.	Pre-plant fumigant	5 days (see label)	Inject 12 inches below planting depth and seal immediately. Wait 7-14 days before planting
Low to Moderate	Velum Total	14 to 18 fl. oz.	In-furrow At-plant	12 hrs.	Apply as in-furrow spray with 5 to 6 gal./acre of water at planting. Contains an insecticide-imidacloprid, plus a fungicide/nematicide-fluopyram

Table 23. Fumigant, granular, and liquid nematicides available in South Carolina for control of nematodes. See labels for specific species controlled by each product. (Continued)

Nematode level	Product	Rate/acre for 38 inch rows	Application Method	Re-entry interval	Comments
Moderate to High	Vydate CLV	8.5 – 17.0 fl. oz.	Post-emergence	48 hrs.	Apply 2- to 4-weeks after emergence as a band over the row or broadcast. Always apply in combination with an at-plant or pre-plant nematicide.
Low to Moderate	Temik 15G	3.0 – 6.0 lbs.	In-furrow at-plant	48 hrs.	Drill granules just below the seed line or place in seed furrow and cover with soil.
Low to Moderate	AgLogic 15G	3.5 to 6.0 lbs.	In-furrow at-plant	48 hrs.	Apply granules in the seed furrow and immediately cover with soil by mechanical means. OR Apply granules in a 4 to 6-inch band (T-Band) over open seed furrow and immediately cover with soil by mechanical means.

Table 24. Nematicides available in South Carolina as commercial seed treatments for control of low to moderate levels of nematodes. See labels for specific species controlled by each product.

Nematode level	Product	Application Method	Re-entry interval	Comments
Low to Moderate	AERIS Seed-Applied Insecticide/Nematicide	Available only as a commercial seed treatment	Not applicable	Contains a nematicide and an insecticide. See label for further information.
Low to Moderate	Avicta 500 FS	Available only as a commercial seed treatment	Not Applicable	Contains only the nematicide Abamectin.
Low to Moderate	Avicta Duo Cotton	Available only as a commercial seed treatment	Not applicable	Contains a nematicide (Abamectin at 12.4%) and an insecticide (Thiamethoxam at 28.1%). See label for further information.
Low to Moderate	Avicta Duo COT202	Available only as a commercial seed treatment	Not applicable	Contains a nematicide (Abamectin at 11.2%) and an insecticide (Thiamethoxam at 28.0%). See label for further information.
Low to Moderate	PONCHO/VOTiVO	Available only as a commercial seed treatment	Not applicable	Contains a nematicide and an insecticide. See label for further information.

REGULATION OF PLANT GROWTH

Since cotton is an indeterminate, perennial plant, conditions that promote very vigorous growth can produce plants that have high proportions of vegetative growth relative to reproductive growth. Conditions such as excessive rainfall, irrigation or nitrogen fertilization, as well as planting in fields with a history of high growth potential, can result in a highly vegetative or "rank" cotton plant. In these cases, it is beneficial to apply a growth regulator to control excessive vegetative growth, plant height, and ultimately to reduce boll rot (from dense canopies) and increase yield.

Mepiquat plant growth regulators reduce the internode length of cotton, and the leaves thicken and appear darker green. Slight increases in earliness and yield are usually seen when mepiquat is used properly. Sometimes yield decreases have been experienced when stress occurs. Avoid mepiquat use, or use lower rates, when plant stress is detected or expected. In many cases on Coastal Plain soils, the most common stress condition that would prevent mepiquat application would be inadequate soil moisture.

MEPIQUAT USE FACTORS

The need for this product will depend on many factors. Anything affecting plant growth and vigor will influence the need for mepiquat. Some of these factors include variety, planting date, plant density, soil characteristics, plant nutrition, soil moisture, temperature, and fruit retention. The best "plant growth regulator " for cotton is good early-season fruit retention. Some conditions which will likely favor the use of mepiquat are:

- Late-planted cotton (after May 20)
- Excessive rainfall or irrigation
- Excessive nitrogen fertility
- High plant densities (more than 3 to 4 plants per row foot)
- Planting in fields that have a history of rank growth
- Using full-season, indeterminate varieties
- Delayed maturity caused by any of a number of factors, such as delayed sidedress nitrogen applications, weed pressure, herbicide injury, heavy early-season pest infestations, cool early-season temperatures, etc.

PLANT GROWTH MONITORING

Mepiquat applications ultimately are based on plant vigor determinations. Plant vigor is important because a more vigorous plant tends to allocate more of its energy into producing vegetative matter (leaves, stem, high proportion of vegetative branches) versus reproductive matter (bolls). If vigor is too high, mepiquat can slow vegetative growth and redirect this growth toward bolls; if vigor is too low, mepiquat use should be avoided, since some other factor is regulating plant growth (e.g., drought, pest infestations, weed pressure, etc.). Listed below are some vigor assessment parameters and some corresponding thresholds to guide mepiquat use. *Do not rely on any single vigor assessment measurement for mepiquat applications; rather, use a*

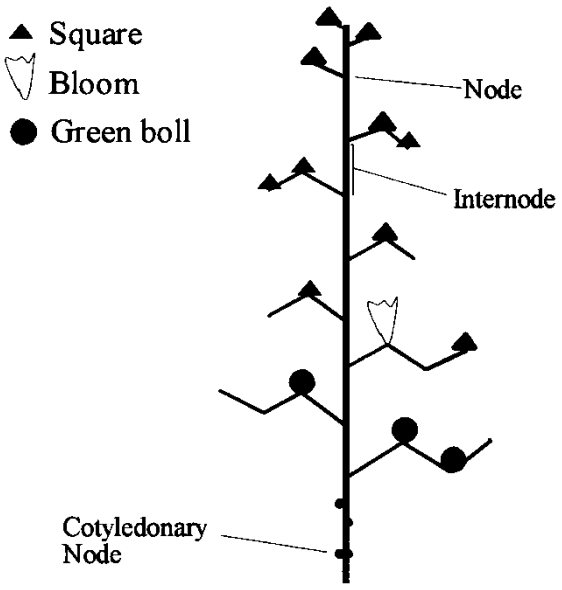
combination of assessments to base applications. IN ANY CASE, DO NOT APPLY MEPIQUAT WHEN PLANTS ARE STRESSED OR IF ANY STRESS CONDITION IS EXPECTED WITHIN SEVEN TO 10 DAYS AFTER APPLICATION.

Plant Height. Mepiquat will control plant height effectively. However, plant height targets at various points throughout the season must be known to make informed decisions regarding its proper use. Measure plant height from the cotyledonary node to the terminal on 20 plants per average-sized field. The target plant height at first bloom (as indicated by having 5 to 6 blooms per 25 feet of row) is 20 to 26 inches. If plants are shorter than 20 inches at first bloom, do not apply mepiquat; if plants are taller than 26 inches, mepiquat application might be warranted. In general, at harvest, plant height should equal row spacing to minimize boll rot and optimize plant performance.

Height-to-Node Ratio. Dividing the plant height (in inches) by the total number of nodes results in the height-to-node ratio. This measure is extremely useful if used properly. Measure at least 20 plants per average-sized field to get a good estimate. The targets during the season are:

- DURING SQUARING: 1.2 TO 1.7 INCHES
- DURING BLOOM: 1.7 TO 2.0 INCHES

If values are lower than the targets, avoid mepiquat use; if values are higher than the targets, mepiquat applications might be warranted.



Nodes Above White Bloom (NAWB). Another vigor assessment to be used during the bloom period is the number of nodes above the highest white bloom at the first fruiting position. To measure NAWB, locate the highest first-position white bloom, count the mainstem node where the bloom is located as "0", then count up to the terminal node (identified as the mainstem node that has a unfurled mainstem leaf at least 1 inch in diameter). The diagram shows a plant that is at 7 NAWB.

At first bloom (identified as having five to six blooms per 25 feet of row), the target is 7 to 10 NAWB. Maintain this range throughout the bloom period as long as possible, since 4 to 5 NAWB indicates the beginning of "cutout", or the end of the effective bloom period. After this point, bolls developing from any new blooms will not likely be harvestable. For best results on mepiquat

applications, use a combination of plant height, height-to-node ratio, and nodes above white bloom measurements; however, stress assessment must always be considered.

GENERAL USE OPTIONS (PIX, MEPEX, MEPEX GINOUT, TOPIT, MEPICHLOR, PENTIA)

Option 1: Apply 8 to 16 oz. (0.022 to 0.044 lb ai)/acre at early bloom stage (five to six blooms per 25 feet of row) if plants are over 26 inches tall, have height-to-node ratios of over 2 inches, and if NAWB$\geq$10. This option is most effective for fields with medium growth potential.

Option 2: Apply 8 oz. (0.022 lb ai)/acre at early bloom stage if plants are over 26 inches tall, have height-to-node ratios over 2 inches, and if NAWB$\geq$10, followed by 8 oz. (0.022 lb ai)/acre two to four weeks later if those same plant growth parameters indicate the need. This option is most effective for fields with medium to high growth potential.

Option 3: Apply 2 to 4 oz. (0.005 to 0.011 lb ai)/acre at first square stage if the height-to-node ratio is over 1.7 inches. Follow-up applications of 2 to 4 oz. (0.005 to 0.011 lb ai)/acre should be considered two weeks after first square stage, at early bloom stage, and at early bloom + 2 weeks, if conditions warrant. Consult the previously-mentioned targets for plant height, height-to-node ratio, and NAWB for use guidelines. This option is especially suited to fields and conditions conducive to high to very high growth potential.

CAUTION: DO NOT APPLY MEPIQUAT TO COTTON THAT IS STRESSED, OR IF STRESS CONDITIONS ARE EXPECTED WITHIN 7 TO 10 DAYS.

Safety and Application Procedure Remarks

- FOLLOW ALL DIRECTIONS ON PRODUCT LABEL.
- APPLY IN A MINIMUM OF 20 GALLONS OF WATER/ACRE WITH GROUND EQUIPMENT OR NOT LESS THAN 5 GALLONS/ACRE WITH AERIAL EQUIPMENT.
- DO NOT TANK MIX WITH ANY PRODUCTS OTHER THAN INSECTICIDES OR MITICIDES UNLESS RECOMMENDED ON THE PRODUCT LABEL.

GENERAL USE OPTIONS (STANCE)

Limited university data has shown Stance (a premix of mepiquat chloride and cyclanilide) to be an effective plant growth regulator for reducing plant internode length. Growers are cautioned to use this product on a limited basis until more information can be gathered. Bayer CropScience recommends using Stance at a rate of 3 oz/A.

TABLE 25. COTTON PLANT GROWTH REGULATOR INFORMATION

Active Ingredient	Recommended Use Rate	REI	PHI
Mepiquat Chloride 4.2%		12 hours	30 days
PIX L	0.5 to 1.0 pt/acre		
MEPICHLOR L	0.5 to 1.0 pt/acre		
MEPEX L	0.5 to 1.0 pt/acre		
PENNAX L	0.5 to 1.0 pt/acre		

Active Ingredient	Recommended Use Rate	REI	PHI
Mepiquat Chloride 3.9%		12 hours	30 days
PIX ULTRA L	0.5 to 1.0 pt/acre		

Active Ingredient	Recommended Use Rate	REI	PHI
Mepiquat chloride and Kinetin 4.2% and 0.0025%		12 hours	30 days
MEPEX GINOUT L	0.5 to 1.0 pt/acre		

Active Ingredient	Recommended Use Rate	REI	PHI
Mepiquat pentaborate 9.6%		12 hours	30 days
PENTIA L	0.5 to 1.0 pt/acre		

Active Ingredient	Recommended Use Rate	REI	PHI
Mepiquat chloride and Bacillus cereus 4.2% and 0.0058%		12 hours	30 days
PIX PLUS L	0.5 to 1.0 pt/acre		

Active Ingredient	Recommended Use Rate	REI	PHI
Mepiquat chloride and Cyclanilide 8.4% and 2.1%		24 hours	30 days
STANCE SC	2.0 to 3.0 fl oz/acre		

IRRIGATION

Cotton has been irrigated successfully in western cotton growing areas for many years. However, it is difficult to find research data from the Southeast that strongly supports profitable irrigation of cotton. Growing irrigated cotton in the Southeast requires more management than nonirrigated production. Yield response to irrigation depends to a large degree on the proper timing of the right amount of water, insect control, proper nitrogen management and providing drainage to dispose of excess water during wet periods. Many experiments have shown yield decreases with irrigation because one or more of these variables were not properly managed or could not be controlled.

Attention to details is essential for irrigated cotton production. When investing in irrigation of a crop, do not make costly mistakes that will negate the benefit of applying supplemental water. Soils should have the productive capacity for making two bales or more per acre. Pests (nematodes, diseases, insects, mites and weeds) should be controlled. Proper nitrogen management is required, and lime and other nutrients must be supplied based on soil test results.

WATER USE BY COTTON

Cotton has long been considered a dry weather crop. This is a misconception. Since cotton fruits over a relatively long period, it can tolerate short periods of low soil moisture better than some other crops, especially when the stress occurs early in the fruiting period. However, cotton will produce the best yield when moisture is relatively high during the fruiting period.

Research has shown cotton water use in relation to plant development to be as follows:

Stage of Growth	Water Use per Day (in)
Emergence to Square	< 0.1
Square to Early Bloom	0.10 to 0.25
Early Bloom to Mature Boll	0.25 to 0.40

IRRIGATION TIMING

Irrigation prior to bloom may be beneficial to activate preemergence herbicides and to obtain rapid germination and emergence after planting. Additional supplemental water before bloom is usually not needed in South Carolina. However, if plants wilt before noon and growth is not progressing satisfactorily (seven to 10 nodes above the first bloom are desirable), irrigation with 0.75 to 1.0 inches may be justified.

After first bloom, irrigation timing and amounts should be determined with tensiometers. Two tensiometers should be installed, one at a depth of 8 in and one at 18 in. Irrigation should begin when soil moisture tension at the 8-inch depth reaches

20 centibars (cb). Enough water should be added to maintain the soil moisture tension at the 18-inch depth at 20 cb or less. Rain gauges should be used to monitor the rainfall and irrigation water applied.

TERMINATING IRRIGATION

When to terminate irrigation is a difficult decision. At the end of the ninth week of blooming, some bolls will begin opening. Continuing irrigation into the boll-opening period will likely result in lower-quality fiber and increased risk of boll-rot damage. Terminating the irrigation season with a wet soil profile is a good plan unless boll rot is a factor. A cutoff date between August 20 and September 5 is suggested as a guide for cotton planted from mid-April to early May.

CULTURAL PRACTICES FOR IRRIGATED COTTON

Planting Date: Best irrigated cotton yields will be achieved with a full growing season. However, very early planting should be avoided to reduce the risk of boll rot and hard lock which may develop when bolls are opening in mid- to late August. This will occur when cotton is planted in late March or early April.

Variety: Available data indicate that varieties which perform best under dryland conditions also perform best with irrigation. Full-season varieties generally have greater yield potential than early-maturing varieties since early varieties tend to cut out sooner. Unless planting is delayed substantially, a full-season variety is likely to be more productive.

Plant height should also be considered when selecting a variety for production under irrigation. A variety that produces a tall plant is likely to provide conditions favorable for boll rot development.

Plant Population: Plant population is an important consideration for irrigated cotton. Plant spacing should be no more than one to two plants per foot of row. Skip-row planting is advised on heavy-textured soils. These practices will help reduce the risk of boll rot by providing better drying conditions.

Fertilization: Follow the same recommendations as for non-irrigated production except for nitrogen management.

Nitrogen Management: Nitrogen (N) management for irrigated cotton is critical for successful production. Too much nitrogen, especially when combined with adequate water, will result in excessive vegetative growth at the expense of fruiting. Also, problems with insect control, delayed maturity and difficulties with defoliation may occur with excess N. The margin for error in managing an irrigated crop is much less than that for non-irrigated production. Setting bolls early in the fruiting period is critical for successful irrigated production. Boll rot is a greater threat to irrigated production than for non-irrigated cotton. Plant size must be managed to reduce the

risk from this threat. The best way to accomplish this is to set bolls early and continuously during the fruiting period.

GROWTH REGULATOR

Use of the growth regulator mepiquat is advised for most irrigated cotton. However, the same precautions used in determining if mepiquat should be applied to dryland cotton should also be observed. That is, do not apply mepiquat to stressed plants. Use of mepiquat on cotton under stress will likely result in a yield decline. See Table 20 in the section entitled Regulation of Plant Growth for rate and recommendations on the use of mepiquat.

RECOMMENDATIONS SUMMARY FOR IRRIGATED COTTON

The following summary of Clemson University recommendations for irrigated cotton is based on our best data and experience. It is impossible to fully support all the recommendations from data alone. There are not enough years of research data available to put confidence intervals around each statement. However, growers should fully consider these points.

1. With current economic conditions and agronomic data, irrigation of cotton can be profitable with good management. Large yield increases due to irrigation are not possible in years with good to excellent rainfall. These good years make it impossible to show large increases in lint yield due to irrigation over a long period of time. However, lint yield increases should be sufficient to justify irrigation if cultural practices and water management practices conform to the best information about cotton production.

2. Nitrogen rates should be increased to at least 100 lb/acre with irrigation.

3. Irrigation should be terminated by late August or early September.

4. The soil water potential should be maintained at tensions less than 20 cb in the surface 2 ft. Tensiometers provide the only reliable way to monitor.

5. Mepiquat should be used to reduce the vegetative growth of plants.

6. The insect control program must be well-managed.

WEED CONTROL IN COTTON

Table 26. Preplant Burndown Herbicides for Weed Management in Cotton

Herbicide	Rate/Acre Broadcast		Mode of Action	Preharvest Interval	Restricted Entry Interval
	Formulation	Active Ingredient			
Aim 2EC (*carfentrazone*)	1.0-2.0 fl oz	0.016-0.032 lb	14	3 days	12 hours
Aim 1.9EW					
Comments : Apply any time prior to planting. For best results, apply to weeds that are less than 4 inches tall (less than 3 inch rosettes). Use higher rate for treating larger weeds. Add a COC (1-2 gal per 100 gals spray solution, NIS (1 qt per 100 gals spray solution, or MSO (1-2 gal per 100 gals of spray solution). Add 2,4-D LVE to improve control of cutleaf eveningprimrose and wild radish. Tank mix partners include GLYPHOSATE, LIBERTY, GRAMOXONE, 2,4-D LVE, or CLARITY. **Rainfast interval = 6-8 hours.**					
Brake F16 2.7 SC (*fluridone* + *fomesafen*)	16 fl oz	0.15 lb + 0.1875 lb	12 + 14	None	24 hours
Comments: Apply BRAKE F16 up to 14 days before planting cotton. Very effective on Palmer amaranth (*glyphosate-resistant and ALS-resistant biotypes*). Do not apply more than 16 fl oz per acre per season. Do not apply by air or through an irrigation system. Dry weather following application of BRAKE F16 will reduce its effectiveness on Palmer amaranth. Tank mix Brake F16 with glyphosate and 2,4-D for control of existing weeds prior to planting. Follow up BRAKE F16 with a residual herbicide program at planting.					
Clarity 4S (*dicamba*)	8.0 fl oz	0.25 lb	4	7 days	24 hours
Comments: Excellent control of most winter annual broadleaf weeds. Following application of CLARITY and at least 1 inch rainfall, a waiting period of at least 21 days is required before cotton planting. In general, CLARITY is less effective than 2,4-D LVE on cutleaf eveningprimrose control. **Rainfast interval = 4 hours.**					
Direx 4L (*diuron*)	1.5-2.0 pt	0.75-1.0 lb	7	7 days	12 hours
Comments: Apply in a minimum of 10 GPA of water per acre. Controls winter annual weeds (up to 2" in size) and provides some residual control into the early growing season. Must be applied 15 to 150 days prior to cotton planting. Add a compatibility agent to the spray tank when tank mixing with GLYPHOSATE. Do not apply where soil-applied organophosphate insecticide was used as severe crop injury will occur. Do not apply to sandy or sandy loam soils with organic matter less than 1.0%. **Rainfast interval = heavy rainfall soon after application may wash product off of the foliage and a repeat application may be needed to ensure adequate weed control (suggest 1 hour).**					
ET 0.208 EC (*pyraflufen ethyl*)	0.5-2.0 oz	0.0008-0.003 lb	14	---	12 hours
Comments: Cotton may be planted any time after ET application. For best result, apply ET to broadleaf weeds less than 4 inches tall or rosettes less than 3 inches in diameter. Do not apply more than 2.0 oz/A for burndown. Add a suitable adjuvant like NIS at 1.0% v/v (1 gal per 100 gal of spray solution) will optimize weed control. Ground application requires minimum of 10 gallons/A. Do not allow livestock to graze in treated areas. **Rainfast interval = 1 hour.**					

Table 26. Preplant Burndown Herbicides for Weed Management in Cotton. (Continued)

Herbicide	Rate/Acre Broadcast		Mode of Action	Preharvest Interval	Restricted Entry Interval
	Formulation	Active Ingredient			
Flexstar GT 3.5 2.82EC (*fomesafen* + *glyphosate*)	3.5-5.3 pt	0.25-0.37 lb + 0.99-1.50 lb ae	14 + 9	70 days	24 hours

Comments: Apply FLEXSTAR GT 7-14 days before planting. Very effective on Palmer amaranth (*glyphosate-resistant and ALS-resistant biotypes*) that has not emerged from the soil. Apply only to coarse textured soils (sandy loam, loamy sand, sandy clay loam). Adequate rainfall or irrigation (around 0.25") within 7 days of application is required for activation. Some crinkling or spotting of cotton foliage or stunting may occur, especially if heavy rainfall occurs during or soon after emergence, but plants outgrow these effects and develop normally. Tank mix with COTORAN, DIREX, PROWL, or STAPLE to broaden the spectrum of weed control. **Rainfast interval = heavy rainfall shortly after application may reduce effectiveness.**

Resistance Management: *Make only **one** application of a group 14 containing herbicide per growing season.*

FirstShot 50 SG (*thifensulfuron* + *tribenuron*)	0.5-0.8 oz	0.125-0.20 lb + 0.125 + 0.20 lb	2 + 2	---	12 hours

Comments: Apply 14 days before planting cotton. If applying to light-textured soils, such as sands, loamy sands, and sandy loams, wait an additional 7 days to plant. Add COC at 1 gal per 100 gals or NIS at 2 pt per 100 gal of spray solution plus nitrogen fertilizer (UAN at 2 qt/A or AMS at 2 lb/A). FIRSTSHOT may be tank mixed with 2,4-D LVE (for improved control of cutleaf eveningprimrose, henbit, and Carolina geranium), GLYPHOSATE, CLARITY, LIBERTY, or GRAMOXONE. If tank mixing with 2,4-D LVE, observe the more restrictive waiting interval to plant (14-30 days, depending on rate, see 2,4-D LVE section). **Rainfast interval = 2 hours.**

Glyphosate acid equivalent (ae) 4.5 lb ae/gal	22-32 fl oz	0.75-1.13 lb ae	9	7 days	4 hours

Comments: Apply in a minimum of 10 GPA of water per acre 14-30 days prior to cotton planting. Controls henbit, ryegrass, cutleaf evening primrose and wild radish (*although not as effective as glyphosate + 2,4-D LVE*). 2,4-D or CLARITY can be added to this mixture. **Rainfast interval = heavy rainfall soon after application may wash product off of the foliage and a repeat application may be needed to ensure adequate weed control (suggest 1 hour).**

Goal 2XL (*oxyfluorfen*)	1.0-2.0 pt	0.25-0.5 lb	14	75 days	24 hours

Comments: Apply GOAL 2XL a minimum of 7 days before planting cotton. Tank mix with GLYPHOSATE or PARAQUAT for control of larger winter annual broadleaf weeds or annual grasses in fallow beds (fall or late winter/early spring burndown). Provides postemergence and soil residual control of horseweed, pigweeds, and henbit.

Resistance Management: *Make only **one** application of a group 14 containing herbicide per growing season.*

Table 26. Preplant Burndown Herbicides for Weed Management in Cotton. (Continued)

Herbicide	Rate/Acre Broadcast		Mode of Action	Preharvest Interval	Restricted Entry Interval
	Formulation	Active Ingredient			
Gramoxone SL 2S (*paraquat*)	2.0-4.0 pt	0.5-1.0 lb	22	7 days	12 hours
paraquat 3S	1.5-2.0 pt				
Comments: GRAMOXONE is a RESTRICTED USE PESTICIDE. Apply in a minimum of 10 GPA at planting. Controls seedling *glyphosate- and ALS-resistant Palmer amaranth* that have emerged since the early preplant burndown treatment. Add NIS at 1 qt/100 gal of spray mix. **Rainfast interval = 30 minutes.**					
Leadoff 33.4 DF	1.5 oz			30 days	4 hours
(*rimsulfuron* + *thifensufluron*)		0.0157 lb 0.0157 lb	2 2		
Comments: Apply LEADOFF 30 days or more prior to planting cotton. LEADOFF tank mix partners include GLYPHOSATE, PARAQUAT, 2,4-D LVE, DICAMBA, or GLUFOSINATE. No additional surfactant is needed if tank mixed with glyphosate or glufosinate with a built-in adjuvant system. Otherwise, add NIS at 1 qt per 100 gal or COC at 1 gal per 100 gal or MSO at 0.5 gal per 100 gal of spray solution plus an ammonium nitrogen fertilizer (AMS at 2 lb/A or UAN at 2 qt/A).					
Liberty 280 SL (*glufosinate*)	29-43 oz	0.53-0.79 lb	10	70 days	12 hours
Interline 2.34SL					
Comments: Thorough spray coverage is essential for optimum performance. Ground application requires a minimum of 15 gallons of water/acre. Dense weed canopies require 20 to 40 gallons per acre. Best results obtained when daytime temps exceed 75 F. Consult label for maximum season application rates for LIBERTY (burndown + in-season applications). **Rainfast interval = 4 hours.**					
Prowl 3.3EC (*pendimethalin*)	1.8-3.6 pt	0.75-1.5 lb	3	60 days	24 hours
Comments: Apply in a minimum of 10 GPA of water per acre. Apply PROWL up to 15 days before planting. PROWL must be activated by rainfall or irrigation, preferably within 2 days. For best results, apply to weeds that are less than 4" tall (less than 3" rosettes). Use higher rate for treating larger weeds. Dense weed or cover crop stands will reduce the effectiveness of residual weed control. Add 2,4-D LVE to improve control of cutleaf eveningprimrose and Carolina geranium.					
Resource 0.86EC (*fumiclorac*)	2.0-4.0 fl oz	0.013-0.026 lb	14	7 days	12 hours
Comments: Apply in a minimum of 10 GPA of water per acre any time prior to planting. For best results, apply to weeds that are less than 4" tall (less than 3" rosettes). Use higher rate for treating larger weeds. Add a COC (1-2 gal/100 gals), NIS (1 qt/100 gals), or MSO (1-2 gal/100 gals). Add 2,4-D LVE to improve control of cutleaf eveningprimrose. **Rainfast interval = heavy rainfall soon after application may wash product off of the foliage and a repeat application may be needed to ensure adequate weed control (suggest 1 hour).**					
Sharpen 2.85SC (*saflufenacil*)	1.0 fl oz	0.022 lb	14	80 days	12 hours

Table 26. Preplant Burndown Herbicides for Weed Management in Cotton. (Continued)

Herbicide	Rate/Acre Broadcast	Mode of Action	Preharvest Interval	Restricted Entry Interval
Comments: Apply SHARPEN a minimum of **42 days** plus the accumulation of **1.0 inch of rainfall or irrigation** before planting cotton. Add COC at 1 gal per 100 gal or MSO at 1 gal per 100 gal of spray solution plus nitrogen fertilizer (UAN at 2 qt/A or AMS at 2 lb/A). If tank mixing with GLYPHOSATE, AMS is recommended. Do not apply SHARPEN with other group 14 (PPO inhibitors) products (i.e., VALOR OR REFLEX) as a tank mix or as a sequential application within 30 days or crop injury may result. Do not apply to coarse soils classified as SAND with less than 1.5% organic matter or cotton injury may result. Tank mix partners include CLARITY, DISTINCT, GLYPHOSATE, and PROWL H2O. **Rainfast interval = 1 hour.**				
Valor 51WDG (*flumioxazin*)	2.0 oz 0.063 lb	14	21 days	12 hours
Valor EZ 4SC	2.0 fl oz			

Comments: Apply in a minimum of 10 GPA of water per acre 14-30 days prior to cotton planting. Controls cutleaf evening primrose and wild radish (*although not as effective as glyphosate + 2,4-D LVE*) and provides 2-4 weeks of residual control of weeds such as *glyphosate- and ALS-resistant Palmer amaranth*. 2,4-D or CLARITY may be tank mixed with this mixture*. Be sure to follow the clean-out instructions for removing VALOR from the sprayer after each day's use;* ***do not let VALOR sit overnight in the tank***. See below for preplant burndown waiting intervals prior to cotton planting (Assumes 2.0 oz/A of Valor SX):

Ground Residue Amounts	Cotton Plant-Back Intervals (days before planting)	
	Strip-Till Before Valor SX	Strip-Till following Valor SX
<30 % residue cover	28 days	7 days
>30 % residue cover	21 days	7 days

Resistance Management: *Make only* ***one*** *application of a group 14 containing herbicide per growing season.*

Warrant 3.0ME (*acetochlor*)	1.25-2.0 qt 0.94-1.5 lb	15	---	12 hours

Comments: Apply WARRANT any time prior to planting but before weeds germinate. Provides residual control of small seeded broadleaves and grasses. The optimum rate of WARRANT is 3 pt/A. Do not exceed 4.0 qt/A of WARRANT per season. Tank mix with GLYPHOSATE or PARAQUAT to control exisiting weeds. Do not apply ACETOCHLOR within 50ft of any well where depth to ground water is 30 feet or less: sands with less than 3% organic matter; loamy sands with less than 2% organic matter; or sandy loams with less than 1% organic matter.

Table 27. At-Plant Postemergence Broadcast for Glyphosate-Resistant Palmer Amaranth

Herbicide	Rate/Acre Broadcast		Mode of Action	Preharvest Interval	Restricted Entry Interval
	Formulation	Active Ingredient			
Gramoxone SL 2S (*paraquat*)	2.0-4.0 pt	0.5-1.0 lb	22	7 days	12 hours
paraquat 3S	1.5-2.0 pt				

Comments: PARAQUAT is a RESTRICTED USE PESTICIDE. Apply PARAQUAT broadcast or in a band behind the planter furrow alone in a minimum of 10 GPA at planting or after planting (before cotton emerges) tank mixed with residual herbicides, such as REFLEX, DIURON, WARRANT, and/or PROWL H2O. Controls seedling *glyphosate- and ALS-resistant Palmer amaranth* that have emerged from an earlier preplant burndown application. Increase the rate of PARAQUAT and spray volume if weeds are dense or have significant size (greater than 4 inches). Add NIS at 1 qt/100 gal of spray mix. **Rainfast interval = 30 minutes.**

Table 28. Weed and Cover Crop Response to Burndown/Preplant Herbicides in Conservation Tillage Cotton[1]

	Aim/ET[2]	Glyphosate[2]	Glyphosate + 2,4-D[2]	Glyphosate + Direx[2]	Glyphosate + Leadoff[2]	Glyphosate + Sharpen[2]	Glyphosate + Valor SX[2]	Gramoxone[2]	Gramoxone + 2,4-D[2]	Gramoxone + Clarity[2]	Gramoxone + Valor SX[2]	Gramoxone + Direx[2]	Liberty[2]
barley, little	F	E	E	E	E	E	E	G	G	G	G	G	G
bluegrass, annual	G	F	F	E	E	E	E	G	G	G	G	G	P
buttercups	G	E	E	E	E	E	E	E	E	E	E	E	E
chickweed, common	G	F	G	GE	E	E	E	E	E	GE	E	E	E
clovers	P	PF	F	F	G	E	F	G	G	GE	GE	GE	F
cudweed	G	E	E	E	E	E	E	FG	FG	FG	FG	FG	G
dandelion	P	P	E	GE	E	G	G	N	E	GE	P	GE	FG
dock, curly	P	PF	G	F	F	F	G	F	FG	GE	P	F	G
eveningprimrose, cutleaf	GE	PF	E	GE	E	E	FG	F	E	GE	E	GE	G
geranium, Carolina	GE	FG	E	GE	E	E	E	GE	E	GE	E	E	GE
henbit/deadnettle	G	F	G	E	E	E	E	G	GE	E	E	GE	G
horseweed (marestail)	G	E	GE	E	GE	E	GE	F	GE	E	GE	GE	GE
mustard, wild	G	FG	E	GE	G	E	GE	FG	E	G	GE	G	GE
pansy, field	G	F	F	G	---	E	F	G	G	G	G	GE	G
peanut, volunteer	F	F	F	F	P	GE	FG	P	F	GE	F	F	GE
pepperweed, Virginia	G	G	E	GE	E	E	G	G	GE	G	G	GE	G
radish, wild	G	FG	GE	GE	G	E	GE	G	GE	GE	GE	GE	GE
ryegrass, Italian	F	G	F	FG	E	E	G	FG	FG	FG	FG	G	P
sorrel, red	F	E	E	E	G	G	E	E	E	E	E	E	PF
spurry, corn	G	GE	GE	GE	E	E	G	FG	G	G	G	G	---
swinecress	G	FG	G	G	E	E	FG	PF	FG	FG	PF	FG	GE
vetch	GE	F	E	G	E	E	FG	G	GE	GE	GE	G	GE
wheat/rye cover crop	P	E	E	G	E	E	E	FG	F	F	G	G	F

[1]Key to Response Ratings: E = excellent control, 90% or better; G = good control, 80 to 90%; F = fair control 70 to 80%; P = poor control, less than 70%; --- = Insufficient Data.

[2]Herbicide rates for burndown are ET at 1.0 oz/A; Aim at 2.0 oz/A; Glyphosate at 0.75 lb ae/A (22 oz/A of 4.5 lb ae/gal or 32 oz/A of 3.0 lb ai/gal); 2,4-D at 1-2 pt/A; Clarity at 8 oz/A; Direx at 1.6 pt/A; Leadoff at 1.5 oz/A; Sharpen at 1.0 oz/A; Gramoxone at 3.0 pt/A; Valor SX at 2.0 oz/A; and Liberty at 29 oz/A.

Glyphosate-Resistant Palmer Amaranth Programs - Cotton

Palmer amaranth populations have been documented in South Carolina that are resistant to glyphosate (i.e., Roundup, Touchown), acetolactate synthase (ALS) inhibiting herbicides (i.e., Staple, Envoke) and dinitroaniline (yellow) herbicides (i.e., Prowl, Treflan, and Sonalan). The following table is designed to aid producers in managing glyphosate-resistant and ALS-resistant Palmer amaranth populations in cotton.

Overuse of PPO-inhibitors (i.e., Valor, Reflex) could lead to the development of PPO-resistant Palmer amaranth biotypes. The use of overlapping residual herbicides with postemergence herbicides will help preserve the utility of these PPO-inhibitors in the near future.

Table 29. Managing Glyphosate-resistant Palmer Amaranth in Roundup Ready Flex Cotton[1]

Herbicide Program				
Preplant Burndown (PPB), Preplant Incorporate (PPI) or Preemergence (PRE)	**POST BROADCAST (1 to 4 leaf)**	**POST BROADCAST (5-6 leaf)**	**POST-DIRECTED/ LAYBY**	**HOODED**
Conventional Tillage <u>Dryland</u> Prowl or Treflan or Treflan + Cotoran PPI fb Reflex[2] PRE	glyphosate + Dual Magnum or Warrant *(no Palmer emerged)* OR glyphosate + Staple LX[3] *(Palmer < 2")*	glyphosate + Warrant *(no Palmer emerged)* glyphosate + Envoke[3] (*Palmer < 4"*)	Layby Pro + MSMA OR Caparol + MSMA OR Suprend + MSMA	Paraquat + Direx
Conventional Tillage <u>Irrigated</u> Reflex[2] + Staple LX[3] PRE *<u>or</u>* Reflex[2] + Direx PRE *<u>or</u>* Reflex[2] + Prowl PRE				
Conservation Tillage <u>Dryland</u> Valor[2,4] PPB followed by Direx + Warrant + Paraquat PRE *<u>or</u>* Valor[2,4] PPB followed by Paraquat + Reflex[2] + Direx PRE *<u>or</u>* Valor[2,4] PPB followed by Paraquat + Reflex[2] + Warrant PRE				
Conservation Tillage <u>Irrigated</u> Valor[2,4] PPB followed by Direx + Staple LX[3] + Paraquat PRE *<u>or</u>* Valor[2,4] PPB followed by Paraquat + Reflex[2] + Diuron PRE				

Table 30. Managing Glyphosate- and ALS-resistant Palmer Amaranth in Roundup Ready Flex Cotton[1]

Herbicide Program				
Preplant Burndown (PPB), Preplant Incorporate (PPI) or Preemergence (PRE)	**POST BROADCAST (1 to 4 leaf)**	**POST BROADCAST (5-6 leaf)**	**POST-DIRECTED/ LAYBY**	**HOODED**
Conventional Tillage <u>Dryland</u> Prowl *<u>or</u>* Treflan *<u>or</u>* Treflan + Cotoran PPI followed by Reflex[2] + Warrant *<u>or</u>* Warrant + Direx PRE	glyphosate + Dual Magnum or Warrant *(no Palmer emerged)*	glyphosate + Warrant *(no Palmer emerged)*	Layby Pro + MSMA OR Caparol + MSMA OR Suprend + MSMA	Paraquat + Direx Paraquat + Caparol
Conventional Tillage <u>Irrigated</u> Reflex[2] + Direx PRE *<u>or</u>* Reflex[2] + Prowl PRE				
Conservation Tillage <u>Dryland</u> Valor[2,4] PPB followed by Direx + Warrant + Paraquat PRE *<u>or</u>* Valor[2,4] PPB followed by Paraquat + Reflex[2] + Direx PRE *<u>or</u>* Valor[2,4] PPB followed by Paraquat + Reflex[2] + Warrant PRE				
Conservation Tillage <u>Irrigated</u> Valor[2,4] PPB followed by Direx + Warrant + Paraquat PRE *<u>or</u>* Valor[2,4] PPB followed by Paraquat + Reflex[2] + Diuron PRE				

[1]Hand weeding, cultivation, and/or application of paraquat mixtures with hooded sprayers will likely be needed.
[2]Make only one application of Reflex or Valor during the growing season for resistance management.
[3]Make only one application of an ALS-inhibiting herbicide (Staple, Envoke, Suprend) per growing season. *Will not control ALS-resistant Palmer amaranth*.
[4]See Valor SX in the preplant burndown discussion for interval between application and planting with a strip-till planter.

Table 31. Managing Glyphosate-resistant Palmer Amaranth in Liberty-Link Cotton[1]

Herbicide Program				
Preplant Burndown (PPB) or Preemergence (PRE)	**POST BROADCAST (1-4 leaf)**	**POST DIRECTED (5-6 leaf)**	**LAYBY**	**HOODED**
Conventional Tillage Reflex[2] + Direx or Prowl or Staple LX PRE or Staple LX[3] + Direx or Prowl PRE	Liberty[4] + Dual Magnum OR Warrant *(Palmer < 4")* OR Liberty[4] + Staple LX[3] *(Palmer < 4")*	Liberty[4] + Warrant (Palmer < 4")	Layby Pro + MSMA OR diuron + Valor[2] + MSMA OR diuron + MSMA	Paraquat + Direx Paraquat + Caparo
Conservation Tillage Valor[2,5] PPB followed by Paraquat + Direx + Warrant PRE or Valor[2,5] PPB followed by Paraquat + Reflex[2] + Direx PRE or Valor[2,5] PPB followed by Paraquat + Reflex[2] + Warrant PRE				

[1]Hand weeding, cultivation, and/or application of paraquat mixtures with hooded sprayers will likely be needed.
[2]Make only one application of Reflex or Valor throughout the growing season for resistance management.
[3]Make only one application of an ALS-inhibiting herbicide (Staple, Envoke, Suprend) per growing season. *Will not control ALS-resistant Palmer amaranth*.
[4]Liberty will not consistently control Palmer amaranth larger than 4" tall.
[5]See Valor SX in the preplant burndown discussion for interval between application and planting with a strip-till planter.

Table 32. Weed Response to Soil Applied Cotton Herbicides[1]

	PREPLANT INCORPORATED		PREEMERGENCE							
	Prowl	**Treflan**	**Brake F16**	**Command**	**Cotoran**	**Direx**	**Prowl**	**Reflex**	**Staple LX**	**Warrant**
anoda, spurred	P	P	---	GE	F	F	P	---	E	---
barnyardgrass	E	E	E	E	G	G	G	P	FG	GE
beggarweed, Florida	P	P	---	FG	GE	G	P	P	G	P
bermudagrass	P	P	P	PF	P	P	P	P	P	P
citronmelon	P	P	P	P	FG	F	P	P	FG	P
cocklebur, common	P	P	P	F	GE	P	P	G	P	P
cowpea	P	P	P	P	P	P	P	P	FG	P
crabgrass	E	E	E	E	FG	FG	G	FG	P	E
crotolaria, showy	P	P	P	G	G	G	P	P	FG	P
croton, tropic	P	P	G	P	G	F	P	FG	P	---
crowfootgrass	E	E	E	E	FG	FG	G	---	---	E
dayflower, Benghal	P	P	---	P	G	P	P	P	P	---
eclipta	P	P	---	G	G	G	P	GE	G	P
goosegrass	E	E	E	E	F	F	G	---	PF	E
jimsonweed	P	P	E	G	G	G	P	---	FG	P
johnsongrass, seedling	E	E	E	G	P	P	G	---	FG	P
johnsongrass, rhizome	P	P	P	P	P	P	P	P	P	P
lambsquarters, common	GE	GE	E	G	E	E	G	E	FG	F
morningglory spp.	P	P	F	P	G	F	P	PF	F	P
nutsedge, purple	P	P	P	P	P	P	P	---	P	P
nutsedge, yellow	P	P	P	P	P	P	P	GE	P	F
panicum, fall	G	G	E	E	F	P	F	---	PF	E
panicum, Texas	P	P	E	G	P	P	F	F	P	PF
pigweed spp.	G	GE	E	P	GE	GE	F	E	GE	GE
ALS-resistant	G	GE	E	P	GE	GE	F	E	P	GE
DNA-resistant	P	P	E	P	GE	GE	P	E	GE	GE
poinsettia, wild	P	P	---	G	P	P	P	GE	G	P
purslane, common	E	E	E	GE	E	F	G	G	G	G
pusley, Florida	E	E	E	GE	G	F	G	P	P	GE
ragweed, common	P	P	F	GE	E	G	P	G	P	PF
redweed (chocolateweed)	P	P	F	GE	E	GE	P	G	GE	P
ryegrass, annual	E	E	E	GE	G	G	G	P	P	G
sandbur	E	E	E	G	G	G	G	---	---	FG
senna, coffee	P	P	FG	P	GE	P	P	P	G	P
sesbania, hemp	P	P	FG	G	P	P	P	P	P	P
sicklepod	P	P	FG	P	G	F	P	P	PF	P
sida, prickly	P	P	G	E	G	F	P	---	PF	P
signalgrass, broadleaf	G	G	E	E	P	P	G	FG	P	G
smartweed, Pennsylvania	P	P	FG	G	G	G	P	---	G	PF
spurge	P	P	G	P	P	F	P	G	G	F
starbur, bristly	GE	GE	F	P	GE	G	P	GE	FG	PF
velvetleaf	P	P	G	E	F	PF	P	P	E	P
vol. peanuts	P	P	P	F	P	P	P	P	P	P

[1]***Key to Response Ratings***: E = excellent control, 90% or better; G = good control, 80 to 90%; F = fair control, 70 to 80%; P = poor control, less than 70%; --- = Insufficient Data.

2

Table 33. Preplant Incorporated Herbicides for Weed Management in Cotton

Herbicide	Rate/Acre Broadcast		Mode of Action	Preharvest Interval	Restricted Entry Interval
	Formulation	Active Ingredient			
Prowl 3.3EC (*pendimethalin*)	1.0-2.0 pt	0.5-1.5 lb	3	21 days	24 hours
Prowl H_2O 3.8CS	2.0-4.0 pt	0.95-1.9 lb			
Comments: Apply PROWL up to 60 days before planting and incorporate. Controls annual grasses and some small-seeded broadleaf weeds, seedling johnsongrass; poor control of large-seeded broadleaf weeds (i.e., annual morningglory, cocklebur, sicklepod). For maximum pigweed control, use 2.0 pt/A application rate. Use the lower rate if a sequential application of pendimethalin is planned at planting. Incorporate to a depth of 2 to 3 inches immediately after application. Cross disk for best results. Application within a week of planting is recommended. **NOTE:** *If your field(s) have a history of poor Palmer amaranth control with yellow herbicides (PROWL, TREFLAN, SONALAN), a follow-up preemergence herbicide (i.e. Dual Magnum, Warrant) will be needed at planting or early postemergence.*					
Treflan 4HFP (*trifluralin*)	1.0-2.0 pt	0.5-1.0 lb	3	60 days	12 hours
Comments: Controls annual grasses and some small-seeded broadleaf weeds, seedling johnsongrass; poor control of large-seeded broadleaf weeds (i.e., annual morningglory, cocklebur, sicklepod). Use 2.0 to 3.0 pt/A for rhizome johnsongrass control. For enhanced pigweed control, use 1.5 pt/A on coarse-textured soils and 2.0 pt/A on medium-textured soils. Incorporate to a depth of 2 to 3 inches immediately after application. Cross disk for best results. Application within a week of planting is recommended. **NOTE:** *If your field(s) have a history of poor Palmer amaranth control with yellow herbicides (PROWL, TREFLAN, SONALAN), a follow-up preemergence herbicide (i.e. DUAL MAGNUM, WARRANT) will be needed at planting or early postemergence.*					
Treflan 4HFP (*trifluralin*)	1.0-2.0 pt	0.5-1.0 lb	3	90 days	12 hours
+					
Cotoran 4F (*fluometuron*)	1.0-2.0 qt	1.0-2.0 lb	7		
Comments: Controls annual grasses and broadleaf weeds, seedling johnsongrass; COTORAN improves control of large-seeded broadleaf weeds (i.e., annual morningglory, cocklebur, sicklepod). See above for soil texture and rate discussion on TREFLAN. Use lower rate of COTORAN on coarse textured soils. Incorporate to a depth of 2 to 3 inches immediately after application. Cross disk for best results. Application within a week of planting is recommended.					

Table 34. Preemergence Herbicides for Weed Management in Cotton

Herbicide	Rate/Acre Broadcast		Mode of Action	Preharvest Interval	Restricted Entry Interval
	Formulation	Active Ingredient			
Brake F16 2.7 SC (*fluridone* + *fomesafen*)	16 fl oz	0.15 lb + 0.1875 lb	12 + 14	None	24 hours
Comments: Very effective on Palmer amaranth (*glyphosate-resistant and ALS-resistant biotypes*), crabgrass, prickly sida, and crowfootgrass. Apply BRAKE F16 within 36 hours of planting. Do not apply more than 16 fl oz per acre per application. Dry weather following application of BRAKE F16 will reduce its effectiveness on Palmer amaranth. Apply an early postemergence herbicide, such as *glyphosate* or LIBERTY plus a residual herbicide (i.e., DUAL MAGNUM, STAPLE, or WARRANT) within 12 to 16 days after BRAKE F16 application.					
Command 3ME (*clomazone*)	2.0-3.33 pt	0.75-1.25 lb	13	65 days	12 hours
Comments: Controls crabgrass, fall panicum, crowfootgrass, Texas panicum, velvetleaf, spurred anoda, and prickly sida. Provides only marginal suppression of most other broadleaf weeds (i.e., *Palmer amaranth*). May be tank mix with other herbicides to broaden weed spectrum. Do not apply COMMAND to cotton unless disulfoton or phorate organophosphate insecticide is applied in-furrow with the seed at planting time at a minimum of 0.75 lb of active ingredient per acre. Do not reduce the application rate of the organophosphate insecticide when COMMAND is applied as a band treatment. Combinations of at-planting systemic granular carbamate and organophospate insecticides applied in conjunction with COMMAND may result in injury to cotton. Crop injury may occur with higher rates of COMMAND on sandy soils. DIURON is not recommended at planting when COMMAND is used as plant injury may result. Do not apply in the air or within 1200 ft of housing developments, commercial fruit, vegetable, or nut production; or commercial ornamental nurseries or greenhouses. Do not apply more than 1.25 lb ai per acre per season. Do not allow liverstock to graze on treated cotton forage or trash, or feed treated cotton forage or trash to livestock.					
Cotoran 4F (*fluometuron*)	2.0-4.0 pt	1.0-2.0 lb	7	60 days	24 hours
Comments: Controls Palmer amaranth (*including ALS- and glyphosate-resistant*), sandbur, crabgrass, tropic croton, and coffee senna. Tank mix with STAPLE LX for improved control of spurred anoda and velvetleaf. For improved pigweed control, particularly in conservation tillage, REFLEX may be applied in combination with COTORAN preemergence. Cotton injury may be observed when COTORAN is applied in combination with a systemic insecticide at planting. In addition, COTORAN applied with COMMAND may result in cotton injury. Use the lower end of the rate range on lighter soils.					
Direx 4L (*diuron*)	0.8 qt	0.8 lb	7	90 days	12 hours
Comments: Controls Palmer amaranth (*including ALS- and glyphosate-resistant*), common ragweed, and bristly starbur. Do not apply where soil-applied organophosphate insecticide was used as severe crop injury and stand loss will occur. Seedling diseases may weaken cotton plants and increase the possibility of injury from the use of TRIFLURALIN products followed by DIREX. These treatments should only be used in conjunction with a standard fungicide seed treatment plus a supplemental soil fungicide program such as CAPTAN-PCNB mixture. Do not apply to sands or sandy loam soils with organic matter less than 1.0%.					

Table 34. Preemergence Herbicides for Weed Management in Cotton. (Continued)

Herbicide	Rate/Acre Broadcast		Mode of Action	Preharvest Interval	Restricted Entry Interval
	Formulation	Active Ingredient			
Flexstar GT 3.5 2.82EC (*fomesafen* + *glyphosate*)	3.5-5.3 pt	0.25-0.37 lb + 0.99-1.50 lb ae	14 + 9	70 days	24 hours

Comments: Very effective on Palmer amaranth (*glyphosate-resistant and ALS-resistant biotypes*) that has not emerged from the soil. Apply only to coarse textured soils (sandy loam, loamy sand, sandy clay loam). Adequate rainfall or irrigation (around 0.25") within 7 days of application is required for activation. Some crinkling or spotting of cotton foliage or stunting may occur, especially if heavy rainfall occurs during or soon after emergence, but plants outgrow these effects and develop normally. Tank mix with COTORAN, DIREX, PROWL, or STAPLE to broaden the spectrum of weed control.

Resistance Management: *Make only **one** application of a group 14 containing herbicide per growing season.*

Prowl H_2O 3.8CS (*pendimethalin*)	1.0-2.0 pt	0.48-0.95 lb	3	60 days	24 hours
Prowl 3.3EC	1.2-2.4 pt	0.50-0.99 lb			

Comments: Controls Palmer amaranth (*glyphosate- and ALS-resistant biotypes*), common lambsquarters, Florida pusley, and crabgrass. Apply at planting or up to 2 days after planting.

Note: *If your field has a history of poor Palmer amaranth control with yellow herbicides, consider tank mixing PROWL with COTORAN, REFLEX, or STAPLE.*

Reflex 2 EC (*fomesafen*)	12-16 fl oz	0.1875-0.25 lb	14	70 days	24 hours
Dawn 2 EC					

Comments: Very effective on Palmer amaranth (*glyphosate-resistant and ALS-resistant biotypes*). Apply only to coarse textured soils (sandy loam, loamy sand, sandy clay loam). Adequate rainfall or irrigation within 7 days of application is required for activation. Some crinkling or spotting of cotton foliage or stunting may occur, especially if heavy rainfall occurs during or soon after cotton emergence, but plants outgrow these effects and develop normally. Tank mix with COTORAN, DIREX, PROWL, or STAPLE to broaden the spectrum of weed control.

Resistance Management: *Make only **one** application of a group 14 containing herbicide per growing season.*

Staple LX 3.2SL (*pyrithiobac*)	1.7-2.1 fl oz	0.0425-0.0525 lb	2	60 days	4 hours

Comments: Controls Palmer amaranth (*glyphosate-resistant biotypes*), spurred anoda, and velvetleaf. Plant stresses from cool temps, thrips damage, or excessive soil moisture may cause temporary leaf yellowing or stunting. As conditions improve, cotton will recover. Do not use on soils where organic matter is less than 0.5% or on coarse textured soils (sands or loamy sands). Do not apply more than one preemergence application of STAPLE per year. Tank mix with PROWL for improved grass control.

Resistance Management: *Make only **one** application of a group 2 containing herbicide per growing season.*

Table 34. Preemergence Herbicides for Weed Management in Cotton. (Continued)

Herbicide	Rate/Acre Broadcast		Mode of Action	Preharvest Interval	Restricted Entry Interval
	Formulation	Active Ingredient			
Warrant 3.0ME (*acetochlor*)	1.25-2.0 qt	0.94-1.5 lb	15	---	12 hours

Comments: Provides residual control of small seeded broadleaves and grasses. Apply after planting but before weeds germinate. The optimum rate of WARRANT is 3 pt/A. Do not exceed 4.0 qt/A of WARRANT per season. Tank mix with GLYPHOSATE or PARAQUAT to control weeds that have germinated since planting. Environmental conditions that follow application of WARRANT including cold, wet soils or water logged condition from excessive rain may result in crop injury. Do not apply ACETOCHLOR within 50ft of any well where depth to ground water is 30 feet or less: sands with less than 3% organic matter; loamy sands with less than 2% organic matter; or sandy loams with less than 1% organic matter.

Table 35. Weed Response to Postemergence Broadcast Cotton Herbicides[1]

	Assure II	Cotoran	Envoke	Envoke + Staple	Fusilade DX/Fusion	Glyphosate[2]	Glyphosate+Dual Mag.[2]	Glyphosate + Envoke[2]	Glyphosate + Prowl[2]	Glyphosate + Staple[2]	Glyphosate + Warrant[2]	Liberty[3]	Liberty + Dual Mag.[3]	Liberty + Prowl[3]	Liberty + Warrant[3]	MSMA	Poast/Poast Plus	Select/Select MAX	Sequence[2]	Staple	Xtendimax[4]
anoda, spurred	P	---	P	G	P	GE	GE	E	GE	E	GE	P	P	P	P	P	P	P	GE	G	G
barnyardgrass	G	G	---	---	G	E	E	E	E	E	E	G	G	G	G	F	GE	GE	E	---	P
beggarweed, Florida	P	G	GE	GE	G	E	E	E	E	E	E	G	G	G	G	E	P	P	E	G	G
bermudagrass	G	P	P	P	G	F	F	FG	F	FG	F	P	P	P	P	P	F	G	F	P	P
citronmelon	P	G	GE	GE	P	GE	GE	E	GE	E	GE	G	G	G	G	PF	P	P	GE	---	G
cocklebur, common	P	FG	GE	G	P	E	E	E	E	E	E	E	E	E	E	E	P	P	E	G	E
cowpea	P	FG	G	GE	P	E	E	E	E	E	E	G	G	G	G	F	P	P	E	---	E
crabgrass	G	PF	P	P	G	E	E	E	E	E	E	FG	G	G	FG	F	GE	GE	E	P	P
crotolaria, showy	P	G	---	---	P	G	G	G	G	G	G	G	G	G	G	F	P	P	G	---	G
croton, tropic	P	FG	PF	PF	P	E	E	E	E	E	E	G	G	G	G	F	P	P	E	P	GE
crowfootgrass	G	PF	F	P	F	E	E	E	E	E	E	G	G	G	GE	F	FG	G	E	P	P
dayflower, Benghal	P	P	F	F	P	FG	G	G	FG	G	FG	FG	G	FG	FG	P	P	P	FG	P	P
eclipta	P	---	P	FG	P	E	E	E	E	E	E	G	G	G	G	---	P	P	E	G	G
goosegrass	G	PF	P	P	G	E	E	E	E	E	E	FG	G	G	FG	F	GE	GE	E	P	P
jimsonweed	P	G	P	GE	P	E	E	E	E	E	E	E	E	E	E	P	P	P	E	E	E
johnsongrass, seedling	E	P	FG	FG	GE	E	E	E	E	E	E	G	G	G	GE	F	GE	E	E	P	P
johnsongrass, rhizome	E	P	PF	PF	GE	GE	G	GE	E	GE	E	P	P	P	P	P	G	GE	E	P	P
lambsquarters, common	P	G	G	GE	P	G	G	E	G	G	G	E	G	G	G	P	P	P	E	P	E
morningglory spp.	P	G	G	G	P	G	G	E	G	G	G	E	E	E	E	F	P	P	G	G	E
nutsedge, purple	P	P	FG	FG	P	F	F	G	F	FG	FG	P	P	P	P	F	P	P	FG	PF	P
nutsedge, yellow	P	P	G	G	P	FG	FG	GE	FG	FG	F	P	P	P	P	FG	P	P	F	PF	P
panicum, fall	GE	PF	P	P	GE	E	E	E	E	E	E	G	G	GE	GE	F	E	E	E	P	P
panicum, Texas	G	P	P	P	G	E	E	E	E	E	E	G	G	GE	GE	P	E	E	E	P	P

[1]Key to Response Ratings: E = excellent control, 90% or better; G = good control, 80 to 90%; F = fair control, 70 to 80%; P = poor control, less than 70%; --- = Insufficient Data.

[2]Use only on glyphosate-tolerant (Gly-Tol or Roundup Ready [RR] Flex) cotton varieties.

[3]Use only on glufosinate-tolerant (LibertyLink [LL]) cotton varieties.

[4]Use only on Bollgard II XtendFlex cotton varieties.

Table 35. Weed Response to Postemergence Broadcast Cotton Herbicides(cont)[1]

	Assure II	Cotoran	Envoke	Envoke + Staple	Fusilade DX/Fusion	Glyphosate[2]	Glyphosate+Dual Mag.[2]	Glyphosate + Envoke[2]	Glyphosate + Prowl[2]	Glyphosate + Staple[2]	Glyphosate + Warrant[2]	Liberty[3]	Liberty + Dual Mag.[3]	Liberty + Prowl[3]	Liberty + Warrant[3]	MSMA	Poast/Poast Plus	Select/Select MAX	Sequence[2]	Staple	Xtendimax[4]
pigweed spp.	P	PF	PF	F	P	E	E	G	E	E	E	G	G	G	G	P	P	P	E	G	E
glyphosate-resistant	P	PF	PF	F	P	P	P	P	P	E	P	G	G	G	G	P	P	P	P	G	E
ALS-resistant	P	PF	P	P	P	E	E	E	E	E	E	G	G	G	G	P	P	P	E	P	E
poinsettia, wild	P	F	G	G	P	G	G	E	G	GE	E	GE	GE	GE	GE	N	P	P	G	F	E
purslane, common	P	FG	---	---	P	F	F	G	F	G	F	FG	FG	FG	FG	P	P	P	G	F	---
pusley, Florida	P	PF	P	P	P	F	F	PF	FG	PF	FG	P	P	G	PF	P	P	P	FG	P	P
ragweed, common	P	G	G	G	P	E	E	E	E	E	E	E	E	E	E	P	P	P	E	FG	E
redweed (chocolateweed)	P	FG	---	---	P	G	G	G	G	G	G	E	E	E	E	P	P	P	G	---	E
ryegrass, annual	G	P	---	---	G	E	E	E	E	E	E	FG	FG	FG	FG	GE	G	G	E	---	P
sandbur, field	G	PF	---	P	G	E	E	E	E	E	E	G	G	GE	GE	F	G	G	E	P	P
senna, coffee	P	FG	---	GE	P	E	E	E	E	E	E	GE	GE	GE	GE	P	P	P	E	GE	E
sesbania, hemp	P	FG	---	GE	P	F	F	---	---	GE	---	G	G	G	G	P	P	P	---	GE	E
sicklepod	P	FG	E	E	P	GE	GE	E	GE	GE	GE	E	E	E	E	F	P	P	E	PF	E
sida, prickly	P	FG	P	F	P	E	E	G	E	G	E	G	G	G	G	P	P	P	E	F	E
signalgrass, broadleaf	G	P	P	P	GE	E	E	E	E	E	E	G	G	GE	GE	F	E	E	E	P	P
smartweed, Pennsylvania	P	FG	G	G	P	GE	GE	E	GE	E	GE	GE	GE	GE	GE	P	P	P	GE	G	E
spurge, annual	P	F	---	---	P	G	G	G	G	G	G	FG	FG	FG	FG	P	P	P	G	FG	E
starbur, bristly	P	G	GE	GE	FG	E	E	E	E	E	E	GE	GE	GE	GE	P	P	P	E	GE	E
velvetleaf	P	G	G	G	P	GE	GE	E	GE	E	GE	G	G	G	G	P	P	P	GE	G	E
vol. corn	G	P	P	P	E	E	E	E	E	E	E	F	F	F	F	P	E	GE	E	P	P
RR hybrids	G	P	P	P	E	P	P	P	P	P	P	F	F	F	F	P	E	GE	P	P	P
RR+LL hybrids	G	P	P	P	E	P	P	P	P	P	P	P	P	P	P	P	E	GE	P	P	P
vol. peanuts	P	F	PF	PF	P	F	F	F	F	F	F	GE	E	GE	GE	P	P	P	F	P	E

[1]Key to Response Ratings: E = excellent control, 90% or better; G = good control, 80 to 90%; F = fair control, 70 to 80%; P = poor control, less than 70%; --- = Insufficient Data.

[2]Use only on glyphosate-tolerant (Gly-Tol or Roundup Ready [RR] Flex) cotton varieties.

[3]Use only on glufosinate-tolerant (LibertyLink [LL]) cotton varieties.

[4]Use only on Bollgard II XtendFlex cotton varieties.

Table 36. Postemergence Broadcast Herbicides for Weed Management in Cotton

Herbicide	Rate/Acre Broadcast		Mode of Action	Preharvest Interval	Restricted Entry Interval
	Formulation	Active Ingredient			
Assure II 0.88E (*quizalofop*)	5-12 fl oz	0.034-0.069 lb	1	80 days	12 hours
Comments: Apply ASSURE at 7-8 oz/A over-top to control annual grasses up to 6" tall. Apply 5 oz/A to control volunteer RR-corn in cotton. For control of rhizome johnsongrass, apply 5 oz of Assure II when johnsongrass is 10-24" tall and then retreat with 5 oz when regrowth reaches 6-10" tall. For bermudagrass control, apply 10-12 oz/A at 3" tall (up to 6" runners). Add COC at 1 gal/100 gallons or 1 qt/100 gallons of spray mixture. Application intervals should be 7 days apart to allow for regrowth. Do not exceed 18 oz/A in a growing season. **Rainfast interval = 1 hour**.					
Cotoran 4L (*fluometuron*)	2.0-2.5 pt	1.0-1.25 lb	7	60 days	24 hours
Comments: Apply COTORAN to cotton after reaching 3 inches in height. Controls *glyphosate- and ALS-resistant Palmer amaranth (less than 2 inches tall)* and annual morningglory (less than 3 inches tall). Add surfactant at 2 qt/100 gal of spray solution. Tank mix partners may include MSMA, PARALLEL PCS, PYRIMAX **Rainfast interval = 2 hours.**					
Dual Mag. 7.62EC (*s-metolachlor*) Parallel PCS 8.0EC (*metolachlor*)	1.0-1.33 pt	0.95-1.27 lb	15	100 days	24 hours
Comments: Apply METOLACHLOR at when cotton is 3 to 6 inches tall. DUAL MAGNUM does not control emerged weeds, but will provide residual control of annual grasses, pigweeds, and suppression of yellow nutsedge. Tank mix with MSMA, GLYPHOSATE (ROUNDUP READY FLEX) or LIBERTY (LIBERTY-LINK) for control of emerged weeds. Do not apply to sand or loamy sand soils. **Rainfast interval = none**.					
Envoke 75WDG (*trifloxysulfuron*)	0.10-0.15 oz	0.0046-0.0069 lb	2	60 days	12 hours
Apply ENVOKE to 5-leaf or greater cotton for control of pigweed, annual morningglory, and yellow nutsedge. *Weak on Palmer amaranth*. Add NIS (a minimum of 80% surface active) at 1 qt/100 gal of spray solution. Do not apply with any other additive or growth regulator as unacceptable injury may occur. Tank mix with STAPLE for enhanced smallflower morningglory control. Do not apply as a preemergence as substantial cotton injury will result. **Rainfast interval = 3 hours.** **Resistance Management:** *Make only **one** application of a group 2 containing herbicide per growing season.*					
Fusilade DX 2EC (*fluazifop-p-butyl*)	8-12 fl oz	0.125-0.188 lb	1	90 days	12 hours
Comments: Controls annual and perennial grasses before they exceed 6-8" tall. For rhizome johnsongrass control, apply 12 oz/A when it is 8-18" tall. Make a second application (8 oz/A) when regrowth is 6-12" tall. For bermudagrass, apply 12 oz/A when runners are 4-8" long, and 8 oz/A when re-growth reaches 4-8". Add COC at 1 gal/100 gallon or NIS 2 pt/100 gal of spray solution. Controls volunteer RR-corn in cotton. Do not apply after boll set. Do apply more than 48 oz/A per or within 90 days of harvest. **Rainfast interval = 1 hour.**					

Table 36. Postemergence Broadcast Herbicides for Weed Management in Cotton. (Continued)

Herbicide	Rate/Acre Broadcast		Mode of Action	Preharvest Interval	Restricted Entry Interval
	Formulation	Active Ingredient			
Fusion 2.56EC (*fluazifop-p-butyl* + *fenoxaprop-p-ethyl*)	8-12 oz	0.16-0.24 lb	1 1	90 days	24 hours
Apply FUSION at 8 oz/A for control of most annual grasses before they exceed 6-8" tall. For rhizome johnsongrass, apply 10-12 oz/A for control of johnsongrass 8-18" tall. A second 8 oz/A treatment may be applied to control regrowth 6-12" tall. For bermudagrass, treat 4-8" runners with 12 oz/A, and then apply a second application of 8 oz/A to 4-8" re-growth. Add COC at 1 gal/100 or NIS at 2 pt/100 gallon of spray solution. Controls volunteer RR-corn in cotton. **Rainfast interval = 1 hour.**					
Glyphosate acid equivalent (ae) 4.5 lb ae/gal	22-32 fl oz	0.75-1.12 lb ae	9	7 days	4 hours
Comments: USE ONLY ON COTTON VARIETIES DESIGNATED AS GLY-TOL OR ROUNDUP READY FLEX! Apply GLYPHOSATE at 0.75 to 1.12 lb ae/A over-the-top from ground cracking up to 7 days before harvest. Controls annual grasses and broadleaves. In general, the first over-the-top broadcast application should be applied early to minimize weed competition (1 to 3" tall weeds). No restriction on the timing of sequential treatments. Tank mix with STAPLE, DUAL MAGNUM, or WARRANT for residual control of weeds. Aerial application rates are limited to 0.75 lb ae/A. Maximum combined total of all applications from emergence through harvest cannot exceed 4.5 lb ae/A. **Rainfast interval = 2 hours.**					
Resistance Management: *Glyphosate-resistant Palmer amaranth is spreading rapidly throughout South Carolina. Continued reliance on glyphosate-only programs will enhance selection and spread of resistant biotypes. Tank mixing glyphosate with other chemistries must be utilized. Biotypes of Palmer amaranth resistant to both ALS- and glyphosate chemistries have been confirmed in South Carolina.*					
Liberty 2.34 SL (*glufosinate*) Interline 2.34 SL	29-43 fl oz	0.53-0.79 lb	10	70 days	12 hours
Comments: USE ONLY ON COTTON VARIETIES DESIGNATED AS LIBERTY-LINK! Apply LIBERTY/INTERLINE in a minimum of 15 GPA using flat fan nozzles at 30-60 PSI from emergence up to the bloom growth stage. Spray coverage is essential for maximum LIBERTY/INTERLINE performance. Controls annual grasses, broadleaf weeds, and *ALS- and glyphosate-resistant Palmer amaranth (less than 4" tall)*. Up to three over-the-top applications (do not exceed 36 oz/A per application) spaced apart by 10-14 days may be made, but do not exceed 87 oz/A per growing season. Add AMS at 3 lb/A to the spray solution. Tank mix with STAPLE or DUAL MAGNUM for residual weed control. Do not apply LIBERTY in conjunction with grass herbicides (i.e., SELECT, FUSILADE, or POAST). Applications of postemergence grass herbicides and LIBERTY/INTERLINE should be separated by at least 5 days. Do not graze the treated crop or cut for hay. **Rainfast interval = 4 hours.**					
Resistance Management: *Do not rely solely on GLUFOSINATE for complete weed control in cotton. Tank mix a residual herbicide(s) at each GLUFOSINATE application. Soil residual herbicides at burndown and at planting will help ensure optimum weed management particularly if environmental conditions delay timely sprayer operations. Residual herbicides throughout the growing season are a key component of good weed resistance strategies.*					

Table 36. Postemergence Broadcast Herbicides for Weed Management in Cotton. (Continued)

Herbicide	Rate/Acre Broadcast		Mode of Action	Preharvest Interval	Restricted Entry Interval
	Formulation	Active Ingredient			
MSMA 6.6 (*MSMA*)	2.4 pt	2.0 lb	17	--	12 hours
MSMA 6 Plus	2.66 pt				
Comments: Apply MSMA over-the-top cotton from 3-leaf (3 inches) up to early first square stage (about 6 inch cotton), whichever comes first using ground equipment. Slight burning and a reddish coloration of the cotton leaves may occur following application, but plant will develop normally. Only one application is allowed per season (at 2 lb ai/A), except where a salvage operation is needed (i.e., Palmer amaranth escapes the first application). A second repeat salvage treatment should be timed 1 to 3 weeks after first application. Do not make more than two applications per season with a seasonal maximum of 4 lb ai per acre per season. Do not apply within 50 ft of permanent water bodies or aquatic habitat including, but not limited to lakes, reservoirs, rivers, streams, marshes, ponds, and estuaries. Apply only when conditions do not favor drift onto adjacent crops. Do not feed foliage to livestock or graze treated areas. Do not apply after first bloom.					
Poast 1.5E (*sethoxydim*)	1.0-1.5 pt	0.19-0.28 lb	1	75 days	12 hours
Poast Plus 1E	1.5-2.25 pt				
Comments: Apply POAST/POAST PLUS anytime during crop growth before annual grasses exceed 4-6" tall. For rhizome johnsongrass, apply 1.5 pt/A (2.25 pt/A POAST PLUS) up to 25" tall. A second 1.0 pt/A (1.5 pt/A POAST PLUS) treatment may be applied to control regrowth up to 12" tall. For bermudagrass, treat 6" runners with 1.5 pt/A (2.25 pt/A POAST PLUS), and then apply a second application of 1.0 pt/A (1.5 pt/A POAST PLUS) to 4" re-growth. Add 1 pt/A of DASH HC or SUNDANCE HC adjuvant or COC 2 pt/A. Include UAN at 4-8 pt/A or AMS at 2.5 lb/A for enhanced crabgrass activity. Consult label for tank mix partners. Controls volunteer corn in cotton. **Rainfast interval = 1 hour.**					
Prowl H_2O 3.8CS (*pendimethalin*)	1.0-2.0 pt	0.48-0.95 lb	3	60 days	24 hours
Prowl 3.3EC	1.2-2.4 pt	0.50-0.99 lb			
Comments: Apply PROWL broadcast postemergence over the top after cotton reaches the 4- to 5-leaf stage of growth, but not after the 8-leaf stage of growth. Over the top applications made before the 4-leaf stage or after the 8-leaf stage of development may result in crop injury and/or yield loss. If a timely irrigation follows or rain occurs after application, PROWL provides residual control of Palmer amaranth (*glyphosate- and ALS-resistant biotypes*), common lambsquarters, Florida pusley, and crabgrass. Postemergence applications of PROWL may cause temporary growth reduction and/or leaf discoloration or malformation of cotton following application. **Note:** *If your field has a history of poor Palmer amaranth control with yellow herbicides, consider an alternative postemergence residual herbicide, such as WARRANT or DUAL MAGNUM.*					

Table 36. Postemergence Broadcast Herbicides for Weed Management in Cotton. (Continued)

Herbicide	Rate/Acre Broadcast		Mode of Action	Preharvest Interval	Restricted Entry Interval
	Formulation	Active Ingredient			
Prowl H_2O 3.8CS (*pendimethalin*)	1.0-2.0 pt	0.48-0.95 lb	3	60 days	24 hours
Prowl 3.3EC	1.2-2.4 pt	0.50-0.99 lb			
+ *Glyphosate* acid equivalent (ae)	22-32 fl oz		9		
4.5 lb ae/gal		0.75-1.12 lb ae			

Comments: USE ONLY ON COTTON VARIETIES DESIGNATED AS ROUNDUP READY FLEX! Apply PROWL broadcast postemergence over the top after cotton reaches the 4- to 5-leaf stage of growth, but not after the 8-leaf stage of growth. Over the top applications made before the 4-leaf stage or after the 8-leaf stage of development may result in crop injury and/or yield loss. Controls Palmer amaranth (*glyphosate- and ALS-resistant biotypes*), common lambsquarters, Florida pusley, and crabgrass. Postemergence applications of PROWL may cause temporary growth reduction and/or leaf discoloration or malformation of cotton following application. **Note:** *If your field has a history of poor Palmer amaranth control with yellow herbicides, consider an alternative postemergence residual herbicide such as WARRANT or DUAL MAGNUM.*

Prowl H_2O 3.8CS (*pendimethalin*)	1.0-2.0 pt	0.48-0.95 lb	3	70 days	24 hours
Prowl 3.3EC	1.2-2.4 pt	0.50-0.99 lb			
+ Liberty 280SL 2.34S (glufosinate)	29-43 fl oz	0.53-0.79 lb	10		

Comments: USE ONLY ON COTTON VARIETIES DESIGNATED AS LIBERTY-LINK! Apply PROWL broadcast postemergence over the top after cotton reaches the 4- to 5-leaf stage of growth, but not after the 8-leaf stage of growth. Over the top applications made before the 4-leaf stage or after the 8-leaf stage of development may result in crop injury and/or yield loss. Controls Palmer amaranth (*glyphosate- and ALS-resistant biotypes*), common lambsquarters, Florida pusley, and crabgrass. Postemergence applications of PROWL may cause temporary growth reduction and/or leaf discoloration or malformation of cotton following application. **Note:** *If your field has a history of poor Palmer amaranth control with yellow herbicides, consider an alternative postemergence residual herbicide such as WARRANT or DUAL MAGNUM.*

Select 2EC (*clethodim*)	6.0-16.0 oz	0.094-0.25 lb	1	70 days	24 hours
Select MAX 0.97EC	9.0-32.0 oz	0.068-0.24 lb			

Table 36. Postemergence Broadcast Herbicides for Weed Management in Cotton. (Continued)

Herbicide	Rate/Acre Broadcast		Mode of Action	Preharvest Interval	Restricted Entry Interval
	Formulation	Active Ingredient			
Comments: Apply SELECT/SELECT MAX anytime during crop growth before annual grasses exceed 4-6" tall. For rhizome johnsongrass, apply 8 oz/A (12-14 oz/A SELECT MAX) up to 24" tall. A second 6 oz/A (6-18 oz/A SELECT MAX) treatment may be applied to control regrowth. For bermudagrass, treat 6" runners with 8 oz/A (16 oz/A SELECT MAX), and apply 8 oz/A (16 oz/A SELECT MAX) to 6" re-growth. Add COC at 1 qt/A plus AMS at 2.5-4.0 lb/A for enhanced johnsongrass and volunteer corn activity. **Rainfast interval = 1 hour.**					
Sequence 5.25L (*glyphosate* + *s-metolachlor*)	2.5 pt	0.75 lb ae + 0.94 lb	9 + 15	100 days	24 hours
Comments: USE ONLY ON COTTON VARIETIES DESIGNATED AS ROUNDUP READY FLEX! Apply 2.5 pt/A over-the-top from cotyledon stage up to 10-leaf stage (not to exceed 12-inch cotton). Do not apply after the 10-leaf stage of cotton development as severe injury, including yield loss, may occur. Controls annual grasses and broadleaves. In general, the first over-the-top broadcast application should be applied early to minimize weed competition (1 to 3" tall weeds). Do not add AMS or other adjuvants. This combination provides residual control of annual grasses, pigweeds, Florida pusley, dayflower, and suppression of yellow nutsedge. Do not exceed 3.5 pt/A per season. Do not tank mix with STAPLE. **Rainfast interval = 2 hours.**					
Staple LX 3.2SL (*pyrithiobac*)	1.3-3.8 fl oz	0.033-0.095 lb	2	60 days	4 hours
Comments: Apply STAPLE over-the-top or post-directed beginning at the first true leaf stage of cotton to control cocklebur, pigweed, and annual morningglory. *Fair to good performance on Palmer amaranth (less than 2" tall). For heavily infested field with glyphosate-resistant Palmer amaranth, apply STAPLE at 2.6 oz/A.* Add NIS at 1 qt/100 gal of spray solution. May cause temporary leaf yellowing, bronzing, or crinkling particularly under cool conditions. A total of 5.1 oz/A may be applied per season. Allow a minimum of 7 days between applications. STAPLE may be tank-mixed with most insecticides approved for use on cotton. Do not tank mix with any DUAL product. DUAL and STAPLE applications should be spaced apart by at least 5 days. Do not tank-mix with malathion-containing insecticides. To avoid injury, MALATHION insecticide application should be made at least 24 hours before or after a STAPLE application. **Rainfast interval = 4 hours**.					
Resistance Management: *Make only **one** application of a group 2 containing herbicide per growing season.*					
Warrant 3.0ME (*acetochlor*)	3 pt	1.125 lb	15	---	12 hours
Comments: Apply WARRANT over-the-top from emergence until cotton reaches first bloom. Provides residual control of small seeded broadleaves and grasses. Optimum application timing for first broadcast application is 2-3 leaf stage followed by a second directed application at 5-6 leaf stage (see POST DIRECTED section). Do not exceed 4.0 qt/A of WARRANT per season. Tank mix with GLYPHOSATE (use only on ROUNDUP READY FLEX varieties) or LIBERTY (use only on LIBERTY LINK varieties) for control of existing weeds. Do not apply WARRANT using a sprayable fluid fertilizer as the carrier because of severe crop injury may occur. Do not apply WARRANT to the following soils within 50ft of any well where depth to ground water is 30 feet or less: sands with less than 3% organic matter; loamy sands with less than 2% organic matter; or sandy loams with less than 1% organic matter.					

Table 37. Weed Response to Postemergence Directed Cotton Herbicides[1]

	Aim	Liberty[2]	MSMA	MSMA + Caparol	MSMA + Cobra	MSMA + Cotoran	MSMA + Direx	MSMA + Layby Pro	MSMA + Suprend	MSMA + Valor	Flexstar GT[3]
anoda, spurred	G	P	P	F	F	FG	F	F	F	G	E
barnyardgrass	P	FG	F	FG	F	F	F	FG	FG	FG	E
beggarweed, Florida	G	P	P	F	F	FG	F	F	F	G	E
bermudagrass	P	P	P	P	P	P	P	P	P	P	F
citronmelon	P	G	F	G	G	G	G	G	G	G	E
cocklebur, common	G	E	E	E	E	E	E	E	E	E	E
cowpea	G	G	FG	G	FG	G	G	G	G	G	E
crabgrass	P	FG	F	FG	F	F	F	FG	FG	FG	E
crotolaria, showy	G	E	G	G	G	G	G	G	G	G	E
croton, tropic	G	G	F	G	E	G	G	G	GE	E	E
crowfootgrass	P	FG	F	FG	F	F	F	FG	FG	FG	E
dayflower, Benghal	P	PF	GE	GE	GE	GE	GE	GE	GE	GE	PF
eclipta	G	G	G	G	G	G	E	E	G	E	E
goosegrass	P	F	F	FG	F	F	F	FG	FG	F	E
jimsonweed	G	E	F	G	GE	GE	G	G	G	G	E
johnsongrass, seedling	P	G	F	FG	F	F	F	FG	FG	F	E
johnsongrass, rhizome	P	F	P	P	P	P	P	P	P	P	G
lambsquarters, common	FG	E	P	G	F	G	G	G	G	G	E
morningglory spp.	GE	E	F	E	E	G	GE	GE	E	E	G
nutsedge, purple	P	P	F	F	F	F	F	F	E	FG	FG
nutsedge, yellow	P	P	FG	FG	FG	FG	G	G	E	G	G
panicum, fall	P	FG	F	FG	F	F	F	FG	FG	FG	E
panicum, Texas	P	P	P	F	P	P	P	F	F	PF	E

[1]Key to Response Ratings: E = excellent control, 90% or better; G = good control, 80 to 90%; F = fair control, 70 to 80%; P = poor control, less than 70%; --- = Insufficient Data.

[2]Use only on LibertyLink (LL) cotton varieties

[3]Use only on glyphosate-tolerant (Gly-Tol or Roundup Ready [RR] Flex) cotton varieties.

Table 37. Weed Response to Postemergence Directed Cotton Herbicides (cont)[1]

	Aim	Liberty[2]	MSMA	MSMA + Caparol	MSMA + Cobra	MSMA + Cotoran	MSMA + Direx	MSMA + Layby Pro	MSMA + Suprend	MSMA + Valor	Flexstar GT[3]
pigweed spp.	G	G	P	FG	G	FG	GE	GE	GE	G	E
glyphosate-resistant	G	G	P	FG	G	FG	GE	GE	GE	G	G
ALS-resistant	G	G	P	FG	G	FG	GE	GE	GE	G	E
poinsettia, wild	G	PF	PF	PF	G	F	PF	G	P	G	G
purslane, common	P	F	PF	FG	G	FG	G	G	G	G	FG
pusley, Florida	G	F	P	F	F	F	F	F	F	FG	G
ragweed, common	FG	E	F	E	E	GE	E	E	E	GE	E
redweed (chocolateweed)	G	GE	P	G	GE	FG	GE	GE	G	GE	G
ryegrass, annual	G	FG	P	P	FG	P	GE	GE	P	F	E
sandbur	P	FG	F	FG	F	F	F	FG	FG	F	E
senna, coffee	---	GE	F	G	F	G	G	G	---	G	E
sesbania, hemp	P	---	P	PF	F	PF	PF	---	---	G	GE
sicklepod	P	E	F	GE	PF	G	GE	GE	E	GE	E
sida, prickly	FG	GE	P	GE	GE	FG	GE	GE	GE	GE	G
signalgrass, broadleaf	P	FG	F	FG	F	F	F	FG	FG	F	E
smartweed, Pennsylvania	---	GE	P	F	F	G	F	F	---	G	G
spurge	G	FG	P	G	G	P	G	G	G	G	E
starbur, bristly	---	G	PF	G	G	G	G	G	GE	G	GE
velvetleaf	F	G	P	G	G	F	G	G	FG	G	E
vol. corn	P	G	P	FG	FG	FG	G	G	FG	G	E
RR hybrids	P	G	P	FG	FG	FG	G	G	FG	G	F
RR+LL hybrids	P	P	P	FG	FG	FG	G	G	FG	G	F
vol. peanut	P	E	F	F	F	F	G	G	FG	G	F

[1]***Key to Response Ratings***: E = excellent control, 90% or better; G = good control, 80 to 90%; F = fair control, 70 to 80%; P = poor control, less than 70%; --- = Insufficient Data.

[2]Use only on LibertyLink (LL) cotton varieties

[3]Use only on glyphosate-tolerant (Gly-Tol or Roundup Ready [RR] Flex) cotton varieties.

Table 37. Weed Response to Postemergence Directed Cotton Herbicides (cont)[1]

	Glyphosate[2]	Glyphosate + Aim/ET[2]	Glyphosate + Caparol[2]	Glyphosate + Direx[2]	Glyphosate + Envoke[2]	Glyphosate + Prowl[2]	Glyphosate + Staple[2]	Glypohsate + Valor[2]	Prefix	Reflex	Sequence[2]	Xtendimax[3]	HOOD Gramoxone + Direx
anoda, spurred	E	E	E	E	E	E	E	E	P	P	E	G	G
barnyardgrass	E	E	E	E	E	E	E	E	P	P	E	P	G
beggarweed, Florida	E	E	E	E	E	E	E	E	G	G	E	G	E
bermudagrass	F	F	F	F	F	F	F	F	P	P	F	P	P
citronmelon	GE	GE	GE	GE	E	GE	E	E	G	G	E	G	G
cocklebur, common	E	E	E	E	E	E	E	E	G	G	E	E	G
cowpea	GE	GE	GE	GE	GE	GE	GE	E	F	F	GE	E	G
crabgrass	E	E	GE	GE	E	E	E	E	P	P	E	P	G
crotolaria, showy	G	G	G	G	G	G	G	G	---	---	G	G	G
croton, tropic	E	E	E	E	E	E	E	E	---	---	E	GE	F
crowfootgrass	E	E	GE	GE	E	E	E	E	P	P	E	P	G
dayflower, Benghal	PF	GE	FG	FG	PF	PF	FG	GE	---	---	PF	P	G
eclipta	E	E	E	E	E	E	E	E	G	G	E	G	F
goosegrass	E	E	GE	GE	E	E	E	E	P	P	E	P	G
jimsonweed	E	E	E	E	E	E	E	E	G	G	E	E	G
johnsongrass, seedling	E	E	GE	GE	E	E	E	E	P	P	E	P	G
johnsongrass, rhizome	GE	GE	G	G	E	GE	GE	GE	P	P	GE	P	P
lambsquarters, common	G	GE	GE	GE	GE	G	GE	GE	FG	FG	G	E	F
morningglory, annual	FG	E	GE	GE	GE	FG	GE	E	G	G	FG	E	FG
nutsedge, purple	FG	FG	FG	FG	GE	FG	FG	GE	FG	P	FG	P	PF
nutsedge, yellow	G	F	F	F	E	G	FG	E	F	P	F	P	PF
panicum, fall	E	E	GE	GE	E	E	E	E	P	P	E	P	G
panicum, Texas	E	E	GE	GE	E	E	E	E	P	P	E	P	G

[1]***Key to Response Ratings***: E = excellent control, 90% or better; G = good control, 80 to 90%; F = fair control, 70 to 80%; P = poor control, less than 70%; --- = Insufficient Data.

[2]Use only on glyphosate-tolerant (Gly-Tol or Roundup Ready [RR] Flex) cotton varieties

[3]Use only on Bollgard II XtendFlex cotton varieties

Table 37. Weed Response to Postemergence Directed Cotton Herbicides (cont)[1]

	Glyphosate[2]	Glyphosate + Aim/ET[2]	Glyphosate + Caparol[2]	Glyphosate + Direx[2]	Glyphosate + Envoke[2]	Glyphosate + Prowl[2]	Glyphosate + Staple[2]	Glypohsate + Valor[2]	Prefix	Reflex	Sequence[2]	Xtendimax[3]	HOOD Gramoxone + Direx
pigweed spp.	E	E	E	E	E	E	E	E	E	E	E	E	GE
glyphosate-resistant	P	F	F	G	G	P	G	G	E	E	P	E	GE
ALS-resistant	E	E	E	E	E	E	E	E	E	E	E	E	GE
poinsettia, wild	G	GE	GE	G	E	G	G	GE	G	G	GE	E	G
purslane, common	F	G	FG	GE	FG	F	FG	GE	P	P	F	---	G
pusley, Florida	PF	G	G	G	PF	PF	PF	GE	GE	GE	PF	P	PF
ragweed, common	E	E	E	E	E	E	E	E	GE	GE	GE	E	F
redweed (chocolateweed)	GE	GE	GE	GE	GE	GE	GE	GE	G	G	GE	E	FG
ryegrass, annual	E	E	E	E	E	E	E	E	F	F	E	P	F
sandbur, field	E	E	GE	GE	E	E	E	E	P	P	E	P	G
senna, coffee	E	E	E	E	E	E	E	E	FG	FG	GE	E	F
sesbania, hemp	F	GE	GE	FG	FG	F	GE	FG	GE	GE	G	E	F
sicklepod	E	E	E	E	E	E	E	E	FG	FG	E	E	GE
sida, prickly	FG	FG	G	G	FG	FG	G	GE	FG	FG	FG	E	PF
signalgrass, broadleaf	E	E	GE	GE	E	E	E	E	P	P	E	P	GE
smartweed, Pennsylvania	G	GE	G	G	E	G	E	G	---	---	G	E	G
spurge	G	GE	G	GE	G	G	G	G	G	G	G	E	G
starbur, bristly	GE	GE	GE	GE	GE	GE	GE	GE	---	---	GE	E	E
velvetleaf	E	E	E	E	E	E	E	E	PF	PF	E	E	---
vol. corn	E	E	E	E	E	E	E	E	FG	F	E	P	F
RR hybrids	FG	FG	FG	FG	GE	FG	FG	GE	FG	F	FG	P	F
RR+LL hybrids	FG	FG	FG	FG	GE	FG	FG	GE	FG	F	FG	P	F
vol. peanut	G	GE	G	G	FG	FG	F	FG	P	P	G	E	P

[1]Key to Response Ratings: E = excellent control, 90% or better; G = good control, 80 to 90%; F = fair control, 70 to 80%; P = poor control, less than 70%; --- = Insufficient Data.

[2]Use only on glyphosate-tolerant (Gly-Tol or Roundup Ready [RR] Flex) cotton varieties

[3]Use only on Bollgard II XtendFlex cotton varieties

Table 38. Postemergence Directed Herbicides for Weed Management in Cotton

Herbicide	Rate/Acre Broadcast		Mode of Action	Preharvest Interval	Restricted Entry Interval
	Formulation	Active Ingredient			
Aim 2EC (*carfentrazone*)	1.0-1.6 fl oz	0.013-0.025 lb	14	7 days	12 hours
Aim 1.9EW					
Comments: Apply AIM at 1.0-1.6 oz/A when cotton is a minimum of 6" tall (if less than 5-6 nodes, use a hooded sprayer) and where a sufficient height differential exists between crop and weed (3-4"). Care must be taken to ensure that no spray contacts green foliage or unbarked stem; otherwise, severe crop injury may occur. For best performance, apply to actively growing weeds less than 4" tall. Coverage is essential for good control. Add COC 1 gal or NIS at 2 pt/100 gallons of spray solution. For additional control of broadleaf and grass weeds, AIM may be tank mixed with other herbicides labeled for cotton post-directed and layby applications.					
Caparol 4L (*prometryn*)	1.3-2.4 pt	0.65-1.2 lb	5	---	12 hours
Comments: Apply CAPAROL at 1.3 pt/A when cotton is 6 inches tall and up to 2.4 pt/A when cotton is at least 12" tall before weeds are 2 inches in height. Add NIS at 2 qt/100 gal of spray solution. Tank mix partners may include GLYPHOSATE, MSMA, or GRAMOXONE (hooded applicatations only).					
Cobra 2EC (*lactofen*)	6.0-12.5 fl oz	0.094-0.195 lb	14	70 days	12 hours
Comments: Apply COBRA when cotton is 6" tall and where sufficient height differential exists between crop and weed (3-4"). Direct spray to the lower 2 inches of the cotton stem to avoid injury. Apply when weeds are small and actively growing. Adjust nozzles to ensure full coverage of target weeds. Do not apply more than 25 fl oz/A of COBRA per year. Do not apply more than 2 applications of COBRA per season. Do not apply a sequential application of COBRA within 14 days of first application. Tank mix partners may include MSMA or DIURON. **Rainfast interval =30 minutes.**					
Cotoran 4L (*fluometuron*)	2.0-4.0 pt	1.0-2.0 lb	7	60 days	24 hours
Comments: Apply COTORAN at 2.0-4.0 pt/A (depending on soil texture) when cotton is at least 3" tall. Add surfactant at 2 qt/100 gal of spray solution. Tank mix partners may include PYRIMAX, PARALLEL PCS, and MSMA.					
Diuron 4F (*diuron*)	1.0-1.5 pt	0.4-1.2 lb	7	---	12 hours
Comments: Apply DIREX at 1.0-1.5 pt/A when cotton is at least 6 inches tall (1.0 pt/A on 6-8" tall cotton and 1.5 pt/A on cotton that is 8-12" tall). For enhanced control of emerged weeds, tank mix with MSMA, GLYPHOSATE, or GRAMOXONE (hooded only).					

Table 38. Postemergence Directed Herbicides for Weed Management in Cotton (Continued)

Herbicide	Rate/Acre Broadcast		Mode of Action	Preharvest Interval	Restricted Entry Interval
	Formulation	Active Ingredient			
Dual Mag. 7.62 EC (*s-metolachlor*)	1.0-1.33 qt	0.95-1.27 lb	15	80 days	24 hours
Comments: Apply DUAL at 1.0-1.33 pt/A when cotton is at least 3 inches tall. For enhanced control of emerged weeds, tank mix with MSMA, GLYPHOSATE, CAPAROL or COTORAN.					
ET 0.208EC (*pyraflufen ethyl*)	0.5-1.0 fl oz	0.0008-0.0016 lb	14	7 days	12 hours
ET X 0.338EC	0.3-0.6 fl oz				
Comments: Apply ET at 0.5-1.0 fl oz/A or ET X at 0.3-0.6 fl oz/A when cotton is at least 18" tall and has a minimum of 3” of stem bark. Apply when weeds are less than 4” tall. Avoid contact with desirable foliage. Allow a minimum of 30 days between applications. **Rainfast interval = N/A**					
Envoke (*trifloxysulfuron*)	0.1-0.2 oz	0.0047-0.0094 lb	2	60 days	12 hours
Comments: Apply ENVOKE at 0.1-0.2 oz/A when cotton at least 6" tall through layby. For control of emerged weeds (use higher rate for larger weeds; max 4” tall). Add NIS at 2 qt or COC at 1 gal/100 gal of spray solution. **Rainfast interval = 3 hours.** **Resistance Management:** *Make only **one** application of a group 2 containing herbicide per growing season.*					
Fierce 76WDG (*flumioxazin* + *pyroxasulfone*)	3.0 oz	0.063 lb + 0.080 lb	14 + 15	60 days	12 hours
Comments: Apply FIERCE at 3.0 oz/A when cotton is at least 6” tall with a directed shielded sprayer. For layby timings, FIERCE applied when cotton is at least 18” tall and should be directed at the lower 2 inches of the cotton stem to avoid injury. FIERCE should be tank mixed with MSMA, DIURON, or GLYPHOSATE to control emerged weeds. Add NIS at 1 qt per 100 gal of spray solution. Do not apply more than 3 oz/A of FIERCE during a single application. Do not apply more 6 oz/A during a single growing season. Do not make a sequential application of FIERCE within 30 days of the first application of FIERCE. **Rainfast interval = 1 hour.**					

Table 38. Postemergence Directed Herbicides for Weed Management in Cotton (Continued)

Herbicide	Rate/Acre Broadcast		Mode of Action	Preharvest Interval	Restricted Entry Interval
	Formulation	Active Ingredient			
Flexstar GT 3.5SL (*fomesafen* + *glyphosate*)	3.5 pt	0.25 lb + 0.99 lb ae	14 + 9	70 days	24 hours
Comments: USE ONLY ON COTTON VARIETIES DESIGNATED AS ROUNDUP READY FLEX! For directed applications, apply FLEXSTAR GT to cotton at least 6" tall. Apply FLEXSTAR GT to cotton at least 18" tall with 4" of bark at the base of the plant at layby. Care must be taken so that no spray contacts green foliage or unbarked stem; otherwise, severe crop injury may occur. Apply FLEXSTAR GT when weeds are small (2-4 cotyledon stage for broadleaf weeds) and if activated by rainfall will provide residual weed control. Do not apply more than 3.5 pt/A of FLEXSTAR GT per postemergence directed application per year. Tank mix partners may include any herbicide labeled for postemergence directed applications in cotton. **Rainfast interval = 1 hour.**					
Resistance Management: *Make only **one** application of a group 14 containing herbicide per growing season.*					
Glyphosate acid equivalent (ae) 4.5 lb ae/gal	22-32 fl oz	0.75-1.12 lb ae	9	7 days	4 hours
Comments: USE ONLY ON COTTON VARIETIES DESIGNATED AS ROUNDUP READY FLEX! Apply 0.63 to 1.12 lb ae/A from cracking until 7 days before harvest. Controls annual grasses and broadleaves. Direct spray allows better contact with weeds under the cotton canopy. Best results are obtained when weeds are less than 3" tall. Consult label for maximum application rates allowed during the season. Tank mixes with GLYPHOSATE labeled for post-directed applications to ROUNDUP READY FLEX cotton varieties include AIM, CAPAROL, DIREX, DUAL MAGNUM, DUAL II MAGNUM, ENVOKE, PARRLAY, STAPLE, VALOR, WARRANT, and PENDIMETHALIN. See tank mix partner labels for more information. **Rainfast interval = heavy rainfall soon after application may wash product off of the foliage and a repeat application may be needed to ensure adequate weed control (suggest 1 hour).**					
Resistance Management: *Glyphosate-resistant (Group 9) Palmer amaranth is spreading rapidly throughout South Carolina. Continued reliance on glyphosate-only programs will enhance selection and spread of resistant biotypes. Tank mixing glyphosate with other chemistries must be utilized.*					

Table 38. Postemergence Directed Herbicides for Weed Management in Cotton (Continued)

Herbicide	Rate/Acre Broadcast		Mode of Action	Preharvest Interval	Restricted Entry Interval
	Formulation	Active Ingredient			
Goal 2XL (*oxyflourfen*)	1.0-2.0 pt	0.25-0.5 lb	14	90 days	24 hours
GoalTender	0.5-1.0 pt				
Comments: Apply GOAL/GOALTENDER when cotton is 6 to 8 inches tall. Apply when weeds are small and actively growing preferably when there are not more than 4 true leaves present. Adjust nozzles to ensure full coverage of target weeds. Do not use hollow cone nozzles. Use a minimum of 20 GPA spray volume. Do not apply more than 0.5 lb ai/A of oxyflourfen per season. GOAL/GOALTENDER may be tank mixed with other herbicides registered for postemergence use in cotton.					
Resistance Management: *Make only **one** application of a group 14 containing herbicide per growing season.*					
Layby Pro 4L (*liuron* + *diuron*)	1.0-2.0 pt	0.25-0.5 lb + 0.25-0.5 lb	7 + 7	76 days	24 hours
Comments: Apply LAYBY PRO at 1.0-1.5 pt/A when cotton at least 8" tall and 1.6-2.0 pt/A when cotton greater than 15" tall. For control of emerged weeds (use higher rate for larger weeds; max 4" tall). Add NIS at 2 qt or COC at 1 gal/100 gal of spray solution. **Rainfast interval = 2 hours.**					
Liberty 280 2.34SL (*glufosinate*)	29-43 fl oz	0.53-0.79 lb	10	70 days	12 hours
Comments: USE ONLY ON COTTON VARIETIES DESIGNATED AS LIBERTY-LINK! Apply LIBERTY at 29 oz/A as a directed application when cotton canopy prevents spray from reaching weeds below. Do not exceed 87 oz/A per season (up to three 29 oz/A applications). If weather conditions prevent a timely 1st application, then LIBERTY may be applied up to 43 oz/A to control larger weeds. If more than 29 oz/A are used in any single application, seasonal total may not exceed 72 oz/A including all application timings. Controls annual grasses and broadleaves. Direct spray allows better contact with weeds under the cotton canopy. Best results are obtained when weeds are less than 3" tall. Direct spray to the lower third of the cotton plant. Add AMS at 3 lb/A to the spray solution. For residual control of weeds, tank mix DUAL MAGNUM, WARRANT, or STAPLE. **Rainfast interval = 4 hours.**					

Table 38. Postemergence Directed Herbicides for Weed Management in Cotton (Continued)

Herbicide	Rate/Acre Broadcast		Mode of Action	Preharvest Interval	Restricted Entry Interval
	Formulation	Active Ingredient			
MSMA 6L	2.67 pt	2.0 lb	17	---	12 hours
Comments: Apply MSMA when cotton is 3" tall up to first bloom. Do not apply after first bloom. A slight burning or reddish discoloration of the foliage may occur after application; however, cotton plants will develop normally. Add surfactant at 2 qt/100 gal to the spray solution. Do not apply more than 4 lb ai/A of MSMA. **Rainfast interval = 2 hours.**					
Prefix 5.29EC	2.0-2.33 pt			80 days	24 hours
(*s-metolachlor*		1.09-1.26 lb	15		
+		+			
fomesafen)		0.24-0.28 lb	14		
Comments: For directed applications, apply PREFIX to cotton at least 6" tall. Apply PREFIX to cotton at least 18" tall with 4" of bark at the base of the plant at layby. Care must be taken so that no spray contacts green foliage or unbarked stem; otherwise, severe crop injury may occur. PREFIX will control small emerged weeds (2-4 cotyledons for broadleaf weeds) and if activated by rainfall within 7-10 days will provide residual weed control. Add NIS at 1-2 qt or COC at 1 gal/100 gallons of spray solution. Do not apply more than 2.33 pt/A of PREFIX per season. Do not add liquid nitrogen to PREFIX tank mixes in cotton. Tank mix partners may include CAPAROL, DSMA, DIREX, ENVOKE, KARMEX, LAYBY PRO, MSMA, GLYPHOSATE (glyphosate-tolerant cotton varieties only), and SUPREND. **Rainfast interval = N/A.**					
Resistance Management: *Make only **one** application of a group 14 containing herbicide per growing season.*					
Prowl H20 3.8CS	1.0-2.0 pt			60 days	24 hours
(*pendimethalin*)		0.48-0.95 lb	3		
Prowl 3.3EC	1.2-2.4 pt				
Comments: Apply PROWL directly to the soil between rows as a directed spray following the last cultivation. Layby applications can be applied in cotton previously treated with PROWL. However, the total amount of PROWL applied per acre per season cannot exceed the highest label rate of PROWL for the given soil type. Controls Palmer amaranth (*glyphosate- and ALS-resistant biotypes*), common lambsquarters, Florida pusley, and crabgrass. **Note:** *If your field has a history of poor Palmer amaranth control with yellow herbicides, consider alternative soil residual partner for GLYPHOSATE (i.e., DUAL or WARRANT).* ***Rainfast interval = N/A.***					

Table 38. Postemergence Directed Herbicides for Weed Management in Cotton (Continued)

Herbicide	Rate/Acre Broadcast		Mode of Action	Preharvest Interval	Restricted Entry Interval
	Formulation	Active Ingredient			
Sequence 5.25SL	2.5 pt			50 days	24 hours
(*glyphosate* + *s-metolachlor*)		0.75 lb ae + 0.94 lb	9 + 15		

Comments: USE ONLY ON COTTON VARIETIES DESIGNATED AS ROUNDUP READY FLEX! Apply SEQUENCE at 2.5 pt/A up to 12" tall cotton (10 leaf stage). Do not apply later in cotton development as severe injury, including yield loss, may occur. Controls annual grasses and broadleaves. Best results are obtained when weeds are less than 3" tall. Do not exceed 3.5 pt/A of Sequence per season. Can be tank mixed with CENTRIC or KARATE insecticides. **Rainfast interval = heavy rainfall shortly after application require retreatment.**

Suprend 80WDG (*prometryn* + *trifloxysulfuron*)	1.0-1.5 lb	0.79-1.18 lb + 0.007-0.0105 lb	7 + 2	60 days	12 hours

Comments: Apply SUPREND at 1.0-1.5 lb/A when cotton is at least 6" tall. For control of emerged weeds (use higher rate for larger weeds; less than 6" tall). Add surfactant at 2 qt/100 gal to the spray solution. Do not tank mix SUPREND with MALATHION, PROFENFOS, DENIM, ACEPHATE, BIDRIN, CAPTURE, KARATE or unacceptable crop injury may occur. Do not exceed 0.0188 lb ai/A of trifloxysulfuron per year. **Rainfast interval = 3 hours.**

Resistance Management: *Make only **one** application of a group 2 containing herbicide per growing season.*

Valor SX 51WDG (*flumioxazin*)	1.0-2.0 oz	0.032-0.064 lb	14	21 days	12 hours

Comments: Apply VALOR SX at 2 oz/A when cotton is at least 18" tall as a direct spray to contact only lower 2" of bark on stem (no spray contacts green foliage or unbarked stem). Do not apply MSMA after first bloom. Add NIS at 1 qt/100 gal of spray solution. Do not use COC, MSO, organo-silicone adjuvants, or any adjuvant containing any of these. **Rainfast interval = 2 hours.**

Resistance Management: *Make only **one** application of a group 14 containing herbicide per growing season.*

Warrant 3.0ME (*acetochlor*)	1.5-2.0 qt	1.125 lb	15	---	12 hours

Table 38. Postemergence Directed Herbicides for Weed Management in Cotton (Continued)

Comments: Apply WARRANT postemergence directed from 5-6 leaf stage until cotton reaches first bloom. Provides residual control of small seeded broadleaves and grasses. Do not exceed 4.0 qt/A of WARRANT per season. Tank mix with GLYPHOSATE (use only on ROUNDUP READY FLEX varieties) or LIBERTY (use only on LIBERTY LINK varieties) for control of existing weeds. Do not apply WARRANT using a sprayable fluid fertilizer as the carrier because of severe crop injury may occur. Do not apply WARRANT to the following soils within 50ft of any well where depth to ground water is 30 feet or less: sands with less than 3% organic matter; loamy sands with less than 2% organic matter; or sandy loams with less than 1% organic matter.

Table 39. Hooded Sprayer Herbicides for Weed Management in Cotton

Herbicide	Rate/Acre Broadcast		Mode of Action	Preharvest Interval	Restricted Entry Interval
	Formulation	Active Ingredient			
ET 0.208EC (*pyraflufen ethyl*)	0.5-1.0 fl oz	0.0008-0.0033 lb	14	7 days	12 hours
ET X 0.335EC	0.3-1.25 fl oz				
Comments: Apply ET at 0.5-1.0 fl oz/A or ETX at 0.3-1.25 fl oz/A when cotton is 18 inches or more and has a least 3 inches of stem bark using hooded ground equipment only. Apply when weeds are less than 4" tall. Avoid contact with desirable foliage. Allow a minimum of 30 days between applications. Do not exceed 0.0033 lb ai PYRAFLUFEN ETHYL per season.					
Fierce 76WDG (*flumioxazin* + *pyroxasulfone*)	3.0 oz	0.063 lb + 0.080 lb	14 + 15	60 days	12 hours
Comments: Apply FIERCE at 3.0 oz/A when cotton is at least 6" tall with a hooded sprayer. FIERCE should be tank mixed with MSMA, DIURON, or GLYPHOSATE to control emerged weeds. Add NIS at 1 qt per 100 gal of spray solution. Do not apply more than 3 oz/A of FIERCE during a single application. Do not apply more 6 oz/A during a single growing season. Do not make a sequential application of FIERCE within 30 days of the first application of FIERCE. **Rainfast interval = 1 hour**					
Flexstar GT 3.5SL (*fomesafen* + *glyphosate*)	3.5 pt	0.25 lb + 0.99 lb ae	14 + 9	70 days	24 hours
Comments: For hooded or shielded sprayer applications, apply FLEXSTAR GT to cotton at least 6" tall. Care must be taken so that no spray contacts green foliage or unbarked stem; otherwise, severe crop injury may occur. Apply FLEXSTAR GT when weeds are small (2-4 cotyledon stage for broadleaf weeds) and if activated by rainfall will provide residual weed control. Adjust nozzles to ensure full coverage of target weeds. Do not apply more than 3.5 pt/A of FLEXSTAR GT per postemergence directed application per year. Tank mix partners may include any herbicide labeled for postemergence directed applications in cotton. **Rainfast interval = 1 hour.**					
Resistance Management: *Make only **<u>one</u>** application of a group 14 containing herbicide per growing season.*					

Table 39. Hooded Sprayer Herbicides for Weed Management in Cotton (Continued)

Herbicide	Rate/Acre Broadcast		Mode of Action	Preharvest Interval	Restricted Entry Interval
	Formulation	Active Ingredient			
Glyphosate acid equivalent (ae) 4.5 lb ae/gal	22 fl oz	0.75 lb ae	9	7 days	12 hours
Comments: Hoods should be kept as close to the ground as possible in conventional and non-Roundup Ready cotton varieties. Do not allow the spray to contact stems or foliage of non-Roundup Ready cotton. Apply in 5 -10 GPA at a maximum of 25 PSI. Do not exceed 5 MPH. Cotton should be at least 8" tall. See GLYPHOSATE product label for adjuvant recommendation. Tank mixes with CAPAROL, DIREX, ENVOKE, LAYBY PRO, STAPLE, PROWL, and VALOR will enhance residual weed control. **Rainfast interval = heavy rainfall soon after application may wash product off of the foliage and a repeat application may be needed to ensure adequate weed control (suggest 1 hour).** **Resistance Management:** *Glyphosate-resistant Palmer amaranth is spreading rapidly throughout South Carolina. Continued reliance on glyphosate-only programs will enhance selection and spread of resistant biotypes. Tank mixing glyphosate with other chemistries must be used.*					
Gramoxone SL 2S (*paraquat*)	1.2-2.0 pt	0.3-0.5 lb	22	15 days	24 hours
Comments: Hoods should be kept as close to the ground as possible. Do not allow the spray to contact stems or foliage of cotton. Apply in a minimum of 10 GPA at a maximum of 25 PSI. Do not exceed 5 MPH. Cotton should be at least 8" tall. Add NIS at 2 pt or COC at 1 gal/100 gal of spray solution. Allow 14 days between multiple applications. CAPAROL or DIREX may be tank mixed with GRAMOXONE and will enhance residual weed control. **Rainfast interval = 30 minutes.**					
Liberty 280 2.34SL (*glufosinate*)	29-43 fl oz	0.53-0.79 lb	10	70 days	12 hours
Comments: Hoods should be kept as close to the ground as possible in conventional and non-Liberty-Link cotton varieties. Do not allow the spray to contact stems or foliage of cotton. Apply in a minimum of 15 GPA at a maximum of 25 PSI. Do not exceed 5 MPH. Apply LIBERTY at 29-43 oz/A as a hooded application when cotton canopy prevents spray from reaching weeds below. Cotton should be at least 8" tall. Do not exceed 87 oz/A per season from all application sources. Add AMS at 3 lb/A to the spray solution. For non-Liberty-Link varieties, Tank mix partners for hooded applications of LIBERTY include AIM, CAPAROL, COTORAN, DIREX, DUAL MAGNUM, GLYPHOSATE, KARMEX, PENDIMAX, PROWL, SELECT MAX, and STAPLE. **Rainfast interval = 4 hours.**					

Table 39. Hooded Sprayer Herbicides for Weed Management in Cotton (Continued)

Herbicide	Rate/Acre Broadcast		Mode of Action	Preharvest Interval	Restricted Entry Interval
	Formulation	Active Ingredient			
Prefix 5.29EC (*s-metolachlor* + *fomesafen*)	2.0-2.33 pt	1.09-1.26 lb + 0.24-0.28 lb	15 + 14	80 days	24 hours

Comments: For hooded or shielded sprayer applications, apply PREFIX to cotton at least 6" tall. Care must be taken so that no spray contacts green foliage or unbarked stem; otherwise, severe crop injury may occur. PREFIX will control small emerged weeds (2-4 cotyledons for broadleaf weeds) and if activated by rainfall within 7-10 days will provide residual weed control. Add NIS at 1-2 qt or COC at 1 gal/100 gallons of spray solution. Do not apply more than 2.33 pt/A of PREFIX per season. Tank mix partners include CAPAROL, DSMA, DIREX, ENVOKE, KARMEX, LAYBY PRO, MSMA, GLYPHOSATE (glyphosate-tolerant cotton varieties only), and SUPREND. **Rainfast period = N/A (suggest 1 hour)**

Resistance Management: *Make only **one** application of a group 14 containing herbicide per growing season.*

Table 40. Harvest Aids for Cotton

Herbicide	Rate/Acre Broadcast		Mode of Action	Preharvest Interval	Restricted Entry Interval
	Formulation	Active Ingredient			
Aim 2EC (*carfentrazone*) Aim 1.9EW	1.6 fl oz	0.025 lb	14	7 days	12 hours
Comments: Apply AIM up to 1.6 oz/A after 60 to 70% of the bolls are open. Use a minimum of 10 gallons per acre for ground applications and 5 gallons per acre for aerial applications. Coverage is essential for good defoliation. A repeat application of up to 1.6 oz/A is allowed if foliage is remaining or regrowth is occurring. Dense canopy, large plant sizes, and environmental conditions non-conducive to complete plant coverage may reduce initial application performance and increase need for a second application. AIM may be tank mixed with PREP, FINISH, DEF, DROPP, FOLEX, HARVADE, GINSTAR, COTTONQUIK, or other registered cotton harvest aid products. Do not apply more than 3.2 oz/A per season as a harvest aid. Add a NIS a 0.25% v/v (warmer periods of defoliation) or COC at 1 gal per 100 gal (cooler periods of defoliation). **Rainfast interval = 6-8 hours.**					
ET 0.208 EC (*pyraflufen ethyl*)	1.5-2.75 fl oz	0.0024-0.0045 lb	14	7 days	12 hours
Comments: Apply ET up to 2.75 oz/A when bolls are 60% open. Use a minimum of 20 gallons per acre for ground applications or 5 gallons per acre for aerial applications. Coverage is essential for good defoliation. Adequate defoliation is generally achieved within 7 to 14 days after application. A repeat application of up to 2.75 oz/A is allowed if foliage is remaining or regrowth is occurring. Do not exceed 2 applications or 5.5 oz/A of ET for defoliation of cotton. Applications must be made a minimum of 7 days apart. ET may be tank mixed with COTTONQUIK, CYCLONE, DEF, DROPP, FINISH, FOLEX, GINSTAR, PREP, GRAMOXONE, and/or GLYPHOSATE. **Rainfast interval = 1 hour.**					
Glyphosate acid equivalent (ae) 4.5 lb ae/gal	22-44 fl oz	0.75-1.5 lb ae	9	7 days	12 hours
Comments: Apply GLYPHOSATE after 60% of the bolls are open (non-Roundup Ready cotton). Can be tank mixed with some defoliants; see labels for details. Apply to Roundup Ready cotton varieties after 20% cracked boll stage or to Roundup Ready FLEX cotton up to 7 days before harvest. Do not apply GLYHOSTE to cotton grown for seed as a reduction in vigor or germination may occur. **Rainfast interval = heavy rainfall soon after application may wash product off of the foliage and a repeat application may be needed to ensure adequate weed control (suggest 1 hour).**					
Gramoxone SL 2S (*paraquat*) paraquat 3S	8.0 fl oz 5.4 fl oz	0.13 lb	22	7 days	12 hours

Table 40. Harvest Aids for Cotton (Continued)

Comments: Defoliate cotton as normal. After at least 75-80% of bolls are open, the remaining bolls expected to be harvested are mature, and most of the cotton leaves have dropped, apply GRAMOXONE in a minimum of 20 GPA and add 1 pt NIS per 100 gal of spray solution. **Rainfast interval = 30 minutes.**

Table 41. Cotton Replant Guidelines Following Herbicide Application

	Corn	Cotton	Grain Sorghum	Peanuts	Soybeans	Sunflower	Tobacco	Wheat
M = months, D = days, Spring = The spring following application, --- = no information								
Aim	0 D	0 D	0 D	0 D	0 D	0 D	12 M	0 D
Assure II	120 D	0 D	120 D	120 D	0 D	0 D	120 D	120 D
Brake F16	10 M	0 D	10 M	10 M	8 M	18 M	18 M	8 M
Caparol	Spring	Spring	Spring	Spring	Spring	Spring	Spring	Spring
Cobra	None	None	None	None	None	None	None	None
Cotoran 4L	8 M	0 D	9 M	8 M	9 M	12 M	12 M	3 M
Dawn	10 M	0 D	18 M	10 M	0 D	18 M	18 M	4 M
Direx/Diuron								
USE PATTERN 1[1]	4 M	4 M	4 M	4 M	4 M	4 M	4 M	4 M
USE PATTERN 2[2]	Spring	Spring	Spring	12 M	12 M	12 M	12 M	12 M
LAYBY	Spring	Spring	Spring	12 M	12 M	12 M	12 M	12 M
Dual Magnum	12 M	12 M	12 M	12 M	12 M	12 M	Spring	4.5 M
Envoke	7 M	7 M	7 M	7 M	7 M	18 M	7 M	3 M
ET/ETX	0 D	0 D	30 D	30 D	0 D	30 D	30 D	0 D
Fierce								
3.0 oz/A	7 D[3]/1 M[4]	45 D[4]/30 D[3]	18 M	4 M	0 D	4 M	18 M	30 D
3.75 oz/A	30 D	2 M	18 M	4 M	0 D	4 M	18 M	2 M
FirstShot	14 D	14 D	14 D	45 D	7 D	45 D	45 D	0 D
Flexstar	10 M	0 D	10 M	10 M	0 D	18 M	18 M	4 M
Flexstar GT/GT 3.5	10 M	0 D	10 M	10 M	0 D	18 M	18 M	4 M
Fusion	60 D	0 D	60 D	0 D	0 D	0 D	0 D	60 D
Fusilade DX	60 D	0 D	60 D	0 D	0 D	0 D	0 D	60 D
Glyphosate	0 D	0 D	0 D	0 D	0 D	0 D	1 M	0 D
Goal	10 M	7 D	10 M	60 D	7 D	60 D	60 D	10 M
Gramoxone SL	0 D	0 D	0 D	0 D	0 D	0 D	0 D	0 D
Interline	0 D	0 D	180 D	180 D	0 D	180 D	180 D	70 D
Layby Pro[5]								
0-0.6 lb ai	4 M	4 M	4 M	4 M	4 M	4 M	4 M	3 M
0.61-1.0 lb ai	4 M	4 M	4 M	8 M	8 M	12 M	8 M	4 M
1.01-1.6 lb ai	4 M	4 M	4 M	12 M	8 M	12 M	8 M	8 M
1.61-2.2 lb ai	8 M	8 M	8 M	12 M	12 M	12 M	12 M	12 M
Leadoff	0 D	1 M	10 M	10 M	1 M	10 M	10 M	3 M
Liberty 280 SL	0 D	0 D	180 D	180 D	0 D	180 D	180 D	70 D
MSMA	None	None	None	None	None	None	None	None
Outlook	0 D	Spring	Spring	0 D	0 D	Spring	Spring	4 M
Parallel PCS	12 M	12 M	12 M	12 M	12 M	12 M	Spring	4.5 M
Poast/Poast Plus	30 D	0 D	30 D	0 D	0 D	30 D	0 D	30 D
Prowl/Prowl H_2O	Spring	0 D	10 M	0 D	0 D	0 D	0 D	4 M
Reflex	10 M	0 D	10 M	10 M	0 D	18 M	18 M	4 M
Resource	0 D	30 D	30 D	30 D	0 D	30 D	30 D	30 D
Select/Select MAX	None	None	None	None	None	None	None	None
Sequence	0 D	0 D	0 D	0 D	0 D	Spring	Spring	4.5 M
Sharpen								
1.0 oz/A	0 D	1.5 M	0 D	4 M	0-1M[19]	4 M	4 M	0 D
2.0 oz/A	0 D	3 M	0 D	5 M	1-2 M[19]	5 M	5 M	0 D
3.0 oz/A	0 D	4 M	0 D	6 M	2-3 M[19]	6 M	6 M	0 D
Staple LX	10 M	0 D	24 M	10 M	10 M	10 M	10 M	6 M
Suprend	7 M	7 M	7 M	7 M	7 M	18 M	7 M	3 M
Treflan	5 M	0 D	5 M	0 D	0 D	0 D	5 M	5 M

Table 41. Cotton Replant Guidelines Following Herbicide Application (cont)

	Corn	Cotton	Grain Sorghum	Peanuts	Soybeans	Sunflower	Tobacco	Wheat
M = months, D = days, Spring = The spring following application, --- = no information								
Valor SX/Valor EZ								
1.0 oz/A	7-30 D[6]	7-28 D[7]	30 D	0 D	0 D	30 D	30 D	30 D
1.5-2.0 oz/A	7-30 D[6]	7-28 D[7]	30 D	0 D	0 D	30 D	30 D	30 D
2.1-3.0 oz/A	14-30 D[6]	2 M	30 D	0 D	0 D	2 M	2 M	2 M
Warrant	0 D	0 D	0 D	Spring	0 D	Spring	Spring	4 M
Xtendimax								
11 fl oz/A or less	0 D	0 D[8]/21[9] D	15 D	120 D	0 D[10]/14 D	120 D	120 D	15 D
22-33 fl oz/A	0 D	0 D[8]/120 D	120 D	120 D	0 D[10]/28 D	120 D	120 D	30-45 D
34-44 fl oz/A	0 D	0 D[8]/120 D	120 D	120 D	0 D[10]/120 D	120 D	120 D	45-60 D

[1]DIREX USE PATTERN 1 = Banded DIREX Preemergence or Postemergence application only

[2]DIREX USE PATTERN 2 = Banded DIREX Preemergence and Postemergence or Broadcast DIREX Preemergence (and preplant) or Broadcast DIREX preemergence plus Banded DIREX postemergence applications.

[3]Reduced tillage production.

[4]Conventional tillage production.

[5]Crop rotation intervals are based on the cumulative amount of DIURON in LAYBY PRO applied to a site in the preceding 12 months.

[6]For **corn**: Plant a minimum of 14 days (minimum or strip-till) or 30 days after VALOR SX (conventional tillage system)

[7]For **cotton**: After Valor SX (2.0 oz/A or less) application, conduct strip till operation a minimum of 7 days before planting (regardless of crop residue levels). After conducting strip-till operation, apply Valor SX herbicide a minimum of 28 days before planting (<30% crop residue levels) or 21 days before planting (>30% crop residue levels).

[8]Bollgard II XtendFlex cotton varieties only.

[9]A minimum accumulation of 1 inch of rainfall or overhead irrigation and a waiting interval of 21 days following XTENDIMAX application prior to planting cotton.

[10]Roundup Ready 2 Xtend soybean varieties only.

DEFOLIATION

Defoliation is a standard practice in the production of high yields of quality cotton. Although harvest-aid chemicals have been used for over 40 years, obtaining satisfactory leaf drop is still a problem. Plant, weather, chemical and application factors interact to complicate results and make defoliant response somewhat inconsistent. Among the critical factors involving decisions made by the producer are harvest-aid chemical choice and timing of application.

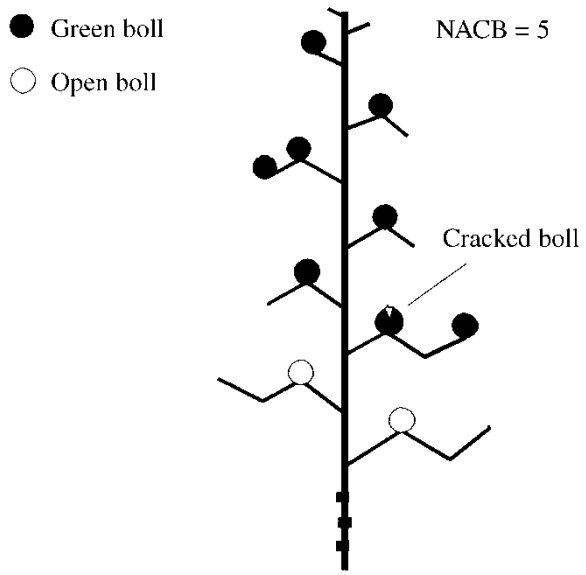
APPLICATION TIMING

Harvest-aid application is determined by the maturity of the crop, present weather conditions, expected weather conditions for the next two to three weeks, and harvest schedule. Research has shown that boll maturity is the most important factor to consider when deciding when to apply harvest-aid materials. Little or no boll maturation occurs after leaves are removed from plants. Therefore, premature defoliation can reduce yield and fiber quality. In South Carolina, two methods are generally considered to be effective in determining crop maturity and timing the application of harvest-aid chemicals. For both methods, it is extremely important to be able to determine which green bolls are mature and harvestable. A green, mature, harvestable boll has the following characteristics:

- **VERY HARD**
- **CANNOT BE EASILY SLICED BY A SHARP KNIFE**
- **WHEN SLICED WITH A SHARP KNIFE, THE LINT STRINGS OUT**
- **SEED COATS ARE DARK YELLOW TO TAN IN COLOR**
- **SEED KERNEL COMPLETELY FILLS CAVITY INSIDE SEED COAT**

For best results on timing of defoliation, use *both* of the following methods:

Percent Open Bolls. Research has shown that under high levels of management, it is usually safe to defoliate cotton at 50 to 60 percent open bolls. Most defoliant labels state a range of percent open bolls at which to time defoliation. Most suggest 60 to 75 percent open bolls. To calculate percent open bolls, count the number of open bolls and total *harvestable* bolls per plant on 3 feet of row at four randomly selected areas of a field. Divide the number of open bolls by the number of total harvestable bolls, and multiply by 100. *It is very important to be able to determine which green bolls are harvestable!*



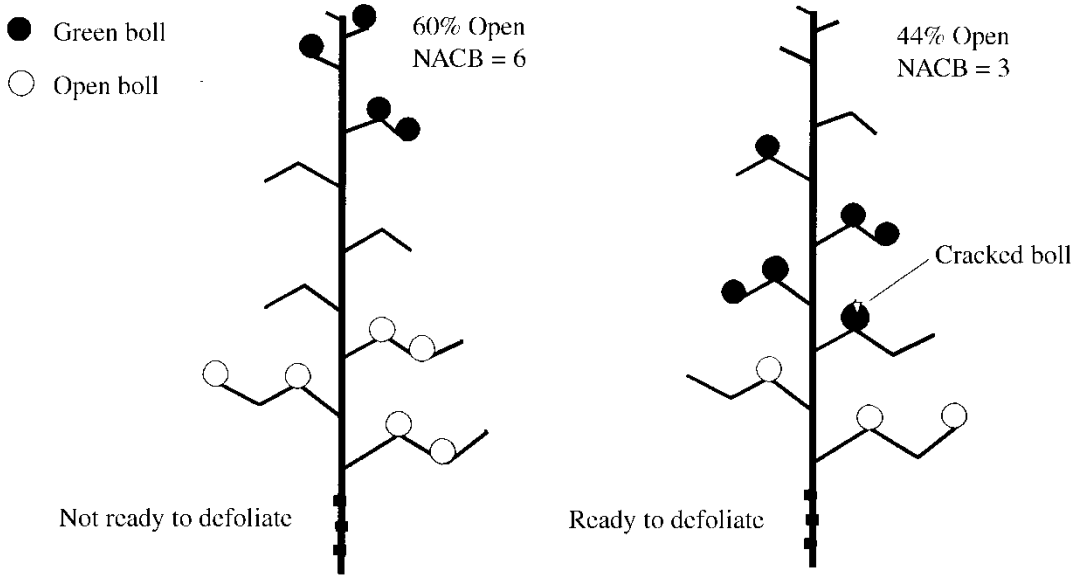
Nodes Above Cracked Boll (NACB). This method has resulted from several years of research across the cotton belt. To determine NACB, examine 20 plants per average-sized field (five plants per four randomly selected sites per field), locate the highest first-

position cracked boll (at least a 0.5-inch crack), count the node of that fruiting branch on which the boll is located as "0", then count the number of nodes up to the fruiting branch that has the highest *harvestable* green boll. *Again, it is very important to determine which green bolls are harvestable!* **The diagram to the left** illustrates a plant at NACB=5.

Defoliating cotton crops at NACB≤4 will result in less than a 5-percent yield reduction, compared to waiting until NACB=0. Additionally, defoliating at this timing will not reduce fiber quality. However, defoliating prior to this timing may enable the harvest of some immature fibers in some younger bolls

For best results on timing of defoliants, use percent open bolls and NACB to time applications. However, there are some situations in which NACB is the superior method. The **diagram below** indicates two conditions in which NACB would be more reliable than percent open bolls. The plant on the left represents a typical crop that has a distinct bottom and top crop. This could be the result of using an indeterminate variety coupled with a mid-season drought. Although it is at 60 percent open boll, NACB=6, which indicates that it would be too early to apply harvest-aid chemicals; defoliating the left plant now would likely reduce yield and micronaire (due to immature fibers in the upper bolls). The plant on the right represents a crop that has a tighter fruiting habit, perhaps caused by using a early-maturing variety, or by a crop that underwent premature cutout. Although it is at 44 percent open boll (which would otherwise indicate that it is too early to defoliate), NACB=3. So, in this case, it would be safe to defoliate the crop even though the percent open boll value is considered low. Waiting until the plant on the right reaches 60 to 75 percent open boll could reduce yield and fiber quality (because the lower bolls would be weathered more than necessary).

Strive to coordinate defoliation applications with harvest capabilities. Vary the planting dates and variety maturity classification to distribute maturity dates, and ultimately, defoliation and harvest activities.



TYPES OF DEFOLIANT CHEMICALS

Defoliants can be classified as having herbicidal or hormonal activity. Def, Folex, Harvade, Aim, and ET are herbicide-type defoliants. They cause leaf drop by injuring the leaf slightly as to cause an increase in ethylene production. However, higher rates of these products or applying these products in conditions that would promote very rapid uptake of the chemical (i.e., high temperatures, very high humidity) can cause desiccation of leaf tissue, which leads to leaf-stick.

Dropp, Finish, CottonQuik and ethephon (Prep, Super Boll, Ethephon) are hormone-type defoliants that directly increase the ethylene synthesis of the plant. Dropp is a cytokinin-type material that has activity on cotton and related species (velvetleaf, okra) for increasing ethylene synthesis. Since the increased ethylene resulting from Dropp applications is not associated with an injury-related increase in ethylene, little or no desiccation or leaf-stick is experienced with Dropp. Ethephon, once absorbed into cotton tissue, is converted to ethylene, so it directly increases the ethylene content in the plant. Again, since no injury is associated with this type of ethylene increase in the plant, no desiccation is expected.

Desiccants, such as paraquat (Starfire) are generally not used on spindle-picked cotton. However, desiccants can be used to desiccate regrowth when the timing from defoliation to harvest is longer than anticipated and regrowth has resulted. Paraquat can also be used to desiccate green weeds that are present prior to harvest. In either of these cases, apply the desiccant after applying any boll-opening or defoliant materials, but allow three days after applying the desiccant before harvesting. Since paraquat is a restricted-use pesticide, use extreme caution. Do not allow gin trash resulting from cotton with paraquat applied to be fed to livestock.

HARVEST-AID CHEMICAL CHOICE

Extensive testing on harvest-aid chemicals has indicated that several products and tank mixtures perform well in South Carolina to obtain adequate leaf drop, boll-opening, and regrowth suppression. Not all of these products are able to accomplish all three attributes of harvest preparation. For instance, Dropp defoliates and suppresses regrowth well, but does not have the boll-opening activity of ethephon. Ethephon may open bolls well and cause some leaf drop, but is weak on suppressing regrowth.

Note: No currently available harvest-aid product will defoliate, open bolls, prevent terminal and basal regrowth, and perform effectively in both warm and cool temperatures by itself. Tank-mixes or combinations of harvest-aids normally provide growers more flexibility and better results in most situations. Apply defoliants when at least 60 percent (75 percent, preferably) of the bolls are open and the remaining bolls expected to be harvested are mature. Harvest-aid materials do not move within the plant. For successful defoliation, each leaf must be contacted by the harvest-aid chemical. Harvest-aids work best when nighttime temperatures are 60 degrees Farenheit or higher, and plants are not drought-stressed. Delaying applications until periods of cooler weather have moderated may lead to better results. Harvest-aids should be applied in the late afternoon or early morning when winds are calm and humidity is high. Apply defoliants in a volume of 10 to 20 GPA by ground or at least 5 GPA by air. If a second application is needed, consult the label for rates.

TABLE 42. COTTON HARVEST AID CHEMICALS

PRODUCT NAME	QUALIFIERS	USE RATE	REI	PHI
Active Ingredient: tribufos 6.0 lb/gal			24 hours	7 days
FOLEX 6-EC	Defoliant	1.33 to 2 pt/ac		
DEF 6 EC	Defoliant	1.33 to 2 pt/ac		

Remarks: Thorough coverage is essential for complete defoliation. Apply when 60% of the bolls are open. Use lower rates if crop is well-matured or when temperatures are warm. Use higher recommended rates when plants are actively growing or in dry weather or cool weather. Needs a 2-hour rain-free period. Regrowth inhibition is poor. Avoid spray drift to other crops. Follow label directions and safety precautions. **DO NOT MIX WITH SODIUM CHLORATE**.

Active Ingredient: thidiazuron 50%			24 hours	5 days
DROPP 50WP FREE FALL 50WP	Defoliant	0.2 to 0.4 lb/ac		
Active Ingredient: thidiazuron 42.4%			24 hours	5 days
DROPP SC	Defoliant	3.2 to 6.4 oz/ac		

Remarks: Thorough coverage is essential for complete defoliation. Very effective at regrowth suppression when used at higher rates. May suppress regrowth for up to 3 weeks after application. However, activity is reduced by cool weather. Do not apply alone or in combination with other products when temperatures are expected to fall below 60 F. Petroleum-based crop oils or penetrating oils will improve defoliation when low temperatures or drought stress conditions occur. Dropp requires a 24-hour rain-free period. Avoid spray drift to other crops and immature cotton. Use only freshly prepared spray solutions. Follow label directions and safety precautions.

Active Ingredient: thidiazuron and diuron 1 lb/gal and 0.5 lb/gal			24 hours	5 days
GINSTAR 1.5EC ADIOS CUTOUT REDI-PIK	Defoliant	0.4 to 1.0 pt/ac		

Remarks: May cause dessication under very hot conditions and high humidity. The addition of other defoliants is not recommended except for ethephon. The addition of crop oil concentrate may improve the performance in cooler weather. Do not exceed 10 oz. of Ginstar per acre except under very adverse conditions. These products contain diuron herbicide. Consult label for rotational restrictions. Follow label directions and safety precautions.

TABLE 42. COTTON HARVEST AID CHEMICALS (Continued)

PRODUCT NAME	QUALIFIERS	USE RATE	REI	PHI
Active Ingredient: dimethipin 4.9 lb/gal			48 hours	
HARVADE-5F	defoliant	8 to 10 oz/ac		
Active Ingredient: dimethipin + thidiazuron 3.2 lb/gal + 0.8 lb/gal			48 hours	
LEAFLESS	defoliant	10 to 12 oz/ac		

Remarks: The addition of 1 pint of crop oil concentrate per acre is required for acceptable results. Thorough coverage is essential for complete defoliation. Apply to mature plants when 70% of the bolls are open. Do not plant rotational crops within 6 months after use. Requires a 6-hour rain-free period. Limited dessication/defoliation of most mature morningglory species as well as sicklepod, croton, and prickly sida has been observed. Follow label directions and safety precautions.

Active Ingredient: ethephon and cyclanilide 6.0 lb/gal and 0.75 lb/gal			48 hours	7 days
FINISH 6 PRO L	defoliant and boll opener	1.33 to 2.67 pt/ac		

Remarks: Use higher rates in cooler weather. Finish provides defoliation, boll opening, and limited regowth inhibition. Terminal regrowth inhibition is stronger than basal regrowth inhibition. Performance may benefit from the addition of low rates of standard defoliant in situations where cotton is actively growing with juvenile growth. See label for rotational restrictions. Follow label directions and safety precautions.

Active Ingredient: amads and ethephon 58.6 % and 18.3 %			48 hours	7 days
FIRSTPICK L COTTONQUIK	defoliant and boll opener	1.75 to 3.5 qt/ac		

Remarks: The 2 quart per acre rate is recommended for most situations. Use higher rates in cool weather. **Do not exceed a maximum of 3.5 quarts per acre per year.** A low rate of a standard defoliant should be added unless cotton is well cut-out with no juvenile growth. CottonQuik only provides limited control of regrowth. Defoliation usually occurs within 7 days after application, however, plants exposed to adverse conditions (low temperatures, drought-stress) may require up to 14 days. Thoroughly rinse application equipment after using this product. Follow label directions and safety precautions.

TABLE 42. COTTON HARVEST AID CHEMICALS (Continued)

PRODUCT NAME	QUALIFIERS	USE RATE	REI	PHI
Active Ingredient: carfentrazone-ethyl 40.0 %			12 hours	7 days
AIM 40DF	defoliant	0.67 to 1.0 oz/ac		
Remarks: TApply when 60 to 70 percent of the bolls are open. **Coverage is essential for complete defoliation.** Use a crop oil concentrate at 1.0 percent v/v. Do not apply more than 2.0 oz/acre total as a harvest-aid. Aim is rainfast witihin one hour of application. Refer to label for rotational restricitions and restricitions on tank mixing. Follow label directions and safety precautions.				
Active Ingredient: pyraflufen-ethyl 0.2 lb/gal			12 hours	7 days
ET	defoliant	1.5 to 2.5 oz/ac		
Remarks: Apply when 60 to 70 pecent of the bolls are open. ET has received limited University testing. Consult label for specific company recommendations.				
Active Ingredient: fluthiacet-methyl 10.3%			12 hours	3 days
BLIZZARD	defoliant	0.5 to 0.6 oz/ac		
Remarks: Apply when 60 to 70 pecent of the bolls are open. Blizzard has received limited University testing. Consult label for specific company recommendations				
Active Ingredient: flumiclorac 10.1%			12 hours	7 days
RESOURCE	defoliant	4.0 to 6.0 oz/ac		
Remarks: Apply when 60 to 70 pecent of the bolls are open. Resource has received limited University testing. Consult label for specific company recommendations				
Active Ingredient: Ethephon 6 lb/gal			48 hours	7 days
PREP 6 L	boll opener and defoliant	0.67 to 1.33 qt/ac		
SUPER BOLL L	boll opener and defoliant	0.67 to 1.33 qt/ac		
ETHEPHON 6 L	boll opener and defoliant	0.67 to 1.33 qt/ac		
PLUCK L	boll opener and defoliant	0.67 to 1.33 qt/ac		
Remarks: Will accelerate boll opening of mature unopened bolls and enhance the activity of defoliants. It will not stimulate boll maturity or consistently open immature bolls. Micronaire may be reduced if applied to cotton that is less than 60% open. Use higher rates during cool weather. Follow label directions and safety precautions.				

TABLE 42. COTTON HARVEST AID CHEMICALS (Continued)

PRODUCT NAME	QUALIFIERS	USE RATE	REI	PHI
Active Ingredient: glyphosate 4 lb/gal			4 hours	7 days
ROUNDUP ULTRA L	regrowth inhibitor and desiccant	1 pt to 2 qt/ac		
Remarks: May provide effective regrowth control. Will not defoliate cotton. Should be used in combination with standard defoliants. May provide some weed control when defoliating weedy cotton. Will not dessicate/defoliate Roundup-Ready cotton varieties.				
Active Ingredient: endothall 5.5 %			48 hrs	7 days
ACCELERATE L	defoliant	1.0 to 1.5 pt/ac		
Remarks: May enhance defoliation of standard defoliants during first few days of defoliant activity. Always add Accelerate to organic phosphates previously tank-mixed with water. Follow labe directions and safety precautions.				
Active Ingredient: cacodylic acid 3.1 lb/gal			48 hrs	7 days
QUICK PICK L	defoliant	0.5 to 1.5 pt/ac		
Remarks: Should be tank-mixed with standard defoliants and boll openers for best results. Avoid high rates in warm weather as leaf dessication may occur. Follow labe directions and safety precautions.				
Active Ingredient: paraquat dichloride 1.5 lbs/gal			48 hours	3 days
R C - Starfire L	Desiccant	1.5 to 2.5 pt/ac		
Remarks: To be used only to desiccate regrowth that cannot be suppressed with other chemicals, or when regrowth has occurred prior to delayed harvest. Defoliate cotton as normal. After cotton leaves have dropped and bolls are open or mature, apply Starfire in a minimum of 20 GPA. Add 1 pint of nonionic surfactant per 100 gallons of spray solution.				

COTTON INSECT MANAGEMENT

Insect pests are major limiting factors in producing cotton in South Carolina. Hundreds of species of insects may be found in cotton, but only a limited number of those species are economically important. A cotton scout must be able to identify the damaging species of insects as well as the common beneficial arthropods. A good scouting program is still the first line of defense against insect pests in cotton. There are many valid techniques that can be used to assess the impact of insects in a field of cotton. The following information is intended to serve as a guide for use in monitoring and controlling infestations of pestiferous insects in cotton. Insecticide treatments should only be applied when numbers of insect pests reach levels that correspond to economic thresholds. Avoid treating infestations that are below thresholds because unnecessary disruptions to populations of beneficial species often result in plant injury by other insect pests.

Since 1996, cotton growers in South Carolina have planted cotton varieties protected from tobacco budworm and bollworm by genes derived from the bacterium, *Bacillus thuringiensis* (Bt). Genes transferred from Bt to cotton enable plants to produce proteins toxic to caterpillars. Cells of leaves, stems, squares, blooms and bolls of these genetically engineered cotton plants contain lethal doses of the toxin. When caterpillars eat the Cry-proteins, their digestive enzymes activate the toxic form of the protein. The Cry-proteins bind to receptors on the lining of the insect gut, and cells are ruptured. The poisoned insects stop feeding within a few hours and die within 2 or 3 days if the dose is sufficiently high. Varieties with single-gene (first-generation) Bt technology provided excellent control (virtually 100%) of tobacco budworm and fair-to-good (about 60 to 90%) control of bollworm over the years (1996-2010). In South Carolina, there was insufficient control of bollworm with single-gene Bt cotton alone, and supplemental applications of insecticides were needed to prevent economic damage.

Thresholds for bollworm in first-generation Bt cotton were developed in response to observations that many problems with bollworm occurred in fields of Bt cotton where there had been moderate to high levels of eggs. For this reason, thresholds were adopted that called for insecticide treatments when egg and small worm numbers were excessive, especially if scouts would be unable to get back within a few days to assess infestations of larvae. An egg threshold of 75 eggs per 100 plants was instituted in the 1997 crop year, along with a threshold of 30 small worms per 100 plants. Square damage has been a poorer indicator of economic damage in Bt cotton, as most surviving larvae have been found in association with bolls and attached dried blooms (commonly called "bloom tags"). Researchers have shown that Bt toxins are apparently expressed in lower concentrations in blooms, pollen, and dried bloom tags, creating a window of opportunity for small bollworms. If small larvae can survive and grow for several days, they are not likely to be killed by Bt toxins.

Since 2011, almost 100% of the cotton acreage in South Carolina was planted to varieties containing two Bt genes for production of dual Cry-proteins. Research has

shown that, when additional genes are added that produce supplementary toxic proteins, effectiveness against lepidopteran pests such as bollworms, armyworms, and soybean loopers increases. Availability of Bt technologies changed on 30 September 2009 when the last opportunity to purchase first-generation Bt cotton (Bollgard varieties – for example DP555BR) for planting during the 2010 season expired (i.e. the phasing out of single-gene Bt varieties). Beginning with the 2011 season, only dual-Bt-gene cotton varieties were commericially available. Varieties expressing more than two Bt proteins are now available and continue to be approved and tested.

Cotton with Bt technology has many potential benefits in terms of insect control, but there will continue to be potential problems with stink bugs and other arthropod pests that are not controlled by Bt toxins and that benefit from reduced use of insecticides. Although Bt cotton has offered good-to-excellent control of important caterpillar pests, the best way to maximize benefits of planting transgenic Bt cotton is to scout vigilantly for pests, allowing properly timed sprays when necessary and detecting additional potential shifts in species importance. Researchers with Clemson University will continue to evaluate insect pest thresholds and control methods with new transgenic varieties, and adjustments will be made to recommendations as deemed appropriate.

INSECT PESTS

Thrips feed on leaves and terminals of seedling plants, thereby stunting growth and delaying maturity. Damaged leaves appear crinkled on top, and lower surfaces will often have a silvery sheen. Leaf margins become cupped and terminal buds may be destroyed. Tobacco thrips, *Frankliniella fusca*, is the predominant species encountered in cotton in South Carolina.

Aphids typically infest plant terminals and uppermost leaves initially. These soft-bodied insects have piercing-sucking mouthparts that are used to suck plant juices from leaves and stems. Heavy infestations on the undersides of leaves produce wilting and cause the leaf margins to curl toward the ground. A parasitic wasp and a fungus, *Neozygites fresenii*, often provide adequate aphid control. **Whiteflies** can also damage cotton by sucking plant fluids, but this happens very rarely in South Carolina. These insects are generally controlled by naturally occurring beneficial arthropods before their damage can reduce yields. Both aphids and whiteflies excrete a substance with a high sugar content referred to as honeydew. Heavy infestations of aphids or whiteflies can produce large amounts of honeydew, thereby coating lower leaves, and giving them a shiny appearance. After mature bolls have opened, honeydew may produce sticky lint. Honeydew may also serve as a substrate for the growth of a sooty mold, which stains lint and reduces color grade.

Plant bugs (tarnished plant bug and cotton fleahopper) infrequently cause problems in June and July. Tarnished plant bugs may also puncture small bolls, inflicting damage symptoms similar to that caused by stink bugs. Adults of both species of plant bugs move to cotton from wild host plants. *Lygus* bugs develop in wild hosts such as aster, blue vervain, and fleabane, while fleahoppers are fond of tropic croton

and primrose. Both adults and nymphs feed on small squares and other tender plant parts.

Tobacco budworm populations have been increasing during recent years. Historically, most problems with tobacco budworms have occurred in the Coastal Plain from moths that deposited eggs during June (pre-bloom). However, in recent years, populations of tobacco budworm have been detected in early July. Tobacco budworm and bollworm are often called the bollworm/budworm complex because they will often be present in the same field, they eat the same plant structures, and they are morphologically quite similar as larvae. Before first bloom, in non-Bt cotton, fields should be treated when 15 or more small (<0.25 inch) larvae or 20 damaged squares are found per 100 plants. After first bloom, in non-Bt cotton that has not been treated previously, insecticide should be applied at 20 or more eggs, 3 small larvae, or 5% damaged squares per 100 plants. Tobacco budworms have been documented to be resistant to multiple insecticide classes, so insecticide choices are limited in non-Bt cotton. Pyrethroid-resistant tobacco budworms occur in cotton in South Carolina and should be considered resistant to that class of chemistry.

Bollworm (corn earworm) is a key insect pest of cotton in South Carolina because it will infest most fields in the state every year. Infestations are most likely to occur in July after moths that have emerged from corn fields begin to deposit eggs on cotton plants. In the Coastal-Plain region, moth flights will usually begin within the period from 6 to 20 July, with the earliest flights occurring in the Savannah Valley area. Bollworms have generally been less of a threat in the Piedmont region, where infestations generally don't materialize before the last week in July. Insecticide applications will be triggered when the numbers of eggs, larvae, or damage reach economic levels (economic thresholds). Scouting for eggs and hatching larvae is a responsibility of a cotton scout. After bollworm moths have deposited their eggs on cotton plants, the eggs will begin hatching in about three days. Eggs are deposited singly and generally on the upper leaf surfaces near plant terminals. By mid-July or later, moths may deposit a higher percentage of eggs lower on the plants on leaves, squares, stems, and even blooms or dried blooms (bloom tags). Scouts should check whole plants for bollworm eggs and larvae and examine the following fruiting forms on each plant: a white bloom, a pink bloom and the two smallest bolls. Remove bloom tags to look for damage on the tips of small bolls where bollworm larvae often gain entry. Historically, in first-generation Bt cotton, an insecticide treatment was recommended when 30 or more small (<0.25 inch in length) larvae were found per 100 plants, and the threshold for bollworms that were not controlled with Bt cotton (commonly called "escaped worm threshold") was three larger ($\geq$0.25 inch in length) larvae per 100 plants or 5% damaged bolls. Treatment thresholds for bollworm in second-generation Bt cotton are being re-evaluated, but the best available options are to consider intervention when egg numbers approach 100 or more per 100 plants for consecutive weeks, when three large ($\geq$0.25 inch in length) larvae are found per 100 plants, or when 5% of bolls are damaged by bollworm. After first bloom, in non-Bt cotton, insecticide should be applied at 20 or more eggs, 3 small larvae, or 5% damaged squares per 100 plants. Cotton fields should be checked at least once a

week, from seedling emergence through the first week in July. More frequent scouting is recommended from early July through mid August, primarily to detect hatch-out of bollworm larvae. Thereafter, weekly field visits should continue until most plants have reached a stage of maturity considered relatively safe from insect damage.

In 1996 pyrethroid-resistant bollworms were found in cotton fields in Hampton County near Estill, SC. Vial tests conducted with moths trapped in the Savannah Valley in 1997 confirmed the presence of resistance. Also, pyrethroid resistance was confirmed from fields in Orangeburg and Calhoun Counties in August of 1997. Both of these fields were characterized by the presence of numerous large bollworms following multiple applications of pyrethroids. Pyrethroid resistance was documented in five locations below the lakes in 1998 from bollworms collected in fields where there had been control problems. Recent studies have shown that rates of survival shown by bollworm in adult vial tests and reported from confirmed field collections after exposure to pyrethroids are increasing, indicating that pyrethroid-resistance genes are still present. Efforts to monitor pyrethroid resistance will continue, but rotation of insecticide class is recommended as part of a resistance management approach. Avoiding consecutive applications of pyrethroids for bollworm would be one possible tactic to delay development of resistance. See detailed recommendations for bollworm insecticides that can be used as alternatives to pyrethroids.

Beet and fall armyworms usually do not occur until late July or early August, as neither species is known to overwinter in South Carolina. Moths of both species lay eggs in masses of 80 to 100 on the undersides of leaves. Newly emerged fall armyworms (first instars) tend to feed singly on the younger growth within the middle portion of a plant. Small beet armyworms are gregarious, and will feed in clusters on the undersides of leaves through third instars. When small larvae feed on the inner surfaces of square bracts, the etchings will be visible externally. Fall armyworms are often found in blooms, where they feed on floral tissue and pollen. Like bollworms, fall armyworms will eventually damage larger bolls. Beet armyworms feed on squares and blooms, but they usually do not bore into bolls. Large beet armyworms are capable of completely defoliating non-*Bt* cotton plants. Second- and third-generation Bt cotton varieties do a very good job in controlling armyworms, but they are not immune from injury, and subtle differences in efficacy exist among the technologies (see GENETIC INSECT CONTROL below).

Spider mites are occasionally a problem in South Carolina cotton. Infestations of mites are often flared by extremely hot and dry weather conditions. Applications of insecticides (e.g. acephate) for other pests may also flare infestations of spider mites by reducing the numbers of beneficial arthropods that prey upon them. Initial infestations occur from spider mites moving from wild host plants or other crops into border rows of cotton. Yellow speckling on the upper surfaces of leaves (in proximity to petiole attachment) will be the first indication of a mite infestation. As mites continue to feed on the undersides of leaves, the upper surfaces will become reddened. Early recognition of these symptoms, and spot treating infested areas, will often prevent spider mites from spreading throughout a field.

Stink bugs have piercing-sucking mouthparts that they use to pierce small bolls and suck sap from the seeds. Seed coats more or less collapse, and the attached lint often acquires a yellowish to brownish colored stain. Small, warty growths on the inside of a boll wall will generally mark the points of penetration. Warts typically form within 48 hours after penetration. Water-soaked lesions are signs of more recent penetrations, where warts may not have had time to develop. Warts may never develop when a stink bug penetrates the boll wall, fails to find a seed, and then quickly withdraws its beak. Furthermore, warts do not form on bolls that have reached full size. Damaged bolls may open prematurely or become hard-locked. Usually only one or two locks will be damaged, but occasionally, if infestations are heavy, bolls may be completely hard locked. Boll damage is the main criterion used to evaluate infestations of stink bugs. A scout should randomly select 25 or more quarter-sized bolls, break them open, and check the inner walls of the bolls for the damage symptoms indicated above. Care should be taken to ensure that all bolls examined are of the same age class because these will provide the most reliable estimate of the actual current damage in a field. When damage symptoms are present, look for adults and large nymphs by shaking plants over a beat cloth or into a plastic pan where they can be examined and identified. It is possible that plant bugs or other sucking insects might damage small bolls, so identification is important before action is taken. By the time a boll is 25 days old, it should be relatively safe from attack.

ACTION THRESHOLDS

Compare numbers on scouting reports to recommended action thresholds described in the remarks after each table in the insecticide recommendations section to help determine need for an insecticide treatment. One must also consider factors such as the stage of plant growth or whether the cotton is a Bt or not-Bt variety. For some insect pests, such as bollworm, insect numbers or damaged-square counts are provided to enable a grower to determine whether or not an insecticide application is warranted. Action thresholds are not well defined for every insect pest, and deciding whether or not to treat may be more difficult. In these situations, there is often a greater likelihood of treating a field when it is unnecessary. Threshold numbers are general in nature and are subject to professional interpretation. County agents and cotton consultants should have the expertise to help determine how these thresholds best apply to field situations on a particular farm.

RESISTANCE MANAGEMENT IN BT COTTON

Most varieties of cotton contain Bt technology (options listed in table below) for controlling caterpillar pests in the crop. A structured cotton refuge is no longer required for Bt cotton, but a "natural refuge" option is available for any brand of cottonseed containing Bt traits. Companies provide guidance about resistance management and product stewardship with Bt technology at the following web pages:

http://www.monsanto.com/products/pages/insect-resistance-management.aspx
http://www.dowagro.com/phytogen/stewardship/
https://www.bayercropscience.us/products/traits/twinlink/resistance-management

Table 43. GENETIC INSECT CONTROL

Trade name	Bollworm	Tobacco budworm	Beet armyworm	Fall armyworm	Soybean looper	Cutworm
Bollgard II	Excellent	Excellent	Excellent	Good	Excellent	Poor
Bollgard 3*	Excellent	Excellent	Excellent	Excellent	Excellent	Poor
WideStrike	Good	Excellent	Excellent	Good	Good	Poor
WideStrike 3	Excellent	Excellent	Excellent	Excellent	Excellent	Poor
TwinLink	Excellent	Excellent	Excellent	Good	Excellent	Poor
TwinLink Plus*	Excellent	Excellent	Excellent	Excellent	Excellent	Poor

Transgenic Bt varieties offer cotton growers a unique technological tool for the management of lepidopterous insect pests. There are differences in their relative effectiveness against several species that are common in South Carolina. *Limited availability in 2017.

COTTON INSECT CONTROL RECOMMENDATIONS

"Instant –View" Threshold Guide

Insect	Number per unit
Stink bugs (SB)	20% injury to medium-sized bolls; 10% during wk 3-5 of bloom; bugs present
Bollworms *2nd & 3rd generation Bt cotton*	After 1st bloom, consider treatment soon after peak egg lay or > 1 egg/plant, 3 or more larger (>0.25 inch) larvae per 100 plants, or 5% damaged bolls
Bollworms *Non-Bt cotton*	After 1st bloom: 20 or more eggs or 3 small (<0.25 inch) larvae per 100 plants or 5% damaged squares
Tobacco budworms (TBW) *Non-Bt cotton only – not found in Bt cotton*	Before 1st bloom: 15 small (<0.25 inch) larvae per 100 plants or 20% damaged squares; after 1st bloom: 20 eggs or 3 small larvae per 100 plants or 5% damaged squares
Thrips	2 or more thrips per plant (less if immatures) and damage present
Aphids	Plants severely infested and stressed with actively growing colonies present
Fall armyworms (FAW)	10 or more per 100 plants, checking blooms and bolls
Spider mites	50% of plants infested and stressed with actively growing colonies present

This quick-view threshold table was intended to be a quick reference for treatment thresholds for the most common insect pests of cotton in South Carolina. The sections described hereafter include detailed information about thresholds and specific insecticide recommendations.

Table 44. THRIPS

Product (at planting)	Product/acre	Lb ai/acre	Acre/gal	REI	PHI	Comments
aldicarb **(R)** AgLogic 15G or Temik 15G	3.5-5.0 lb	0.525-0.75	-	48 hr	90 d	In-furrow granular
thiamethoxam Cruiser Avicta Duo Acceleron (check coding)	- - -	-	- - -	12 hr	-	Seed treatment
imidacloprid Gaucho 600 Aeris Acceleron (check coding)	- - -	-	- - -	12 hr	-	Seed treatment
acephate Orthene/Acephate 97 Orthene/Acephate 90	 16.0 oz 17.2 oz	0.97	 - -	24 hr	21 d	In-furrow spray
phorate **(R)** Thimet 20 G	 5.0 lb	1.0	 -	48 hr	60 d	In-furrow granular
imidacloprid Couraze 4 F Couraze 2 F Admire Pro 4.6 Velum Total 3.67	 10.55 oz 21.1 oz 9.2 oz 14-18 oz	0.33 (0.237-0.305)	 12.1 6.0 13.9 7.1-9.1	12 hr	14 d	In-furrow spray; seed trt + IFS not to exceed 0.5 lb/acre total
Product (foliar sprays)	**Product/acre**	**Lb ai/acre**	**Acre/gal**	**REI**	**PHI**	**Comments**
dicrotophos **(R)** Bidrin 8 E	 3.2 oz	0.2	 40	6 d	30 d	3.2 oz limit pre-square
acephate Orthene/Acephate 97 Orthene/Acephate 90	 3.0 oz 3.2 oz	0.18	 - -	24 hr	21 d	
dimethoate Dimethoate 4 EC	 8.0 oz	0.25	 16	48 hr	14 d	
spinetoram Radiant 1 SC	 1.5-3.0 oz	0.0117-0.0234	 42.7-85.3	4 hr	28 d	Adjuvant needed

The high rate of aldicarb should also provide some protection against nematodes and suppress early populations of aphids and spider mites. When cotton is planted after May 20, seed treatments have proven to be effective in limiting thrips damage to seedling cotton plants. Avicta (with abamectin) and Aeris (with thiodicarb) have some activity on nematodes. Generally, a preventative insecticide used at planting will protect seedlings from severe stunting characteristic of thrips injury. Occasionally, however, conditions will be unfavorable for proper uptake of systemic insecticides (too cool, dry soil, excessive moisture, etc.), and plants can be severely damaged. **Foliar treatments will be most effective when applied to cotton seedlings prior to unfolding of the second true leaf**. A foliar insecticide treatment may be needed when two or more thrips are found per plant. Shake each plant (randomly select 25 or more) into a coffee cup or a similar utensil to facilitate counting. When most plants

have severely damaged growing points and immature thrips are present, one or more foliar treatments may be needed to allow the plants to resume normal growth and development. Examine plants 5-7 days after the initial treatment, and treat again if immatures are still present on most plants. When the newly unfolded leaves of infested plants are free of damage, and plants appear to be growing at a normal rate, further applications of insecticides will have little benefit. Treatments applied beyond the four-leaf stage of growth may actually be counterproductive, as these would likely reduce beneficial populations and result in early-season problems with other pests. Although effective, acephate can flare populations of spider mites and aphids.

Table 45. CUTWORMS

Product	Product/acre	Lb ai/acre	Acre/gal	REI	PHI	Comments
chlorpyrifos **(R)**		0.70-1.0		24 hr	14 d	
Lorsban 4 E	1.5-2.0 pt	(0.75-1.0)	4.0-5.3			
Nufos 4 E	1.5-2.0 pt	(0.75-1.0)	4.0-5.3			
Lorsban Adv 3.755	1.5-2.0 pt	(0.70-0.94)	4.0-5.3			
acephate		0.73-0.97		24 hr	21 d	
Orthene/Acephate 97	12.0-16.0 oz		-			
Orthene/Acephate 90	13.0-16.0 oz		-			
beta-cyfluthrin **(R)**		0.0065-0.025		12 hr	0 d	
Baythroid XL 1 EC	0.8-1.6 oz		80-160			
lambda-cyhalothrin **(R)**		0.015-0.02		24 hr	21 d	
Karate Z 2.08 CS	0.96-1.28 oz		100-133			
Karate 1 EC	1.92-2.56 oz		50-67			
Silencer 1 EC	1.92-2.56 oz		50-67			
Lambda-Cy 1 EC	1.92-2.56 oz		50-67			
cypermethrin **(R)**		0.026-0.097		12 hr	14 d	
Up-Cyde 2.5 EC	1.35-5.0 oz		25.6-94.8			
zeta-cypermethrin/ bifenthrin **(R)**		0.05-0.1		12 hr	14 d	
Hero 1.24 EC	5.2-10.3 oz		12.4-24.6			
esfenvalerate **(R)**		0.03-0.05		12 hr	21 d	
Asana XL 0.66 EC	5.8-9.6 oz		13-22			
gamma-cyhalothrin **(R)**		0.0075-0.01		24 hr	21 d	
Declare 1.25 CS	0.77-1.02 oz		125-166			
zeta-cypermethrin **(R)**		0.008-0.012		12 hr	14 d	
Mustang Max 0.8 EC	1.28-1.92 oz		67-100			
bifenthrin **(R)**		0.04-0.1		12 hr	14 d	
Discipline 2 EC	2.6-6.4 oz		20-50			
Brigade 2 EC	2.6-6.4 oz		20-50			
Fanfare 2 EC	2.6-6.4 oz		20-50			
Bifenture 2 EC	2.6-6.4 oz		20-50			

Treat when cutworms threaten to reduce plant populations below an acceptable level. The risk of infestations will be greater under reduced tillage conditions and in heavier soils, where cutworms can become established on existing vegetation and will move to cotton when it emerges. Destroying established vegetation 3 to 4 weeks before

planting will often prevent cutworm problems. Some of the listed insecticides may be used as "rescue" treatments on cotton seedlings and some are labeled for pre-emergence use as either broadcast, banded, or in-furrow sprays. At-planting treatments may be warranted in situations where cutworms are already established and vegetation cannot be destroyed ahead of time. Often lower rates of insecticide can be use for these preventative at-plant treatments.

Table 46. APHIDS

Product	Product/acre	Lb ai/acre	Acre/gal	REI	PHI	Comments
sulfoxaflor Transform 50 WG	 0.75-1.0 oz	 0.23-0.031	 -	24 hr	14 d	End user stocks only
acetamiprid Assail 30 SG Assail 70 WP (Intruder 70)	 1.5-2.5 oz 0.6-1.1 oz	0.025-0.05	 - -	12 hr	28 d	Ovicidal activity on caterpillars
dicrotophos Bidrin 8	 8.0 oz	0.5	 16	6 d	30 d	16 oz limit post bloom
flonicamid Carbine 50 WG	 1.4-2.8 oz	0.044-0.088	 -	12 hr	30 d	
thiamethoxam Centric 40 WG	 1.25-2.0 oz	0.031-0.05	 -	12 hr	21 d	5 oz limit for season
imidacloprid Couraze 4 F Couraze 2 F Admire Pro 4.6	 1.0-2.0 oz 2.0-4.0 oz 0.9-1.7 oz	0.031-0.0625	 64-128 32-64 75-142	12 hr	14 d	
clothianidin Belay 2.13	 3.0-6.0 oz	0.05-0.1	 21.3-42.6	12 hr	21 d	12 oz limit for season

Treat only when high numbers of aphids are severely infesting plants, populations are building, and the margins of terminal leaves are drooping. Aphids will cause more damage when plants are suffering from lack of moisture, and there are few signs of natural control agents. If there is evidence of widespread parasitism (dead aphids, tan colored and swollen in appearance) and/or fungal pathogens (diseased aphid bodies have a grayish-green colored fuzzy appearance) an insecticide should not be applied. Avoid unnecessary insecticide applications, as subsequent reductions in beneficial populations can result in damage from bollworm and fall armyworm.

Table 47. PLANT BUGS (COTTON FLEAHOPPER AND TARNISHED PLANT BUG)

Product	Product/acre	Lb ai/acre	Acre/gal	REI	PHI	Comments
acephate		0.25-0.75		24 hr	21 d	
Orthene/Acephate 97	4.1-12.3 oz		-			
Orthene/Acephate 90	4.4-13.3 oz		-			
imidacloprid		0.031-0.0625		12 hr	14 d	
Couraze 4 F	1.5-2.0 oz		64-83			
Couraze 2 F	3.0-4.0 oz		32-42.6			
Admire Pro 4.6	0.9-1.7 oz		75-142			
thiamethoxam		0.05-0.0625		12 hr	21 d	5 oz limit for season
Centric 40 WG	2.0-2.5 oz		-			
flonicamid		0.088		12 hr	30 d	
Carbine 50 WG	2.8 oz		-			
dicrotophos **(R)**		0.25-0.5		6 d	30 d	16 oz limit post bloom
Bidrin 8 E	4.0-8.0 oz		16-32			
oxamyl **(R)**		0.25-0.5		48 hr	14 d	
Vydate 3.77 CLV	8.5-17.0 oz		7.5-15			
clothianidin		0.05-0.1		12 hr	21 d	12 oz limit for season
Belay 2.13	3.0-6.0 oz		21.3-42.6			
novaluron		0.058-0.078		12 hr	30 d	Effective on nymphs only
Diamond 0.83 EC	9.0-12.0 oz		14.2-21.3			
sulfoxaflor				24 hr	14 d	End user stocks only
Transform 50 WG	0.75-2.25 oz	0.23-0.071	-			

Plant-bug injury to squares rarely causes economic problems in South Carolina. An economic problem could develop if an early-maturing variety was planted late, an average of one plant bug per foot of row is detected using a beat cloth or beat pan, or 25% or more of pinhead squares have been lost. Pyrethroid insecticides generally provide control of plant bugs when applied at stink bug/bollworm control rates. Avoid treating Bt cotton for plant bugs unless absolutely necessary in June and July as subsequent reductions in beneficial populations often trigger problems with bollworm or fall armyworm. Plant bugs can also injure small bolls like stink bugs. For combinations of plant bugs and stink bugs feeding on small bolls, use boll-injury treatment thresholds for stink bugs.

Table 48. ARMYWORMS (BEET AND FALL ARMYWORM)

Product	Product/acre	Lb ai/acre	Acre/gal	REI	PHI	Comments
Bt cotton	-	-	-	-	-	
emamectin benzoate **(R)** Denim 0.16 EC (BAW) Denim 0.16 EC (FAW)	 6.0-8.0 oz 8.0-12.0 oz	0.0075-0.015	 16-21.3 10.7-16	12 hr	21 d	Suppression of spider mites
indoxacarb Steward 1.25 EC	 9.2-11.3 oz	0.09-0.11	 11.5-14	12 hr	14 d	
methoxyfenozide Intrepid 2 F	 4.0-10.0 oz	0.0625-0.156	 12.8-32	4 hr	14 d	Higher rates for FAW
novaluron Diamond 0.83 EC	 9.0-12.0 oz	0.058-0.078	 10.7-14.2	12 hr	30 d	
spinosad Tracer 4 SC Blackhawk 36 WG	 2.14-2.9 oz 2.4-3.2 oz	 0.067-0.09 0.054-0.072	 44-60 -	4 hr	28 d	Existing stocks of Tracer
methomyl **(R)** Lannate 2.4 LV (FAW)	 1.5-2.25 pt	0.45-0.675	 3.6-5.3	3 d	15 d	May redden leaves
chlorantraniliprole Coragen 1.67 SC Prevathon 0.43 SC	 3.5-7.0 oz 14.0-27.0 oz	0.045-0.09	 18.3-36.5 4.7-9.1	4 hr	21 d	5-d interval/ application
flubendiamide Belt 4 SC	 2.0-3.0 oz	0.0625-0.094	 42.6-64	12 hr	28 d	Can use until supply gone

Varieties containing two or more Bt endotoxins should provide good control of armyworms. Control of fall armyworms (FAW) may be justified when 10 or more larvae are found per 100 plants. Check blooms for the presence of FAW and look for feeding symptoms on boll bracts in the lower canopy. For beet armyworms (BAW) consider applying an insecticide when there are larvae present in noticeable numbers and damage is easily observed. Populations of BAW can develop on pigweeds in the field and move to cotton and overcome the Bt toxins. Pyrethroids applied for control of stink bugs and bollworm will also provide some degree of control of eggs and newly hatched armyworms; however, after the worms have fed on cotton plants, these materials will be less effective. Best control is achieved when applications of insecticide are timed to coincide with egg hatch and emerging larvae.

Table 49. BOLLWORM

Product	Product/acre	Lb ai/acre	Acre/gal	REI	PHI	Comments
Bt cotton	-	-	-	-	-	
Product (pyrethoids)	**Product/acre**	**Lb ai/acre**	**Acre/gal**	**REI**	**PHI**	**Comments**
bifenthrin **(R)**		0.04-0.1		12 hr	14 d	Control of spider mites possible at high rates
Discipline 2 EC	2.6-6.4 oz		20-50			
Brigade 2 EC	2.6-6.4 oz		20-50			
Fanfare 2 EC	2.6-6.4 oz		20-50			
Bifenture 2 EC	2.6-6.4 oz		20-50			
beta-cyfluthrin **(R)**		0.0125-0.02		12 hr	0 d	
Baythroid XL 1 EC	1.6-2.6 oz		49-80			
lambda-cyhalothrin **(R)**		0.025-0.04		24 hr	21 d	
Karate Z 2.08 CS	1.6-2.5 oz		50-80			
Karate 1 EC	3.2-5.12 oz		25-40			
Silencer 1 EC	3.2-5.12 oz		25-40			
Lambda-Cy 1 EC	3.2-5.12 oz		25-40			
cypermethrin **(R)**		0.04-0.1		12 hr	14 d	
Up-Cyde 2.5 EC	2.0-5.0 oz		25-64			
zeta-cypermethrin/ bifenthrin **(R)**		0.05-0.1		12 hr	14 d	
Hero 1.24 EC	5.2-10.3 oz		12.4-24.6			
esfenvalerate **(R)**		0.05		12 hr	21 d	
Asana XL 0.66 EC	9.6 oz		13			
gamma-cyhalothrin **(R)**		0.0125-0.02		24 hr	21 d	
Declare 1.25 CS	1.28-2.05 oz		63-100			
zeta-cypermethrin **(R)**		0.017-0.0225		12 hr	14 d	
Mustang Max 0.8 EC	2.64-3.6 oz		35-48			
Product (non-pyrethoids)	**Product/acre**	**Lb ai/acre**	**Acre/gal**	**REI**	**PHI**	**Comments**
novaluron		0.078-0.09		12 hr	30 d	Apply at egg hatch
Diamond 0.83 EC	12.0-14.0 oz		9.1-10.6			
indoxacarb		0.11		12 hr	14 d	
Steward 1.25 EC	11.3 oz		11.5			
spinosad				4 hr	28 d	Existing stocks of Tracer
Tracer 4 SC	2.14-2.9 oz	0.067-0.09	44-60			
Blackhawk 36 WG	2.4-3.2 oz	0.054-0.072	-			
emamectin benzoate **(R)**		0.01-0.015		12 hr	21 d	Spider mite suppression
Denim 0.16 EC	8.0-12.0 oz		10.7-16			
methomyl **(R)**		0.45-0.675		72 hr	15 d	May redden leaves
Lannate 2.4 LV	1.5-2.25 pt		3.5-5.3			
flubendiamide		0.0625-0.094		12 hr	28 d	Can use until supply gone
Belt 4 SC	2.0-3.0 oz		42.6-64			
chlorantraniliprole		0.065-0.09		4 hr	21 d	5-d interval/ application
Coragen 1.67 SC	5.0-7.0 oz		18.3-25.6			
Prevathon 0.43 SC	20.0-27.0 oz		4.7-6.4			

To reduce selection pressure for resistance in bollworm, avoid using pyrethroid insecticides before 1 July, unless infestations are extremely high. In transgenic cotton varieties that contain Bt endotoxins, an insecticide treatment should not be needed before first bloom. Transgenic Bt cotton varieties that have two or more Bt genes have increased efficacies against bollworms; however, under potential situations of very heavy pressure from bollworm, some Bt technologies, particularly WideStrike, can incur significant injury and losses if not protected with supplemental/timely application(s) of insecticide. To control escaped worms in Bt cotton, an insecticide treatment should be applied when 3 or more larger (>0.25 inch) worms are found per 100 plants or 5% of small bolls are damaged. Also, entire plants can be examined for eggs to determine pending pressure. Insecticide application can be justified if peak egg lay approaches 1 egg per plant. On each plant a scout should examine a white bloom, a pink bloom, and the two smallest bolls. If dried blooms (bloom tags) adhere to small bolls, remove them and look for larvae boring into the boll tips. AFTER FIRST BLOOM, in non-Bt cotton that has not been previously treated, apply an initial insecticide treatment when 20 eggs or 3 small larvae are found per 100 plants or at 5% damaged squares. On non-Bt cotton, two treatments might be required to control bollworms following the initial moth flight in July. AFTER MID-AUGUST, consider the maturity of the crop in determining the need for a treatment. For example, 3 small worms or 5% damaged squares may still be an applicable threshold in late-maturing non-Bt cotton (early- to mid-bloom stage of development), but this infestation level could be tolerated in cotton that is nearing cutout, where most bolls are too mature to be damaged by bollworm.

Table 50. BUDWORM (TOBACCO BUDWORM)

Product	Product/acre	Lb ai/acre	Acre/gal	REI	PHI	Comments
Bt Cotton	-	-	-	-	-	
spinosad Tracer 4 SC Blackhawk 36 WG	 1.4-2.9 oz 1.6-3.2 oz	 0.044-0.09 0.036-0.072	 44-91.4 -	4 hr	28 d	Existing stocks of Tracer
indoxacarb Steward 1.25 EC	 11.3 oz	0.11	 11.5	12 hr	14 d	
novaluron Diamond 0.83 EC	 12.0-14.0 oz	0.078-0.09	 9.1-10.6	12 hr	30 d	Apply at egg hatch
methomyl **(R)** Lannate 2.4 LV	 1.5-2.25 pt	0.45-0.675	 3.5-5.3	72 hr	15 d	May redden leaves
emamectin benzoate **(R)** Denim 0.16 EC	 8.0-12.0 oz	0.01-0.015	 10.7-16	12 hr	21 d	Spider mite suppression
flubendiamide Belt 4 SC	 2.0-3.0 oz	0.0625-0.094	 42.6-64	12 hr	28 d	Can use until supply gone
chlorantraniliprole Coragen 1.67 SC Prevathon 0.43 SC	 5.0-7.0 oz 20.0-27.0 oz	0.065-0.09	 18.3-25.6 4.7-6.4	4 hr	21 d	5-d interval/ application

Varieties containing Bt endotoxins will provide excellent control of tobacco budworm. Insecticides listed for tobacco budworm will provide effective alternatives to the pyrethroids for early- to late-season control where there have been control failures, and for use in resistance management. Indoxacarb and spinosad will conserve beneficial insects and spiders. Spinosad and all of the pyrethroids have activity on eggs of bollworm/tobacco budworm. When treatments are applied using an egg threshold, some eggs will be killed prior to larval emergence. Steward has low ovicidal activity, but when applied to eggs in the blackhead stage, larvae may be killed soon after emergence from consuming the eggshells. BEFORE FIRST BLOOM, in cotton varieties that do not contain Bt endotoxin(s), treat when 15 small (<0.25 inch) larvae are found per 100 plant terminals, or 20% of squares are damaged. AFTER FIRST BLOOM, in non-Bt cotton, insecticide should be applied at 20 or more eggs, 3 small larvae, or 5% damaged squares per 100 plants.

Table 51. SOYBEAN LOOPER AND CABBAGE LOOPER

Product	Product/acre	Lb ai/acre	Acre/gal	REI	PHI	Comments
Bt cotton	-	-	-	-	-	
spinosad Tracer 4 SC Blackhawk 36 WG	 2.14-2.9 oz 2.4-3.2 oz	 0.067-0.09 0.054-0.072	 44-60 -	4 hr	28 d	Existing stocks of Tracer
indoxacarb Steward 1.25 EC	 6.7-9.2 oz	0.065-0.09	 14-19	12 hr	14 d	
novaluron Diamond 0.83 EC	 6.0-12.0 oz	0.039-0.078	 10.7-21.3	12 hr	30 d	
methoxyfenozide Intrepid 2 F	 4.0-10.0 oz	0.0625-0.156	 12.8-32	4 hr	14 d	
emamectin benzoate **(R)** Denim 0.16 EC	 8.0-12.0 oz	0.01-0.015	 10.7-16	12 hr	21 d	Spider mite suppression
flubendiamide Belt 4 SC	 2.0-3.0 oz	0.0625-0.094	 42.6-64	12 hr	28 d	Can use until supply gone

Varieties containing two or more Bt endotoxins will provide excellent control of loopers. Apply an insecticide treatment when there is 25% or more defoliation and harvestable bolls are still developing. There are two species of loopers that defoliate cotton. The cabbage looper is generally controlled by any of the listed insecticides. The soybean looper is more difficult to control and is resistant to most insecticides. Varieties producing two or more Bt toxins will provide very good control of loopers.

Table 52. SPIDER MITES

Product	Product/acre	Lb ai/acre	Acre/gal	REI	PHI	Comments
chlorpyrifos **(R)**		0.47-0.50		24 hr	14 d	Do not graze treated areas or use gin trash as feed
Lorsban 4 E	16.0 oz	(0.50)	8			
Nufos 4 E	16.0 oz	(0.50)	8			
Lorsban Adv 3.755	16.0 oz	(0.47)	8			
bifenthrin **(R)**		0.06-0.1		12 hr	14 d	Higher rates required for adequate control
Discipline 2 EC	3.8-6.4 oz		20-33.7			
Brigade 2 EC	3.8-6.4 oz		20-33.7			
Fanfare 2 EC	3.8-6.4 oz		20-33.7			
Bifenture 2 EC	3.8-6.4 oz		20-33.7			
propargite		0.82-1.69		7 d	50 d	Do not apply until plants are 12 in tall
Comite 6.55	16.0-32.0 oz		4-8			
Comite II 6	20.0-36.0 oz		3.55-6.4			
spiromesifen		0.125-0.25		12 hr	30 d	Per season 32 oz limit 16 oz limit
Oberon 2 SC	8.0-16.0 oz		8-16			
Oberon 4 SC	4.0-8.0 oz		16-32			
etoxazole		0.03-0.045		12 hr	28 d	Max of 1 application
Zeal 72.7 WSP	0.66-1.0 oz		-			
abamectin **(R)**		0.009-0.0188		12 hr	20 d	32 oz limit per season
Agri-Mek 0.15 EC	8.0-16.0 oz		8-16			
Zoro 0.15 EC	8.0-16.0 oz		8-16			
fepyroximate		0.05-0.1		12 hr	14 d	Limit of 2 pt per season
Portal 0.4	16.0-32.0 oz		4-8			

Infestations of spider mites usually appear in border rows of a field or sometimes in isolated spots within a field. When mites first appear, treating border rows or spot treating may prevent outbreaks.

Table 53. STINK BUGS

Product (non-pyrethroids)	Product/acre	Lb ai/acre	Acre/gal	REI	PHI	Comments
dicrotophos **(R)** Bidrin 8 E	4.0-8.0 oz	0.25-0.5	16-32	6 d	30 d	16 oz limit post bloom. Low rates for tank mix only
acephate Orthene/Acephate 97 Orthene/Acephate 90	0.52-0.77 lb 0.55-0.83 lb	0.5-0.75	- -	24 hr	21 d	
oxamyl **(R)** Vydate 3.77 CLV	13.6-17.0 oz	0.4-0.5	7.5-9.4	48 hr	14 d	
novaluron Diamond 0.83 EC	9.0-14.0 oz	0.058-0.09	9.1-14.2	12 hr	30 d	Effective on nymphs only
Product (pyrethroids)	**Product/acre**	**Lb ai/acre**	**Acre/gal**	**REI**	**PHI**	**Comments**
bifenthrin **(R)** Discipline 2 EC Brigade 2 EC Fanfare 2 EC Bifenture 2 EC	 2.6-6.4 oz 2.6-6.4 oz 2.6-6.4 oz 2.6-6.4 oz	0.04-0.1	 20-50 20-50 20-50 20-50	12 hr	14 d	Control of spider mites at high rates
beta-cyfluthrin **(R)** Baythroid XL 1 EC	1.6-2.6 oz	0.0125-0.02	49-80	12 hr	0 d	
lambda-cyhalothrin **(R)** Karate Z 2.08 CS Karate 1 EC Silencer 1 EC Lambda-Cy 1 EC	 1.6-2.5 oz 3.2-5.12 oz 3.2-5.12 oz 3.2-5.12 oz	0.025-0.04	 50-80 25-40 25-40 25-40	24 hr	21 d	
cypermethrin **(R)** Up-Cyde 2.5 EC	2.0-5.0 oz	0.04-0.1	25-64	12 hr	14 d	
zeta-cypermethrin/ bifenthrin **(R)** Hero 1.24 EC	5.2-10.3 oz	0.05-0.1	12.4-24.6	12 hr	14 d	
esfenvalerate **(R)** Asana XL 0.66 EC	9.6 oz	0.05	13	12 hr	21 d	
gamma-cyhalothrin **(R)** Declare 1.25 CS	1.28-2.05 oz	0.0125-0.02	63-100	24 hr	21 d	
zeta-cypermethrin **(R)** Mustang Max 0.8 EC	2.64-3.6 oz	0.017-0.0225	35-48	12 hr	14 d	
alpha-cypermethrin **(R)** Fastac 0.83 EC	3.6 oz	0.023	35.5	12 hr	21 d	

Treat when medium-sized bolls display symptoms of feeding injury by week of bloom (50, 30, 10, 10, 10, 20, 30, 50%) and stink bugs are present. Begin scouting for stink bugs when small bolls appear. Consider using a more aggressive (i.e. 10%) threshold during weeks 3-5 of bloom, as bolls developing during this growth stage are particularly susceptible. Randomly select at least 25 bolls (at least a quarter [1 inch] in diameter) per field (add 1 additional boll for each acre exceeding 25 acres). Break each boll open and examine the carpal walls, lint, and seeds for injury symptoms.

Look for the presence of warty growths on the carpal walls and for discolored seed and lint. To ensure the accuracy of this sampling method, do not deviate from weekly checking of quarter-size diameter bolls. One may also rate an infestation based upon numbers of stink bugs by using a 3-ft beat cloth. When this method is used, an insecticide treatment will be warranted for 1 or more stink bugs per 6 feet of row. Carefully approach and shake the plants on at least 30 feet of row (10, 3-ft samples). Pyrethroids applied for bollworm control will generally provide control of stink bugs as well. Bidrin should be used in a pyrethroid tank-mix in fields with infestations predominated by brown stink bugs. Be especially vigilant for stink bugs when no treatments are being applied for control of caterpillars.

Table 54. WHITEFLIES

Product	Product/acre	Lb ai/acre	Acre/gal	REI	PHI	Comments
acephate		0.5-1.0		24 hr	21 d	
Orthene/Acephate 97	8.2-16.5 oz		-			
Orthene/Acephate 90	8.9-17.8 oz		-			
acetamiprid		0.075-0.1		12 hr	28 d	Ovicidal activity
Assail 30 SG	4.0-5.3 oz		-			
Assail 70 WP	1.7-2.3 oz		-			
Intruder 70 WSP	1.7-2.3 oz		-			
thiamethoxam		0.05-0.0625		12 hr	21 d	5 oz limit for season
Centric 40 WG	2.0-2.5 oz		-			
imidacloprid		0.031-0.0625		12 hr	14 d	
Couraze 4 F	1.0-2.0 oz		64-128			
Couraze 2 F	2.0-4.0 oz		32-64			
Admire Pro 4.6	0.9-1.7 oz		75-142			
pyriproxyfen		0.0538-0.067		12 hr	28 d	An IGR with slow activity
Knack 0.86	8.0-10.0 oz		12.8-16			

Treat fruiting cotton when 50% of plant terminals have whiteflies present in heavy clusters on the undersides of leaves and immatures are present. Treat mature cotton when clusters of whiteflies are present in terminals, bolls are opening, and honeydew is found. Infestations are rare and usually bandedwinged whiteflies. Use higher rates for suppression of difficult-to-control silverleaf whiteflies.

Table 55. MULTIPLE PESTS – PRE-MIXED OR CO-PACKAGED PRODUCTS

Product	Product/acre	Lb ai/acre	Acre/gal	REI	PHI	Comment
imidacloprid/*beta*-cyfluthrin **(R)** Leverage 360	2.8-3.2 oz	0.066-0.075	40-45.7	12 hr	14 d	Pre-mixed
thiamethoxam/*lambda*-cyhalothrin **(R)** Endigo 2.06 ZC	3.5-6.0 oz	0.056-0.096	21.3-36.6	24 hr	21 d	Pre-mixed
imidacloprid/bifenthrin **(R)** Brigadier 2 SC	3.8-7.7 oz	0.06-0.12	16.6-33.7	12 hr	14 d	Pre-mixed
spinosad/*gamma*-cyhalothrin **(R)** Consero CP	1 unit per 32-45 acres	-	-	24 hr	28 d	Co-pack
dicrotophos/bifenthrin **(R)** Bidrin XP II	10.5-12.8 oz	0.41-0.5	-	6 d	30 d	Pre-mixed
chlorantraniliprole/*lambda*-cyhalothrin **(R)** Besiege 1.25 ZC	6.5-12.5 oz	0.063-0.122	10.2-19.7	24 hr	21 d	Pre-mixed
chlorpyrifos/*gamma*-cyhalothrin **(R)** Cobalt 2.55	26.0-38.0 oz	0.518-0.757	3.37-4.9	24 hr	21 d	Pre-mixed
chlorpyrifos/*lambda*-cyhalothrin **(R)** Cobalt Advanced 2.63	16.0-38.0 oz	0.328-0.78	3.37-8.0	24 hr	21 d	Pre-mixed
bifenthrin/avermectin **(R)** Athena 0.87	10.0-17.0 oz	0.068-0.115	7.5-12.8	12 hr	20 d	Pre-mixed
diflubenzuron/*lambda*-cyhalothrin **(R)** DoubleTake 3	3.0-4.0 oz	0.07-0.0938	32-42.7	24 hr	21 d	Pre-mixed
methoxyfenozide/spinetoram Intrepid Edge 3	4.0-8.0 oz	0.094-0.188	16-32	4 hr	28 d	Pre-mixed

For control of multiple pests exceeding thresholds, including but not limited to various combinations of the following: bollworm, beet and fall armyworms, grasshoppers, aphids, plant bugs, stink bugs, and spider mites.

ai = active ingredient; **(R)** = Restricted use; **REI** = re-entry interval; **PHI** = pre-harvest interval

TREATMENT TIPS

• Scout your fields regularly to determine insect population levels and to time insecticide applications.

• Where control problems occur, check your sprayer calibration and insecticide rates to ensure they are correct.

Be especially suspicious of high percentages of bollworms surviving multiple applications of pyrethroids. Suspected resistance problems should be reported to county agents immediately.

• Use high rates, and avoid low rates.

• Insecticides will be much more effective against bollworms when applied within the first 48 hr after hatch-out.
• Use higher spray volumes during hot weather and when control of bollworms is difficult.
• Applying insecticides in oil may increase their effectiveness during unusually hot weather or during rainy weather.
• Hollow cone nozzles are superior to flat fan nozzles in getting good coverage of leaves and other plant parts.
TX6 or TX8 tips provide excellent coverage at 7 to 10 gallons per acre and 60 psi.
• CAUTION: It is prohibited to spray blooming cotton with pyrethroids when bees are actively foraging.

HARVEST AND GIN FOR QUALITY

Producing a high-quality fiber should be the objective of every cotton producer. The dilemma is that the highest quality is reached the first day the individual boll opens, and not all bolls open the same day. Lint quality begins deteriorating immediately after the boll fully opens due to environmental factors. To harvest maximum quality and value from the crop, timing of defoliation and harvest is critical.

Defoliation should be delayed until the last bolls one expects to harvest reach physiological maturity. The industry standard is to wait until 60 to 65 percent of the bolls are open to apply a defoliant and until 90 percent are open to apply a desiccant. Harvest should begin as soon as the leaves drop from the plant, which is normally seven-to-ten days after the defoliant is applied. Harvest should be completed within 18 to 20 days.

Lint moisture content is a determining factor for beginning harvest on any specific day. Cotton should not be picked when the moisture content is above 10 percent. It is preferable to wait until the lint moisture content is 8 percent or less. Cotton picked wet will be more subject to heat damage, more difficult to gin, and generally reduced in quality and value. Wet cotton in a module or packed trailer can result in the loss of the entire load.

The best way to determine lint moisture content is to use a moisture meter. In the event you do not have access to a moisture meter, there are two methods of estimating lint moisture content — by feel or knowing the relative humidity. The feel method involves simply picking a few bolls and squeezing the seed cotton. If the cotton fluffs back when released, it is probably dry enough to start picking.

A more reliable method involves knowing the relative humidity. The equilibrium moisture content of cotton is 10 percent when the relative humidity is 70 percent. When the humidity drops to 70 percent, allow approximately one-half hour for the moisture in the fiber to drop to 10 percent. This method works for cotton that has previously been open and dry enough to pick.

On a typical clear day, the humidity will be above 90 percent in the early morning, drop to 40 to 50 percent during the day, and go back above 90 percent at night. Cotton is rarely dry enough to harvest before 9 a.m. or after dark.

Cotton should be kept as clean as possible during the harvesting operation. The more cotton is handled and moved, the more trash is embedded in the lint which is difficult to remove. The picker can pick and deliver high-quality cotton provided it is set up and operated properly.

To get the picker ready for harvest, you should follow the manufacturer's recommendations for servicing and setup. Pay particular attention to the spindles and replace those that are worn or bent.

You can check for worn spindles by using a sharp pocket-knife. Slide the point of the blade perpendicular along the machined kerf in the spindle. If the blade catches on the barbs, then the spindle is still usable. If the blade does not catch, then the spindle should be replaced. Refer to Clemson University publication EC 648, *Cotton Picker Management & Harvesting Efficiency,* for additional information on cotton picker management.

The moistener pads and doffers should be in good condition and properly adjusted. Clearance between the doffers and spindles should be about the thickness of a dollar bill.

Lubricants should not be allowed to come into contact with the cotton that is to go to the gin. Wipe any grease and oil from the picker head prior to going to the field. Many picker operators do not keep the picker clean during harvest. The access doors and cleaning grates should be cleaned after each dump. The purpose of cleaning the grates is to remove as much trash in the field as possible. The grower should strive to deliver to the gin the cleanest cotton possible. A higher-quality bale will be obtained if the trash is kept out before it gets to the gin.

The ginner cannot improve the quality of the cotton. The best they can do is maintain the quality that is delivered. Generally, the maximum return to the grower is obtained when only two lint cleaners are used after the gin stand. Excessive drying and cleaning at the gin means lower quality and less cotton in the bale. Cotton with a lint moisture between 6 and 8 percent gins best.

For maximum benefit to the grower, the harvester should be utilized to its full capacity throughout the harvest season. A thorough preventative maintenance

program will help minimize down time. Efficiency can be improved by keeping the travel time to the dumping area to a minimum and eliminating inefficient field layout. Cotton yields and fiber quality are reduced whenever harvesting is delayed for any reason.

Take the time at the beginning of each harvest season to train the picker operators. Review the operator's manual with those that are going to be operating the machinery before the harvest season begins. Insist on good safety habits and avoid extreme fatigue. Make sure maintenance and adjustments are performed when needed.

SEEDCOTTON MODULES - QUALITY PRESERVATION

There are significant advantages to the grower and ginner to handle seedcotton in modules. Picker efficiencies are improved because they do not have to wait for empty trailers, and the ginner can extend their ginning season. A lot of cotton can be put into a module. A 32-foot module will hold from 12 to 14 bales of seedcotton. A 24-foot module usually contains eight to 10 bales. With this amount of cotton in one module, it is very important to handle and store them properly. The first step in producing high quality modules is site selection for placement of the module.

Site Selection. Modules should be constructed on high ground that is not subject to flooding. They should not be placed on freshly disturbed soil or on areas with tall grass. Tall grass can hold a lot of moisture, which can get into the module, and if the grass should get into the cotton, the quality of lint will be reduced. The best place to build a module is on closely mowed sod, located away from power lines, and protected from fire. The module should be located in such a way as to provide access for the pickers to dump into it from both sides. Plan for bad weather; place the modules in a position that is accessible, should wet weather set in.

Module Construction. Modules across South Carolina are constructed in a variety of shapes. A well-shaped module will look like a giant loaf of homemade bread, with the highest point in the center and tapering to the ends and sides. The top of the module should be shaped so that water will not puddle in the covering and will run off.

If your cotton picker or boll buggy does not have metered dumping, use the tamper to spread the cotton so that you can evenly pack the module. The last dump should be in the middle of the module and spread to each end so that you can create the desirable shape.

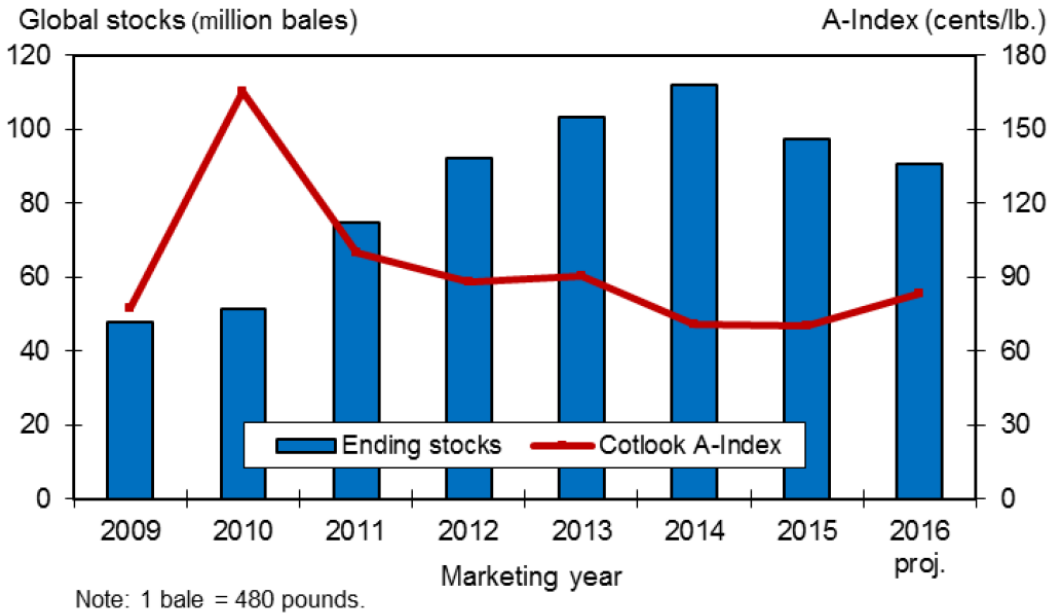
Cover Selection. Price is not always the best criterion for selecting a cover. The cover should be durable enough to stand up to wind and sunlight. Ultraviolet light inhibitors are very important to the longevity of plastic materials. Covers should be checked for holes prior to being placed on the module. Get underneath the cover, and if you see light coming through holes, the cover should be repaired or discarded. Do not use covers that have holes in them. There is too much at risk to take a chance with a cover that is not completely watertight.

Module Preservation. Modules should be built with seedcotton that is less than 12 percent moisture. If you put dry cotton in the module and do not allow it to get wet, it will store for many months without quality deterioration. However, each module should be monitored after construction for seven to 10 days to ensure high-quality lint. Check the temperature of the module with a probe sensor soon after it has been constructed. Then check each day for at least 10 days, and then after any significant rain or severe storm. If the temperature should rise more than 20 ^{o}F above the first reading, the module should be ginned immediately.

2017 COTTON ECONOMIC OUTLOOK

The start of 2017 is looking more promising for producers from a cost and returns perspective as futures prices are trading at their highest level since July of 2014. December 2017 futures approached 75 cents per pound providing hedging and contracting opportunities not seen since 2014. Last year US and major global cotton growers produced larger crops recovering from a low 2015 production level. The increase in global production is still below total consumption as global ending stocks are projected to drop 7% to from the 2015/16 marketing year. Consumption is seeing slow growth having to compete with lower-priced manmade fiber, however the recent trend is somewhat encouraging. Domestic mill use is estimated to be flat while US exports continue grow. US shipment commitments are up 5 million bales over last year. China sold 12 M bales from their stockpile of cotton held in national reserves between May and September of 2016. They are expected to resume sales of stocks in March 2017. This cotton is believed to be poor quality cotton and thus demand for good quality cotton picked up in 2016 helping the US as it had quality cotton to sell. Bullish indicators are an apparent increased demand with the price of cotton rising above 70 cents per pound and China selling old reserves thus reducing global stocks. Major concerns include cotton's competitiveness with synthetic fibers (the market share of fiber imports has flipped in favor of synthetic fiber since 2011), a global economic slowdown, trade disruptions with China, and the value of the US dollar. An issue lingering in global cotton production is Monsanto's cotton seed licensing issue with India. Pulling Monsanto's new and old technology from India could have implications in export market due to reduced India production.

Figure 4
Global cotton stocks and prices



Note: 1 bale = 480 pounds.
Sources: Cotlook and USDA, Interagency Commodity Estimates Committee.

While prices have improved by around 10 cents per pound from a year ago, cotton profitability will be highly sensitive to production and weather fluctuations. Margins are low even at current prices. Low yields for South Carolina in 2015 (547 lb/ac) and 2016 (678 lb/ac) put a tremendous hurt on cotton farmers financially. A better than average year yield wise is needed to go along with improved prices. The question for 2017 is what will the planted acreage response to better cotton prices. The National Cotton Council acreage survey projected an increase of 1 million acres to 11 million acres total in 2017. The survey responses show an increase in cotton acres in the Delta and Southwest regions. The Southeast was shown as steady by National Cotton Council survey. The USDA Outlook Forum during the last week of February forecasted cotton acreage at 11.5 million acres. Planting intentions for cotton is expected to be closer to 12 million acres and an increase in the Southeast with the recent price improvement. Returns to dryland and irrigated production appear to be competitive with other crops in 2017. Credit availability is still a major concern as banks have tightened their lending limits and terms and rates could rise to offset losses to banks' portfolios. Variable costs are expected to be steady in 2017 budgets unless fuel and fertilizer prices rise during planting. Seed prices for major crops aren't expected to increase by much if at all. Peanut seed could be the exception.

Figure 2

U.S. cotton exports and share of global trade

Note: 1 bale = 480 pounds.

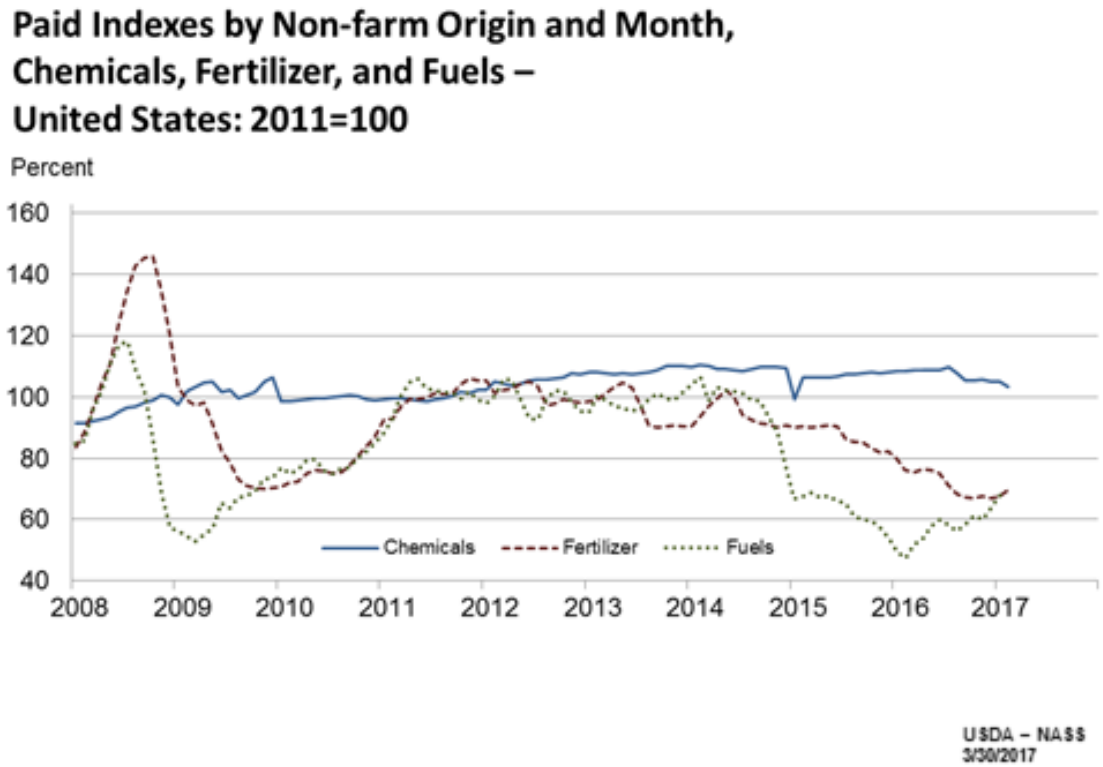
Source: USDA, *World Agricultural Supply and Demand Estimates* reports.

Seed, Fertilizer and Chemicals - Seed cost for major crops aren't expected to increased overall. Varieties with new technology and the most popular varieties could see some increases. Peanuts is likely the exception where seed prices are expected to increase over last year. A seed price of $2.35 per 1,000 seed for cotton is used in the

budget. Fertilizer prices have trended down recently but prices could tighten as Spring approaches. The nitrogen price is estimated at $0.52 per pound of nutrient. Phosphorous is estimated at $0.51 per pound and potassium at $0.40 per pound. The lime price used in the budget is $47.50 per ton. Chemical costs in general have been steady and more recently trending down with availability of generics widely utilized by growers.

Cost of Borrowed Funds – The interest rate charged is dependent upon what lending institutions pay for funds they lend. Traditionally loans are based on the prime rate plus 1 to 2 percent. Low prime lending rates moved banks to adjust the margin with some going to 3 points above prime. Farmers in good financial standing should be able to qualify for near the same rates as 2016 on operating loans. The 2017 rate is estimated in the budget at 5%. Credit availability is still a concern for growers as lenders maintain tighter limits and utilize FSA guaranteed loans.

Fuel and Energy Costs – Fuel and oil prices dropped significantly beginning in 2015 and bottomed in 2016. Some increase in fuel prices could be expected in 2017. The budgeted price for diesel is $1.80 per gallon in the 2017 budget. The irrigated cotton budget charges an average of $5 per acre inch of water.



Labor and Repairs – Operator labor rates are estimated $11.25 per hour in the 2017 budget. Machinery sizes and operations were updated in the 2017 budget to reflect updated and larger equipment. Machinery repairs are increased reflecting higher cost of equipment and parts.

Breakeven Yield and Price – Note the box at the bottom of the front page of the cotton budget which shows breakeven yields and prices. At the budgeted yield of 750 lb/ac for dryland cotton, the breakeven yield to cover variable costs for conventional tillage is 567 lb/ac and 565 lb/ac for strip-till. The breakeven yield to cover total costs is 872 lb/ac for conventional tillage and 862 lb/ac for strip-till. Breakeven prices to cover variable costs are $0.535/lb for conventional and $0.532/lb for strip-till. For irrigated cotton at the budgeted yield of 1000 lb/ac, the breakeven yield to cover variable costs for conventional tillage is 626 lb/ac and 627 lb/ac for strip-till. The breakeven yield to cover total costs is 1,070 lb/ac for conventional tillage and 1001 lb/ac for strip-till. Irrigated breakeven prices to cover variable costs are $0.437/lb for both conventional and strip-till. The breakeven price for total costs is $0.772/lb for conventional and $0.764lb for strip-till. The budget estimates include a charge for land rent (land rent + irrigation = $160 on irrigated budget) and overhead. The net return to risk and management is an estimate of covering all economic costs, cash and non-cash including depreciation.

The 2017 cotton budgets and other agronomic crop budgets can be downloaded from the Extension Agribusiness Team webpage at:
http://www.clemson.edu/extension/agribusiness/enterprise-budgets.html

Contact your local county Clemson Cooperative Extension Agent for help in accessing and using these tools for your operation.

CLEMSON COOPERATIVE EXTENSION

Last revised: 02/06/2017

COTTON - B2RF or WRF Conventional Tillage

ESTIMATED COSTS AND RETURNS PER ACRE
750 POUND YIELD

	UNIT	QUANTITY	PRICE OR COST/UNIT	TOTAL PER ACRE	YOUR FARM
1. GROSS RECEIPTS					
COTTON LINT	LBS	750.00	$0.7200	$540.00	
COTTON SEED	LBS	1253.00	$0.0950	$119.04	
TOTAL RECEIPTS:				**$659.04**	
2. VARIABLE COSTS					
SEED	THOU.	37.50	$2.35	$88.13	
FERTILIZER					
NITROGEN	LBS	70.00	$0.52	$36.40	
PHOSPHATE	LBS	30.00	$0.51	$15.30	
POTASH	LBS	80.00	$0.40	$32.00	
BORON	LBS	0.50	$1.55	$0.78	
SULFUR	LBS	10.00	$0.31	$3.00	
LIME (PRORATED)	TON	0.33	$47.50	$15.68	
HERBICIDES	ACRE	1.00	$32.44	$32.44	
INSECTICIDES	ACRE	1.00	$22.12	$22.12	
GROWTH REG. & DEFOLIANTS	ACRE	1.00	$14.12	$14.12	
SCOUTING	ACRE	1.00	$8.50	$8.50	
GINNING	LBS	750.00	$0.120	$90.00	
CHECK-OFF FEE	BALE	1.56	$1.00	$1.56	
BOLL WEEVIL ERADICATION	BALE	1.00	$1.50	$1.50	
CROP INSURANCE	ACRE	1.00	$20.00	$20.00	
TRACTOR/MACHINERY	ACRE	1.00	$100.78	$100.78	
LABOR	HRS	2.23	$11.25	$25.09	
INTEREST ON OP. CAP.	DOL.	$253.70	5.0%	$12.69	
TOTAL VARIABLE COSTS:				**$520.09**	
3. INCOME ABOVE VARIABLE COSTS:				**$138.95**	
4. FIXED COSTS					
TRACTOR/MACHINERY	ACRE	1.00	$133.01	$133.01	
TOTAL FIXED COSTS:				**$133.01**	
5. OTHER COSTS					
LAND RENT	ACRE	1.00	$60.00	$60.00	
GENERAL OVERHEAD	DOL.	$520.09	7.0%	$36.41	
TOTAL OTHER COSTS:				**$96.41**	
6. TOTAL COSTS:				**$749.51**	
7. NET RETURNS TO RISK AND MANAGEMENT:				**-$90.47**	

BREAK-EVEN YIELD			**BREAK-EVEN PRICE**	
VARIABLE COSTS	567	LBS	VARIABLE COSTS	$0.5347
TOTAL COSTS	872	LBS	TOTAL COSTS	$0.8406

*Seed cost includes tech. fee and treatment. Please adjust accordingly if using Thimet or Aldicarb
* PLEASE NOTE: THIS BUDGET IS FOR PLANNING PURPOSES ONLY.

COTTON - B2RF or WRF

PER ACRE MACHINERY AND LABOR REQUIREMENTS FOR 750 LBS COTTON - STACKED

MONTH	OPERATION	TIMES OVER	LABOR HOURS	MACHINE HOURS	VARIABLE COSTS	FIXED COSTS
3	LIGHT DISKING W/ HERBICIDE 16'	1.00	0.17	0.15	$2.82	$3.11
3	SUBSOILER-BEDDER 8-ROW	1.00	0.13	0.12	$4.43	$4.89
5	PLANTER W/ SPRAYER 8-ROW	1.00	0.13	0.12	$3.12	$4.62
3,6,7,8&9	SELF PROPELLED SPRAYER 90'	6.00	0.07	0.06	$4.74	$5.88
6	HERBICIDE APPLICATOR 12'	1.00	0.17	0.15	$1.58	$1.44
10	COTTON PICKER 6-ROW (500 hp W/MC	1.00	0.32	0.29	$84.09	$113.07
PER ACRE TOTALS FOR SELECTED OPERATIONS			0.99	0.89	$100.78	$133.01
UNALLOCATED LABOR(HRS./AC.)			1.24			

INCOME ABOVE VARIABLE COSTS AT DIFFERING YIELDS AND PRICES

YIELD (LBS)		PRICE ($/lbs.)				
LINT ——————————>>		$0.5760	$0.6480	$0.7200	$0.7920	$0.8640
SEED ——————>>		$0.0760	$0.0855	$0.0950	$0.1045	$0.1140
600	1002	-$80.72	-$28.00	$24.73	$77.44	$130.17
675	1127	-$37.25	$22.06	$81.37	$140.67	$199.98
750	1253	$6.30	$72.20	$138.11	$204.01	$269.91
825	1378	$49.76	$122.25	$194.74	$267.23	$339.72
900	1503	$93.23	$172.31	$251.39	$330.46	$409.54

CHEMICAL USE ASSUMPTIONS FOR 750 LBS COTTON B2RF OR WRF

		UNIT	QUANTITY	PRICE OR COST/UNIT	TOTAL PER ACRE	MONTH
HERBICIDES						
	pendimethalin (Prowl)	PT	2.40	$3.44	$8.25	MAR
	reflex	PT	1.00	$6.44	$6.44	MAR
	glyphosate (generic)	OZ	64.00	$0.15	$9.50	2X JUN
	msma	GAL	0.16	$26.50	$4.24	JUN
	prometryn (Caparol)	PT	1.20	$3.34	$4.01	JUN
INSECTICIDES						
	lambda-cyhalothrin (Karate-Z)	OZ	5.00	$2.77	$13.87	2X JUL/AUG
	acephate (Orthene)	OZ	16.00	$0.52	$8.25	JUN
GROWTH REGULATOR & DEFOLIANTS						
	mepiquat chloride (generic)	OZ	16.00	$0.05	$0.75	2X JUN/JUL
	ethephon (Prep)	PT	1.33	$2.94	$3.91	SEP
	carfentrazone (Aim)	OZ	1.60	$5.91	$9.46	SEP
	TOTAL:				$68.68	

The above listed chemicals are examples and do not imply exclusive recommendations by Clemson University. Contact your local Extension Agent and consult the South Carolina Pest Management Handbook for more information.

CLEMSON COOPERATIVE EXTENSION

Last revised: 02/06/2017

COTTON - B2RF or WRF (Strip-Till)

ESTIMATED COSTS AND RETURNS PER ACRE
750 POUND YIELD

	UNIT	QUANTITY	PRICE OR COST/UNIT	TOTAL PER ACRE	YOUR FARM
1. GROSS RECEIPTS					
COTTON LINT	LBS	750.00	$0.7200	$540.00	
COTTON SEED	LBS	1253.00	$0.0950	$119.04	
TOTAL RECEIPTS:				**$659.04**	
2. VARIABLE COSTS					
SEED	THOU.	37.50	$2.35	$88.13	
FERTILIZER					
NITROGEN	LBS	70.00	$0.52	$36.40	
PHOSPHATE	LBS	30.00	$0.51	$15.30	
POTASH	LBS	80.00	$0.40	$32.00	
BORON	LBS	0.50	$1.55	$0.78	
SULFUR	LBS	10.00	$0.31	$3.00	
LIME (PRORATED)	TON	0.33	$47.50	$15.68	
HERBICIDES	ACRE	1.00	$32.44	$32.44	
INSECTICIDES	ACRE	1.00	$22.12	$22.12	
GROWTH REG. & DEFOLIANTS	ACRE	1.00	$8.62	$8.62	
SCOUTING	ACRE	1.00	$8.50	$8.50	
GINNING	LBS	750.00	$0.120	$90.00	
CHECK-OFF FEE	BALE	1.56	$1.00	$1.56	
BOLL WEEVIL ERADICATION	ACRE	1.00	$1.50	$1.50	
CROP INSURANCE	ACRE	1.00	$20.00	$20.00	
TRACTOR/MACHINERY	ACRE	1.00	$95.97	$95.97	
LABOR	HRS	2.99	$11.25	$33.64	
INTEREST ON OP. CAP.	DOL.	$252.82	5.0%	$12.64	
TOTAL VARIABLE COSTS:				**$518.28**	
3. INCOME ABOVE VARIABLE COSTS:				**$140.76**	
4. FIXED COSTS					
TRACTOR/MACHINERY	ACRE	1.00	$127.33	$127.33	
TOTAL FIXED COSTS:				**$127.33**	
5. OTHER COSTS					
LAND RENT	ACRE	1.00	$60.00	$60.00	
GENERAL OVERHEAD	DOL.	$518.28	7.0%	$36.28	
TOTAL OTHER COSTS:				**$96.28**	
6. TOTAL COSTS:				**$741.89**	
7. NET RETURNS TO RISK AND MANAGEMENT:				**-$82.85**	

BREAK-EVEN YIELD			***BREAK-EVEN PRICE***	
VARIABLE COSTS	565	LBS	VARIABLE COSTS	$0.5323
TOTAL COSTS	862	LBS	TOTAL COSTS	$0.8305

*Seed cost includes tech. fee and treatment. Please adjust accordingly if using Thimet or Aldicarb
* PLEASE NOTE: THIS BUDGET IS FOR PLANNING PURPOSES ONLY.

COTTON - B2RF or WRF (Strip-Till)

PER ACRE MACHINERY AND LABOR REQUIREMENTS FOR 750 LBS COTTON - STACKED

MONTH	OPERATION	TIMES OVER	LABOR HOURS	MACHINE HOURS	VARIABLE COSTS	FIXED COSTS
5	SUBSOILER-PLANTER 6-ROW	1.00	0.34	0.18	$6.35	$7.92
3,6,7,8&9	SELF PROPELLED SPRAYER 90'	5.00	0.40	0.05	$3.95	$4.90
6	HERBICIDE APPLICATOR 12'	1.00	0.17	0.15	$1.58	$1.44
10	COTTON PICKER 6-ROW (500 hp W/MC	1.00	0.42	0.29	$84.09	$113.07
PER ACRE TOTALS FOR SELECTED OPERATIONS			1.33	0.67	$95.97	$127.33
UNALLOCATED LABOR(HRS./AC.)			1.66			

INCOME ABOVE VARIABLE COSTS AT DIFFERING YIELDS AND PRICES

YIELD (LBS)		PRICE ($/lbs.)				
LINT ——————————>>		$0.5760	$0.6480	$0.7200	$0.7920	$0.8640
SEED ——————>>		$0.0760	$0.0855	$0.0950	$0.1045	$0.1140
600	1002	-$78.91	-$26.18	$26.54	$79.26	$131.98
675	1127	-$35.44	$23.87	$83.18	$142.48	$201.79
750	1253	$8.11	$74.01	$139.92	$205.82	$271.72
825	1378	$51.57	$124.06	$196.55	$269.04	$341.53
900	1503	$95.04	$174.12	$253.20	$332.27	$411.35

CHEMICAL USE ASSUMPTIONS FOR 750 LBS COTTON B2RF OR WRF STRIP-TILL

	UNIT	QUANTITY	PRICE OR COST/UNIT	TOTAL PER ACRE	MONTH
HERBICIDES					
pendimethalin (Prowl)	PT	2.40	$3.44	$8.25	MAR
reflex	PT	1.00	$6.44	$6.44	MAR
glyphosate (generic)	OZ	64.00	$0.15	$9.50	2X JUN
msma	GAL	0.16	$26.50	$4.24	JUN
prometryn (Caparol)	PT	1.20	$3.34	$4.01	JUN
INSECTICIDES					
lambda-cyhalothrin (Karate-Z)	OZ	5.00	$2.77	$13.87	2X JUL/AUG
acephate (Orthene)	OZ	16.00	$0.52	$8.25	JUN
GROWTH REGULATOR & DEFOLIANTS					
mepiquat chloride (generic)	OZ	16.00	$0.05	$0.75	2X JUN/JUL
ethephon (Prep)	PT	1.33	$2.94	$3.91	SEP
carfentrazone (Aim)	OZ	0.67	$5.91	$3.96	SEP
TOTAL:				$63.18	

The above listed chemicals are examples and do not imply exclusive recommendations by Clemson University. Contact your local Extension Agent and consult the South Carolina Pest Management Handbook for more information.

CLEMSON COOPERATIVE EXTENSION

Last revised: 02/06/2017

COTTON - B2RF or WRF (Irrigated, Conventional Tillage)

ESTIMATED COSTS AND RETURNS PER ACRE
1000 POUND YIELD - 80 ACRE CENTER PIVOT - 6" OF WATER

	UNIT	QUANTITY	PRICE OR COST/UNIT	TOTAL PER ACRE	YOUR FARM
1. GROSS RECEIPTS					
COTTON LINT	LBS	1000.00	$0.7200	$720.00	
COTTON SEED	LBS	1670.00	$0.0950	$158.65	
TOTAL RECEIPTS:				**$878.65**	
2. VARIABLE COSTS					
SEED	THOU.	37.50	$2.35	$88.13	
FERTILIZER					
NITROGEN	LBS	90.00	$0.52	$46.80	
PHOSPHATE	LBS	30.00	$0.51	$15.30	
POTASH	LBS	80.00	$0.40	$32.00	
BORON	LBS	0.50	$1.55	$0.78	
SULFUR	LBS	10.00	$0.17	$3.00	
LIME (PRORATED)	TON	0.33	$47.50	$15.68	
HERBICIDES	ACRE	1.00	$39.34	$39.34	
INSECTICIDES	ACRE	1.00	$22.12	$22.12	
GROWTH REG. & DEFOLIANTS	ACRE	1.00	$8.62	$8.62	
SCOUTING	ACRE	1.00	$8.50	$8.50	
GINNING	LBS	1000.00	$0.120	$120.00	
CHECK-OFF FEE	BALE	2.08	$1.00	$2.08	
BOLL WEEVIL ERADICATION	BALE	2.08	$1.50	$3.13	
IRRIGATION MACHINERY/LABOR	IN/ACRE	1.00	$30.00	$30.00	
CROP INSURANCE	ACRE	1.00	$20.00	$20.00	
TRACTOR/MACHINERY	ACRE	1.00	$100.78	$100.78	
LABOR	HRS	2.23	$11.25	$25.09	
INTEREST ON OP. CAP.	DOL.	$290.68	5.0%	$14.53	
TOTAL VARIABLE COSTS:				**$595.88**	
3. INCOME ABOVE VARIABLE COSTS:				**$282.77**	
4. FIXED COSTS					
TRACTOR/MACHINERY	ACRE	1.00	$133.01	$133.01	
IRRIGATION - FIXED - ($/ACRE) - COTT	ACRE	1.00	100.00	$100.00	
TOTAL FIXED COSTS:				**$233.01**	
5. OTHER COSTS					
LAND RENT	ACRE	1.00	$60.00	$60.00	
GENERAL OVERHEAD	DOL.	$595.88	7.0%	$41.71	
TOTAL OTHER COSTS:				**$101.71**	
6. TOTAL COSTS:				**$930.60**	
7. NET RETURNS TO RISK AND MANAGEMENT:				**-$51.95**	

BREAK-EVEN YIELD			**BREAK-EVEN PRICE**	
VARIABLE COSTS	626	LBS	VARIABLE COSTS	$0.4372
TOTAL COSTS	1070	LBS	TOTAL COSTS	$0.7720

*Seed cost includes tech. fee and treatment. Please adjust accordingly if using Thimet or Aldicarb
* PLEASE NOTE: THIS BUDGET IS FOR PLANNING PURPOSES ONLY.

COTTON - STACKED (ROUND-UP READY AND BT)

PER ACRE MACHINERY AND LABOR REQUIREMENTS FOR 1000 LBS COTTON - STACKED

MONTH	OPERATION	TIMES OVER	LABOR HOURS	MACHINE HOURS	VARIABLE COSTS	FIXED COSTS
3	LIGHT DISKING W/ HERBICIDE 16'	1.00	0.17	0.15	$2.82	$3.11
3	SUBSOILER-BEDDER 8-ROW	1.00	0.13	0.12	$4.43	$4.89
5	PLANTER W/ SPRAYER 8-ROW	1.00	0.13	0.12	$3.12	$4.62
3,6,7,8&9	SELF PROPELLED SPRAYER 90'	6.00	0.07	0.06	$4.74	$5.88
6	HERBICIDE APPLICATOR 12'	1.00	0.17	0.15	$1.58	$1.44
10	COTTON PICKER 6-ROW (500 hp W/MC	1.00	0.32	0.29	$84.09	$113.07
PER ACRE TOTALS FOR SELECTED OPERATIONS			0.99	0.89	$100.78	$133.01
UNALLOCATED LABOR(HRS./AC.)			1.24			

INCOME ABOVE VARIABLE COSTS AT DIFFERING YIELDS AND PRICES

YIELD (LBS)		PRICE ($/lbs.)				
LINT ——————————>>		$0.5760	$0.6480	$0.7200	$0.7920	$0.8640
SEED ——————>>		$0.0760	$0.0855	$0.0950	$0.1045	$0.1140
800	1336	-$8.91	$61.38	$131.67	$201.96	$272.25
900	1503	$49.07	$128.15	$207.23	$286.30	$365.38
1000	1670	$107.05	$194.92	$282.78	$370.65	$458.51
1100	1837	$165.02	$261.67	$358.33	$454.98	$551.63
1200	2004	$223.00	$328.44	$433.88	$539.32	$644.76

CHEMICAL USE ASSUMPTIONS FOR 1000 LBS COTTON - STACKED

	UNIT	QUANTITY	PRICE OR COST/UNIT	TOTAL PER ACRE	MONTH
HERBICIDES					
pendimethalin (Prowl)	PT	2.40	$6.31	$15.15	MAR
reflex	PT	1.00	$6.44	$6.44	MAR
glyphosate (generic)	OZ	64.00	$0.15	$9.50	2X JUN
msma	GAL	0.16	$26.50	$4.24	JUN
prometryn (Caparol)	PT	1.20	$3.34	$4.01	JUN
INSECTICIDES					
lambda-cyhalothrin (Karate-Z)	OZ	5.00	$2.77	$13.87	2X JUL/AUG
acephate (Orthene)	OZ	16.00	$0.52	$8.25	JUN
GROWTH REGULATOR & DEFOLIANTS					
mepiquat chloride (generic)	OZ	16.00	$0.05	$0.75	2X JUN/JUL
ethephon (Prep)	PT	1.33	$2.94	$3.91	SEP
carfentrazone (Aim)	OZ	0.67	$5.91	$3.96	SEP
TOTAL:				$70.08	

The above listed chemicals are examples and do not imply exclusive recommendations by Clemson University. Contact your local Extension Agent and consult the South Carolina Pest Management Handbook for more information.

CLEMSON COOPERATIVE EXTENSION

Last revised: 02/06/2017

COTTON - B2RF or WRF (Irrigated, Strip-Till)

ESTIMATED COSTS AND RETURNS PER ACRE
1000 POUND YIELD - 80 ACRE CENTER PIVOT - 6" OF WATER

	UNIT	QUANTITY	PRICE OR COST/UNIT	TOTAL PER ACRE	YOUR FARM
1. GROSS RECEIPTS					
COTTON LINT	LBS	1000.00	$0.7200	$720.00	
COTTON SEED	LBS	1670.00	$0.0950	$158.65	
TOTAL RECEIPTS:				**$878.65**	
2. VARIABLE COSTS					
SEED	THOU.	37.50	$2.35	$88.13	
FERTILIZER					
NITROGEN	LBS	90.00	$0.52	$46.80	
PHOSPHATE	LBS	30.00	$0.51	$15.30	
POTASH	LBS	80.00	$0.40	$32.00	
BORON	LBS	0.50	$1.55	$0.78	
SULFUR	LBS	10.00	$0.17	$3.00	
LIME (PRORATED)	TON	0.33	$47.50	$15.68	
HERBICIDES	ACRE	1.00	$39.34	$39.34	
INSECTICIDES	ACRE	1.00	$22.12	$22.12	
GROWTH REG. & DEFOLIANTS	ACRE	1.00	$8.62	$8.62	
SCOUTING	ACRE	1.00	$8.50	$8.50	
GINNING	LBS	1000.00	$0.120	$120.00	
CHECK-OFF FEE	BALE	2.08	$1.00	$2.08	
BOLL WEEVIL ERADICATION	BALE	1.00	$1.50	$1.50	
IRRIGATION 6"	ACRE	1.00	$30.00	$30.00	
CROP INSURANCE	ACRE	1.00	$20.00	$20.00	
TRACTOR/MACHINERY	ACRE	1.00	$93.53	$93.53	
LABOR	HRS	2.99	$11.25	$33.64	
INTEREST ON OP. CAP.	DOL.	$290.51	5.0%	$14.53	
TOTAL VARIABLE COSTS:				**$595.55**	
3. INCOME ABOVE VARIABLE COSTS:				**$283.10**	
4. FIXED COSTS					
TRACTOR/MACHINERY	ACRE	1.00	$125.01	$125.01	
IRRIGATION	ACRE	1.00	$100.00	$100.00	
TOTAL FIXED COSTS:				**$225.01**	
5. OTHER COSTS					
LAND RENT	ACRE	1.00	$60.00	$60.00	
GENERAL OVERHEAD	DOL.	$595.55	7.0%	$41.69	
TOTAL OTHER COSTS:				**$101.69**	
6. TOTAL COSTS:				**$922.25**	
7. NET RETURNS TO RISK AND MANAGEMENT:				**-$43.60**	

BREAK-EVEN YIELD			***BREAK-EVEN PRICE***	
VARIABLE COSTS	627	LBS	VARIABLE COSTS	$0.4369
TOTAL COSTS	1061	LBS	TOTAL COSTS	$0.7636

*Seed cost includes tech. fee and treatment. Please adjust accordingly if using Thimet or Aldicarb
* PLEASE NOTE: THIS BUDGET IS FOR PLANNING PURPOSES ONLY.

COTTON - STACKED (ROUND-UP READY AND BT)

PER ACRE MACHINERY AND LABOR REQUIREMENTS FOR 1000 LBS COTTON - STACKED

MONTH	OPERATION	TIMES OVER	LABOR HOURS	MACHINE HOURS	VARIABLE COSTS	FIXED COSTS
5	PLANTER W/ SPRAYER 8-ROW	1.00	0.34	0.12	$3.12	$4.62
3,6,7,8&9	SELF PROPELLED SPRAYER 90'	6.00	0.40	0.06	$4.74	$5.88
6	HERBICIDE APPLICATOR 12'	1.00	0.17	0.15	$1.58	$1.44
10	COTTON PICKER 6-ROW (500 hp W/MC	1.00	0.42	0.29	$84.09	$113.07
PER ACRE TOTALS FOR SELECTED OPERATIONS			1.33	0.62	$93.53	$125.01
UNALLOCATED LABOR(HRS./AC.)			1.66			

INCOME ABOVE VARIABLE COSTS AT DIFFERING YIELDS AND PRICES

YIELD (LBS)		PRICE ($/lbs.)				
LINT ——————————>>		$0.5760	$0.6480	$0.7200	$0.7920	$0.8640
SEED ——————>>		$0.0760	$0.0855	$0.0950	$0.1045	$0.1140
800	1336	-$10.21	$60.08	$130.37	$200.66	$270.95
900	1503	$47.77	$126.85	$205.93	$285.00	$364.08
1000	1670	$105.75	$193.62	$281.48	$369.35	$457.21
1100	1837	$163.72	$260.37	$357.03	$453.68	$550.33
1200	2004	$221.70	$327.14	$432.58	$538.02	$643.46

CHEMICAL USE ASSUMPTIONS FOR 1000 LBS COTTON - STACKED

	UNIT	QUANTITY	PRICE OR COST/UNIT	TOTAL PER ACRE	MONTH
HERBICIDES					
pendimethalin (Prowl)	PT	2.40	$6.31	$15.15	MAR
reflex	PT	1.00	$6.44	$6.44	MAR
glyphosate (generic)	OZ	64.00	$0.15	$9.50	2X JUN
msma	GAL	0.16	$26.50	$4.24	JUN
prometryn (Caparol)	PT	1.20	$3.34	$4.01	JUN
INSECTICIDES					
lambda-cyhalothrin (Karate-Z)	OZ	5.00	$2.77	$13.87	2X JUL/AUG
acephate (Orthene)	OZ	16.00	$0.52	$8.25	JUN
GROWTH REGULATOR & DEFOLIANTS					
mepiquat chloride (generic)	OZ	16.00	$0.05	$0.75	2X JUN/JUL
ethephon (Prep)	PT	1.33	$2.94	$3.91	SEP
carfentrazone (Aim)	OZ	0.67	$5.91	$3.96	SEP
TOTAL:				$70.08	

The above listed chemicals are examples and do not imply exclusive recommendations by Clemson University. Contact your local Extension Agent and consult the South Carolina Pest Management Handbook for more information.