

Cotton Questions

1. The cotton plant is a tropical perennial.

The Cotton Physiology Today newsletter “Think Like a Cotton Plant” does a good job covering the topic.

General Cotton Questions

2. Which states in the U.S.A. grow cotton?

Alabama, Arizona, Arkansas, California, Florida, Georgia, Kansas, Kentucky, Louisiana, Mississippi, Missouri, New Mexico, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, and Virginia.

3. **What state grows the most cotton?** Texas, 5.5 to 6.0 million acres each year.

4. **What country grows the most cotton?** China; had a 26.2 million bale crop in 2005.

5. **What country plants the most cotton?** India; planted 22 million acres in 2005.

6. **How much does a bale of cotton weigh?** 480 pounds

7. **How many pounds of cottonseed would you expect per bale of cotton ginned?**

Varies by variety but is in the range of 800 to 900 pounds of cottonseed per bale.

8. **What is a good lint turnout?**

Picker cotton can be above 40 percent. Stripper cotton using a bur extractor can be 32 to 35 percent. Stripper cotton with burs can be as low as 14 percent and as high as 29 percent.

9. **What is a cotton module?**

It is a tool used to compress cotton so it can be stored in the field until it is transported to the gin.

10. **How many bales of cotton does a cotton module contain?**

It will usually be in the range of 8 to 14 bales in a cotton module.

11. **How is cotton harvested?**

Two very different type of harvesters; 1) a picker does a very good job extracting the lint and seed from the bur. It is an expensive machine to purchase and requires a high level of maintenance. 2) a stripper takes the bur, leaves, lint and seed from the plant and the gin removes the waste and separates the lint from the cottonseed. The machine is about half the price of a picker and less maintenance is required.

12. **What is Pima cotton?** *Gossypium barbadense*

13. **Where is Pima cotton grown in Texas?** Most of the Pima cotton is grown in El Paso and Hudspeth Counties.

14. What is Cotton Incorporated?

American cotton growers fund Cotton Incorporated through per bale assessments. Cotton Incorporated is designed and operated to build demand for cotton in the U.S. market and for U.S. cotton in world markets.

Land Preparation

Soils analyzed by the Texas A&M lab provides you with the amount of each nutrient in parts per million. To convert to pounds per acre multiply the parts per million by 2.

15. How much nitrogen and phosphorous will need to be applied to produce a 500 pound bale of cotton?

To meet the need of the cotton crop, 60 pounds of nitrogen and 20 to 40 pounds of phosphorus needs to be applied per bale of cotton produced.

16. When should each macro nutrient be applied? Will soil texture make a difference?

Soil texture would certainly impact this. In sandy soils only half of the nitrogen will need to be applied prior to planting or early in the cotton plants development. The rest of the nitrogen would be applied prior to the one-third grown square stage. In soils that have a high percentage of clay, all of the nitrogen can be applied prior to planting. Phosphorus can be applied prior to planting in both soil types and needs to be placed 6 to 8 inches deep where it can be taken up by the plant root. If potassium is needed, in sandy soil only half of the potassium would be applied prior to planting and the rest applied prior to the one-third grown square stage.

17. What are furrow dikes used for?

Furrow dikes are used to retain water in place across the field. If the furrow dikes are correctly built more than 95 percent of the rain will stay in the field compared to less than 75 percent of the water being retained in an undiked field.

18. When should your PPI herbicides be applied and to what depth?

PPI herbicides need to be applied prior to the germination of the susceptible weed. The herbicide controls weed in the upper inch of soil. The PPI herbicide should not be incorporated below that depth.

19. What impact will a PPI herbicide have on a cotton plant if it is incorporated too deep? If the PPI herbicide is placed below the depth of the cottonseed the developing lateral roots on the cotton plant will stop their growth if they expand into an area that is protected by the herbicide. The lateral roots won't develop off of the tap root until it gets below the herbicide band. In some cases the cotton may grow slowly for several weeks.

Insect Questions

- 20. Thrips cause most of their problems when**
 - d. Cotton growth is slowed due to cool temperatures.

- 21. Thrips damage is characterized by**
 - c. Leaf edges silvering and curling upwards

- 22. Cotton fleahoppers are**
 - c. A problem from pinhead squares to first bloom

- 23. Integrated Pest Management (IPM)**
 - a. Requires an understanding of both crop and pest biologies

- 24. Bollworm moths can be distinguished from tobacco budworm moths by**
 - d. The presence of three to four light colored bands on the budworm moth

- 25. Bollworm/tobacco budworm eggs can be distinguished from cabbage looper eggs by**
 - b. The rounded appearance of the bollworm/budworm egg

- 26. Control of bollworm/tobacco budworms is best achieved when**
 - c. First and second instar larvae are present

- 27. Bollworm/tobacco budworm damage is characterized by**
 - b. Holes in the squares and bolls and presence of webbed or brown frass

- 28. Bollworm/tobacco budworm economic thresholds change as the season progresses.**

- 29. Control of overwintered boll weevils occurs**
 - d. When cotton reaches the first match-head size square

- 30. Boll weevils have**
 - b. Chewing mouthparts

- 31. Aphids in cotton can be distinguished from other insects by**
 - a. The presence of cornicles

- 32. Aphid infestations can be accurately sampled by**
c. Counting aphids on the first fully expanded leaf and a leaf in the middle of the plant
- 33. Aphids cause damage by**
b. Sucking plant juices and reducing carbohydrates to squares and bolls
- 34. Natural enemies do have an effect on treatment decisions.**
- 35. It is false to say that any insect in cotton that is not a pest is a beneficial.**
- 36. A predator is an insect that requires multiple hosts to complete development.**
- 37. Beet armyworm damage is characterized by**
c. Holes in the squares and boll and skeletonizing of bracts and leaves
- 38. Pink bollworm damage is characterized by**
d. Rosetted blooms and no obvious boll damage until bolls are cut open
- 39. Proper clothing for field scouting to limit pesticide exposure consists of**
b. Long pants, long sleeved shirt, socks and shoes
- 40. Hand washing with soap is the most important method of limiting pesticide exposure for field scouts**

Disease Questions

- 41. Ascochyta (wet weather) blight problems can be recognized by**
d. Pale brown to ashen spots on the leaves surrounded by a narrow dark brown border

42. Variety selection. Conventional vs. Biotechnology. Determinate vs. Indeterminate. Stormproof vs Open locks. Selecting a cotton variety from tests previously conducted.

Variety selection is difficult since most varieties are not around more than three or four years. The number of conventional varieties is less than a dozen and most seed companies don't have plans to develop any for public sale. Biotechnology has given a wide range of choices with insect resistant genes and weed resistant genes currently on the market and drought tolerant genes soon to be released. These choices come with a price tag that keeps producers from taking full advantage of the technology. Most of the varieties planted are moderately determinant to indeterminate which allows them to go through a stress period of heat and moisture and still recover and make a decent yield. Most picker cottons are opened boll and easier to harvest with either a picker or a stripper. The stormproof cotton occasionally shows its value when weather delays occur. The stormproof cotton will retain the lint where the lint in the picker cotton generally strings out and yield loss occurs.

43. Cottonseed germination tests. Warm germination test? Cool germination test? Combine the two results to obtain the cool-warm vigor index. What does the number mean? Why is that important?

Generally if planting conditions are poor with marginal soil temperatures, then seed with the highest possible Cool-Warm Vigor Index or CWVI, should be planted. As conditions improve and become more conducive to stand establishment, lower quality seed can be planted. The Cool-Warm Vigor Index, developed by Dr. Norman Hopper--Professor of Seed Physiology at Texas Tech, is a measure of the seed's germination, and vigor. The CWVI is a combination of the warm germination test results (obtained from counts after four days of incubation) and results from a cool germination test (results obtained after seven days of incubation). Seed lots with an index of 160 or greater have "Excellent" vigor, 159-140 is "Good"; 139-120 is "Fair" and less than 120 is "Poor". Generally if planting conditions are poor with marginal soil temperatures, then seed with the highest possible CWVI should be planted. As conditions improve and become more conducive to stand establishment, lower quality seed can be planted. The Texas Department of Agriculture's Seed Laboratory in Lubbock will perform the germination tests for a fee.

44. What is an acceptable level for Free Fatty Acid content in cottonseed kept for planting?

There are several measurements available to determine seed quality. All give a good estimation of quality, but measure different aspects. When all the tests are used in conjunction with each other, a true picture of seed quality is apparent. Free fatty acids (FFA) alone only serves as a rough estimate. In general, cotton seed that contains less than 1% FFA are considered good quality, but seed testing 1.5% or higher may be weak. If the FFA content is above the 2-3% level, something has caused the seed to deteriorate. The standard germination test that is performed on all cotton seed is conducted under ideal conditions. Eighty percent germination seed should produce an 80% stand under warm, ideal planting conditions. It is possible to have low FFA seed with a good warm germ, and still have poor vigor seed.

45. The pointed end of a cottonseed is called a micropyle.

46. What emerges from the pointed end of the cottonseed when it germinates?

The primary root (Radicle)

47. The domed shaped end of the cottonseed is called a chalaza.

Planting

48. What impact does cold temperatures have on newly planted cotton?

If the temperature drops in the 40 to 50 degree range for several days, root cold injury can occur. If the soil temperature is in the 50 to 60 degree range, you can expect the emergence of the crop to be very slow. This slow emergence allows seedling disease more opportunity to damage the root system which will weaken the plant.

49. Should cotton planting be delayed if weeds and wheat are drying down?

If delayed planting is an option then it should be considered since weeds and wheat serve as host to several pests that attack cotton. As wheat dries down the insects move to more succulent plants. If cotton happens to be emerging at that time the impact of the insects feeding on the young cotton can be dramatic and yield losses may result.

50. What should be the soil temperature at planting time?

As a rule of thumb planting should be delayed until the soil temperature at the eight inch depth averages a minimum of 60°F for 10 days (temperature should be taken at 8 a.m.). Allowing soil temperatures to increase before planting will cut the time needed for germination and seedling emergence and helps to ensure healthy, uniform stands.

51. What is the correct planting depth on cotton?

It also is important to use high-quality seed and plant in a firm, well prepared seedbed with adequate moisture. Seed should be planted at a depth of 1 to 2 1/2 inches, depending on soil type and availability of moisture. Planting too deep can significantly reduce plant population and seedling health. It is better to delay planting than to plant seed too deep.

52. What is the recommended seeding rate (plant population) for cotton?

Planting rates should be based on a target plant population. Under irrigation three to four plants per foot on 40-inch rows is adequate for maximum yield. Higher planting rates increase seed costs, have adverse effects on yield and quality and intensify seedling disease problems. Under favorable dryland conditions, a plant population of two to three plants per foot is sufficient on 40-inch rows. Seed size varies among varieties and should be considered when planting. Under dryland conditions, any stand greater than 45,000 plants per acre (3.4 plants per foot) is excessive most years.

53. Will foliar feeding seedling cotton increase yield?

In most cases foliar feeding may help the initial growth and health of the plant but it usually doesn't result in an increase in yield in West Central or Far West Texas.

54. A new node on the main stem is formed every 3 to 5 days.

55. The part of the stem between the two nodes is called an internode.

56. On most picker varieties of cotton the first fruiting branch forms at node number 7 or 8.

57. Why does a fruiting branch have a crooked (zig-zag) shape?

The branches from which fruiting buds arise are called fruiting branches, or sympodia (meaning “multiple feet”), because each fruiting branch contains multiple meristems. Fruiting branches have a “zig-zag” growth habit, as opposed to the straight growth habit of the vegetative branches. The initial growth of a fruiting branch is terminated once a fruiting bud forms. The fruiting branch, however, initiates a new growing point, called an *axillary meristem*. The axillary meristem is located at the base of a leaf that subtends the newly formed fruiting bud. The zig-zag” growth habit is a consequence of the stop-and-go growth of the fruiting branch.

58. On a fruiting branch a new square is formed every 5 to 7 days.

59. Why can't glyphosate herbicide be applied to Roundup Ready Cotton after the fourth true leaf stage?

A late application of glyphosate usually results in fewer seeds being developed. The glyphosate is a systemic herbicide and the material is moved to actively growing tissue. Since it moves glyphosate into the area of the plant where the square is developing it makes changes in the male portion of the flower resulting in less pollen being released and fewer seeds developing. Since lint develops from the seed coat then less lint is developed and yield is reduced.

60. When should I stop soil applied nitrogen applications in a developing cotton crop?

The last soil applied application of nitrogen should be made prior to the 1/3 grown square stage. Uptake of water and nutrients is beginning to increase rapidly at this stage and the plant will need time to recover from root injury resulting from the soil applied application before it reaches the peak uptake period of moisture and nutrients.

61. If nitrogen is lost due to rain after the cotton blooms what should be considered?

Foliar feeding of nitrogen should be considered if you know it will be limiting seed and lint production.

62. How much urea can be applied at one foliar application?

A foliar application of up to 5 pounds of actual nitrogen can be made on a weekly basis without resulting in plant injury as long as the plant is actively growing.

63. How soon after a foliar application of nitrogen will it be detectable in the cotton boll?

The nitrogen can be found in the cotton boll within 6 hours after a foliar application. Within 24 hours more than 80 percent of the nitrogen will move into an unstressed plant.

64. I noticed after the last weather front that I have a lot of small bolls on the ground. Why?

Four days of solid cloud cover resulted in a loss of small cotton bolls. The gap of boll set was due to the cloud cover and carbohydrate stress that resulted. The bolls 1 to 4 days old were aborted by the plant. There is not anything that the producer can do about this. What needs to be watched closely is the plants reaction to the reduced fruitload and the increased amount of soil moisture. If the plant growth is out of control an application of mepiquat chloride may be needed. The sooner it is put on the less that will be needed to get the job done. Basically, you have to get the amount of mepiquat chloride to approximately 10 parts per million to slow plant growth; the larger the plant the more growth regulator needed.

65. When should I consider replanting cotton?

If cotton has less than two plants per foot with a lot of skips then replanting could be considered. If you have a uniform stand with one healthy plant per foot, a normal yield can be achieved if ideal growing conditions and a warm open fall occurs.

66. What should I do about hail damaged cotton stands?

Allow at least five days before trying to assess the damage. Examine the plants looking for scars and bruises and determine the number of healthy plants that remain. If cotton has less than two plants per foot with a lot of skips then replanting could be considered. If you have a uniform stand with one healthy plant per foot, a normal yield can be achieved if ideal growing conditions and a warm open fall occurs.

67. Can it be too hot for cotton?

Yes. The ideal growing temperature is: daytime temperatures from 80 to 92 degrees. Nighttime temperatures from 68 to 78 degrees. If cotton gets above 100 degrees it will go into a survival mode and the plant performance is drastically reduced.

68. What is a heat unit and how is it determined?

For cotton the heat unit is based on a temperature of 60 degrees. This is the lowest temperature that the cotton plant will develop at. To determine the number of cotton heat units for a particular day you take the maximum air temperature and combine it with the minimum air temperature and divide that total by 2 then subtract the base temperature of 60. The heat unit can be used to determine plant emergence, predict development of nodes, estimate boll opening and trigger harvest aid applications.

Plant Mapping

69. Cotyledons. What are they? Why are they unique? Why are they important in regard to height-to-node-ratio?

Cotyledons are the only leaves on the plant that are directly across from each other. Plant height is measured starting at the cotyledon scars and going to the terminal.

70. Height-to-node ratio. How is it determined? What can you learn from it? Management considerations.

After plant height is determined then the number of nodes on the plant is counted. The number of nodes divided into the plant height provides you with the average node length. This is commonly referred to as height-to-node ratio and it tells you how well the plant is growing. If the plant is growing slowly then it is usually due to stress. If the stress can be relieved then plant growth will return to normal. If the plant is growing too rapidly then a plant growth regulator may need to be applied to slow down the plant growth.

71. How is percent boll set determined and why is that important?

The percent boll set is determined by counting the number of fruiting positions (squares or bolls) and this number is divided into the total number of squares and bolls that remain on the plant. In most cases that will provide a number less than 1. Multiply this number by 100 and that gives you the percent of boll set. Until you reach flowering you would like to keep square set at more than 80 percent, after the third week of flowering if the percent of boll set is 75 percent or more the cotton crop is doing well.

72. What percent of the cotton yield comes from first position bolls?

You can find differences on this number but most will agree that at least 70 percent of the total lint yield comes from first position bolls. First position bolls are the first boll developed on the fruiting branches.

73. How do you decide when to apply a growth regulator?

If you measure the length of the top five nodes on the cotton plant and it averages more than 2 inches an application of a plant growth regulator such as mepiquat chloride is needed. The problem is by that time the plant is large and the amount of mepiquat chloride needed to raise the entire plant mass to 10 parts per million is high (16 to 32 ounces per acre). Many irrigated producers will make a mepiquat chloride application when 50 percent of the plants have their first matchhead size squares. This reduces the cost and achieves the same results.

74. Nodes-Above-White-Flower. What can you learn from it? Management considerations.

At the time when the first boom appears on the cotton plant the number of nodes above that position indicates the vigor in the plant. Preferably there would be nine nodes above the top white flower when blooming begins. As the plant retains more bolls and stress increases the white flower will get closer to the top of the plant. When you reach the point that there are only four nodes above the top white flower you have reached cut out and over 95 percent of the bolls that will contribute to yield is now on the plant. Through the use of fertilizer and irrigation the length of boll set can be extended and cut out can be delayed which increase the number of bolls on the plant and ultimately the yield of both seed and lint.

75. What is anthesis?

Like many plant terms, there is more than one way to say something. When you say anthesis has begun it means that the plant is now blooming or flowering.

76. It is true to say that on the first day of bloom most of the potential crop yield exists on the cotton plant.

- 77. What is the flower color of Upland cotton (*Gossypium hirsutum*) on the first day of bloom?** White
- 78. What is the flower color of Pima cotton (*Gossypium barbadense*) on the first day of bloom?** Yellow
- 79. All cotton lint develops from the tiny cells located on the outer surface of the seed.**

Irrigation

80. Is stressing the cotton good for developing drought resistance in the cotton plant?

Root development needs soil moisture to continue in its expansion if you stress the plant then the expansion is reduced in proportion to the amount of stress. To maximize root development you would like to avoid all plant stress.

81. If the cotton plant wilts in the heat of the day--it is time to water? Why?

The cotton plant will wilt during the heat of the day as a survival mechanism. By reducing the leaf surface area there is less leaf area for the light to hit. Within the microclimate of this wilted leaf is lower temperatures and higher relative humidity which allows it to remain alive for a longer period of time. Once the stress is removed (sunset) then the leaves expand and the plant looks healthy the next morning. Just because the cotton plant wilts in the afternoon does not mean that an irrigation is needed.

Fiber Quality

82. The fiber length occurs in 15 to 25 days after bloom.

83. What conditions are needed to reach the genetic fiber length potential of a cotton variety?

Since the fiber length is reached in 15 to 25 days after bloom then the genetic potential of the crop can be reached if all stresses are removed. The two most likely to impact cotton in our area is soil moisture and nutrients. If both are adequate during the time of fiber elongation then the genetic potential can be reached.

84. Micronaire influences start shortly after bloom and continues until the cotton is terminated. What is the micronaire premium range and who is that important to? Why?

Micronaire from a marketing aspect is used as a best guess on cotton maturity and fiber fineness. The desired range is 3.5 to 4.9 and preference is given to the cotton in the 3.8 to 4.2 range. With the fine fiber cottons that we produce now it would be better to incorporate the instruments into the classing of cotton that would accurately measure fiber fineness and then develop the correlations to cotton maturity.

85. Does genetics or environment influence fiber strength the most?

Without question fiber strength is highly influenced by genetics. It may vary by 2 grams per tex in a given year but the strong varieties will be at the top each year and the weak varieties will be at the bottom.

86. How late can a boll be set and develop quality lint?

Definitely discussed often. The question references quality, not open. In our area we need to have a boll started by September 1 to have a good chance to develop quality fiber with weight. The discussion is last date to have an open boll and that is around September 14 but the problem is boll retention is lower, quality lint is not developed and lint weight is low.

87. What should the moisture content of the lint be below before it is packed into a cotton module?

The preference is to have lint at 12 percent moisture or less. If you are measuring module temperature and you have a quick rise or a continued rise in temperature then the gin needs to be contacted and the module processed as soon as possible. Most of the time this relates back to moisture problems in the module.

88. It is true to say if the temperature inside the module rises 20 degrees overnight or passes 120 degrees it should be ginned ASAP.

89. How do you estimate yield by boll counting?

A close guess on yield is based on one boll per inch of row equaling a bale of cotton. With the smaller boll cotton that we are raising this has to be adjusted but it will get you in the ball park most years when your counting mature bolls.

90. How do you estimate yield loss?

Pick up the lint and seed in a know area. Measure the width and length in feet which gives you the square feet and then divide the total square feet picked up by 43560 which will give you the portion of an acre harvested. Weigh the lint and seed and multiply by 0.38 to give you the lint picked up based on a 38 percent turnout. This weight will need to be converted to pounds and divided by the portion of the acre picked up. This will be a good estimate on the amount of lint lost per acre.