

# COTTON PHYSIOLOGY TODAY

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## Think Like a Cotton Plant

Charles Stichler and Kater Hake

*There are great volumes of scientific information on the cotton plant's response to its environment and production inputs. But to better understand the cotton plant and why it responds the way it does, producers need to visualize life from a plant's perspective. In short, "learn to think like a cotton plant."*

If a cotton plant could think, what would be the first thing on its mind? The first thing on a cotton plant's mind would be **survival**. Not survival of the species through reproduction, as many people think, but survival of the individual plant. Remember, that the cotton plant is a perennial plant, a small tree or a large shrub that expects to live for years. Commercially we grow cotton from seed, but the plant is "thinking" it will live for years in a warm tropical environment.



When grown for lint, the cotton plant doesn't know it will die in a few short months. In contrast, most annual plants expect to die, so the plant's energy and responses are focused on seed production. The cotton plant, on the other hand, will respond to luxuriant water and fertility (nitrogen primarily) by



first attempting to grow into a tree. The plant gets "big" and expects to set fruit later. Yet, if stressed too much, the plant will stop growing and shed fruit and leaves to conserve its "energy." The plant "thinks" that if it can just keep from dying, it might make it to the next rain. With sufficient moisture, it can continue to grow and set a crop later. Producers need to first satisfy the plant's desire to survive, with sufficient nutrients, water, sunlight and heat, so the plant will be able to consider the second most important factor.

The second most important thing on the mind of a cotton plant is seed production. When the basic needs of the plant have been met with sufficient but not luxuriant water, fertility (nitrogen), adequate sunlight and heat, it will respond by initiating and retaining fruit. Again, compared to annuals, the position of cotton's reproductive structures indicates that they are of secondary importance. Most annual weeds and grasses position their reproduction forms on the main stem at the top, where as cotton produces fruit off to the side on branches.

Once the plant initiates fruiting, it is optimistic and retains squares. Because square production doesn't take much additional water, energy and nutrients — unless physically damaged —



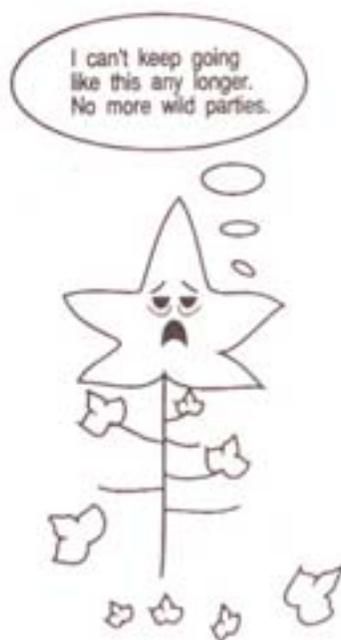
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a square usually will flower. "Pregnancy" (boll and seed production) on the other hand is a severe strain on the plant using up quantities of nutrients and carbohydrates that previously were spent on root and shoot growth. Dan Krieg of Texas Tech University reports that a two bale crop will produce 5,200 pounds of total dry matter per acre in the Texas High Plains. Seed alone makes up about 35% of the total dry weight and contain about 50% of all the nitrogen and phosphorus used by the plant. In addition, the plant must "carry" a boll a minimum of 45 days before it is fully mature.

At or shortly after flowering, the plant makes an important decision — keep the boll or abort it. The plant takes an inventory of its stored nutrients (particularly nitrogen) in the leaves and available nutrients from root uptake. It also checks carbohydrate production in the subtending leaf, and makes an evaluation of available water in the plant. After the plant checks the inventory list, it calculates the

probability of having sufficient supplies to complete the growth and maturation of the boll (particularly the seed). If supplies are good, the decision is made to "stick the boll." If something is lacking, the plant starts the formation of an abscission layer and the fruiting form eventually aborts.



## Last Thing on the Cotton Plant's Mind

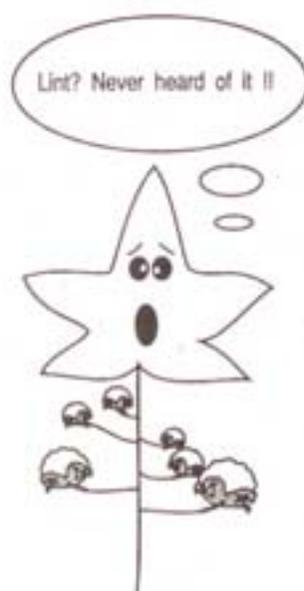
If seed production is the second most important concern on the mind of a cotton plant, then lint production is the last thing on its mind. Lint was once used by the plant to help disperse the mature seed, like the stickers on grass burs, and the parachutes on thistles and dandelion seeds. The cotton plant doesn't care about lint production, much less high quality lint that is long, strong, 3.7 to 4.2 mike with a uniformity ratio higher than 80%.

As long as there is some fuzz to help separate and spread the seed around, that's good enough. Even insects don't want the lint, they want the nutrients in the seed. Man is the only one interested in lint production. Cotton fibers contain very few nutrients, only cellulose or complex carbohydrates. If stress occurs during boll formation, fiber quality is the first to suffer. Water stress or anything that reduces carbohydrate production by the plant causes a reduction in fiber quality.

## The Real Question

Since lint production is basically unimportant to the cotton plant, producing a top yielding, high quality crop on a perennial plant (grown as an annual) should cause some producers to redefine their priorities.

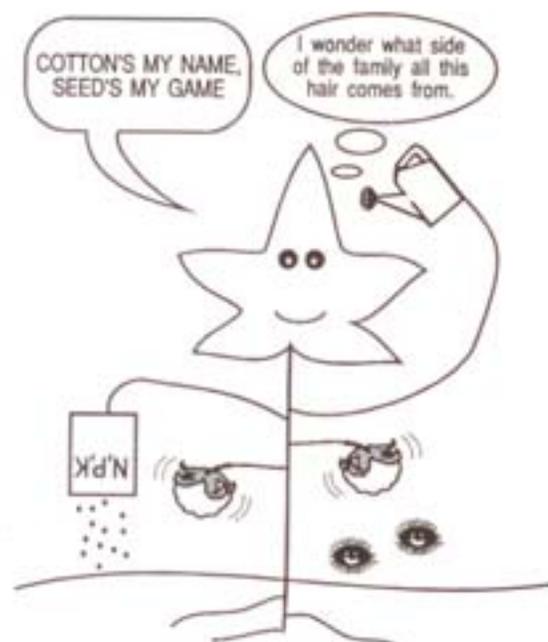
The real question should be "How much high quality seed did you help your cotton plant produce?" rather than, "How much lint did you make?" If you think like a cotton plant thinks, think about supplying the plant's needs to produce mature, high quality seed without excessive growth, and high quality lint will follow. For a bumper seed crop, consider the following points.



**Plant nutrition:** A plant cannot function properly if it is "sick." Soil test to identify deficiencies and maintain adequate soil fertility, particularly nitrogen. With cotton fertility, more is not better. Fertilize according to the amount of available water during the growing season and research data from the area in which you live. Apply P and K early in the season where the plant roots can "find it" in moist soil. Apply nitrogen in such a way as to prevent the plant from "thinking" there's an excess, but supply a sufficient amount to set all the seed the plant is capable of producing. Don't tell the plant to do the wrong thing by applying too much nitrogen too late. Make the plant go into cut-out in time to mature the crop for timely harvest without excess growth.

**Water:** Short season varieties almost have the "mind" of an annual plant. Stress them early and they will quit. Even today's long- to mid-season upland varieties respond less like the "cotton tree" varieties of the past and should not be stressed for water prior to cutout. Once the plant is setting fruit, make sure it has the supplies to keep it going.

Learn to think like a cotton plant thinks. Supply the needs for the plant's survival, growth and seed; and lint production will follow.



## About the Author

Charles Stichler has given this talk at several grower meetings in Texas. His message is direct and valid for the entire Cotton Belt. "Think Like a Cotton Plant Thinks." Charles is the Extension Agronomist for central Texas and supports cotton producers in this area with an extensive research and publication program.

## Cotton Physiology Today Index

Cotton Physiology Today readership has grown from its initial 3700 in October of 1989 to over 20,000 today. Copies of all back issues are available. Just call or write NCC in Memphis, Tennessee.

### Volume 1

- # 1, Oct 89 Effect of Cold Weather on Yield and Quality
- # 2, Nov 89 Making Sense Out of Stalks
- # 3, Dec 89 Environmental Causes of Shed
- # 4, Jan 90 Plant Mapping as a Management Tool
- # 5, Feb 90 Conservation Tillage and Narrow Row Cotton
- # 6, Mar 90 Seed Quality and Germination
- # 7, Apr 90 Root Physiology and Management
- # 8, May 90 Leaf Physiology and Management
- # 9, Jun 90 Full Season Yields from Short Season Weather
- # 10, Jul 90 High Temperature Effects on Cotton
- # 11, Aug 90 Cotton Defoliation
- # 12, Sep 90 Causes of High and Low Micronaire

### Volume 2

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- # 2, N/D 90 Fiber Development and HVI Quality
- # 3, Jan 91 Cotton Nutrition - N, P and K
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- # 5, M/A 91 Cotton's Microclimate
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- # 7, Jun 91 Late Planted Cotton
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- # 9, Aug 91 Efficient Application of Harvest Aids
- # 10, Sep 91 Cotton Stalk Management

### Volume 3

- # 1, Oct 91 Crop Rotation
- # 2, Nov 91 Think Like a Cotton Plant

## Cotton Physiology Book Reprinted

The Cotton Foundation book on Cotton Physiology is back in print. This 700 page, 40 chapter book edited by Jack Mauney and James McD.Stewart covers all aspects of cotton growth, development and physiology in a detailed, well-referenced text. Copies of this book may be ordered by calling Janice McRae at NCC 901-274-9030 or sending your check for \$39.00 to The Cotton Foundation, P.O. Box 12284, Memphis TN, 38182. The second reference book in this series, "Weeds of Cotton: Their Characterization and Control," should be available in early 1992. These Cotton Foundation reference books are supported by a grant from BASF.

The Cotton Physiology Education Program is supported by a grant from The Cotton Foundation, and brought to you as a program of the Technical Services Department of the National Cotton Council in cooperation with the State Extension Services.

Cotton Physiology Today: Edited by Kater Hake

## Correction

In last month's article I erroneously indicated that Bladex, instead of Karmex, was a cotton herbicide with carryover potential. Steve Brown Extension Agronomist for Georgia wrote to us that "Without question, Zorial is the most persistent cotton herbicide and may cause injury to subsequently planted small grains, vegetables, corn and tobacco. However, Bladex is probably the least persistent of the residual herbicides used in cotton. Its half-life is about 2 weeks. Directed and lay-by applications of Karmex/Direx (diuron) or Cotoran/Meturon (fluometuron) are much more likely to carry over and damage sensitive crops."

Thanks to the Extension Agronomist, Specialists and County Agents who wrote or called in with this correction. (KH)

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