

Early Season Cotton Plant Mapping

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For many years, cotton researchers have used plant mapping as a tool to monitor fruit development and retention. This concept has recently gained interest as a tool for cotton management, as research provides a better understanding of the importance of specific fruiting positions. The unique growing patterns of nodes and branches of upland cotton allow a good determination of a fruiting form based solely on where it is located on the plant.

A user of a cotton plant mapping program can choose which stage of development to map. Probably the stage that provides the greatest return for the time invested is the early season. The information gained at this stage of development can still be used to make management decisions in that growing season.

The present consensus is that plant mapping need only be concerned with the first position on the fruiting branches. Other positions may account for 20–40% of the final yield, but valid decisions can be made based on what is happening at the first position. Factors that cause shed at the first position are likely to affect other positions as well.

An effective plant mapping program requires sampling enough plants to represent a field properly. Randomly selecting no fewer than 20 plants from throughout the field is generally recommended. Take care to avoid sampling plants adjacent to large skips or plants with damaged terminals.

Pull or cut plants below the cotyledons and take them from the field for mapping. Examine each plant individually and record the following data: nodes without branches, nodes with vegetative branches, nodes with fruiting branches, first-position aborts, and plant height.

Nodes without Branches

Nodes without branches refers to the number of nodes that fail to give rise to a branch, either vegetative or fruiting. Begin counting with the first node above the cotyledons and continue to the first fruiting branch, omitting nodes where vegetative branches may occur.

Nodes with Vegetative Branches

Vegetative branches grow from lower nodes, typically below the fruiting branches. Their growth pattern is similar to the main stem and they tend to grow out and up. Record the number of nodes on each plant producing a vegetative branch.

Nodes with Fruiting Branches

Fruiting branches are branches that grow out of the middle to upper nodes. These branches support squares and bolls and bend at each fruit attachment, resulting in a zig-zag pattern. Count all the nodes producing a fruiting branch, including terminal nodes that have a main stem leaf at least 1" in diameter.

First-Position Aborts

The first fruiting position is the position on the fruiting branch nearest the main stem. Aborts are locations on fruiting branches where squares or bolls are shed. Because damaged squares eventually shed, they are also considered aborts. Count and record all shed or damaged first-position fruit.

Plant Height

Measure plant height in inches from the cotyledons to the terminal.

Once all measurements have been recorded for each plant, calculate the average for each measurement. These averages represent the growth and development for the field and provide the basis for calculating plant vigor, first fruiting node, and square retention.

Plant Vigor

Plant vigor indicates the early growth potential of cotton plants. It compares plant height to the total number of nodes to determine how tall the plants are for their age. Nodes represent a good measurement for age, as they are relatively unaffected by stress, while

plant height is quite sensitive to stress. Cotton plants with low vigor will be shorter than those with optimum vigor at a specific node number. For example, the variety Acala SJ-2 should be 12–13" tall when it has a total of 10 nodes. Excess vigor is denoted if a plant is taller than the optimum at the specific node number.

When plant vigor is low, determine the cause. Factors that can cause low vigor are stresses from moisture, temperature, seedling disease, etc. Management practices that could further limit height such as reduced irrigation and application of the plant growth regulator PIX®* should generally be avoided when vigor is low.

If the index indicates high or excess vigor, examine fruit retention closely. Many times excessive plant height is a result of early fruit shed, which often is caused by insect pressure. Practices to consider when vigor is excessive include insect control and PIX® applications.

First Fruiting Node

The first fruiting node indicates the age when the plant begins to fruit; it is also one of the components of earliness. Many factors may influence which node will produce the first fruiting branch, including variety, plant density, and weather during the first weeks after emergence.

Many of the newer varieties are bred for earliness, and the first fruiting branch will generally occur on node 5 or 6. Low plant populations may cause the first fruiting node to be lower, while high populations often cause the first fruiting node to be higher. Unusually cool or hot nights may also cause the first fruiting node to be higher.

Cotton plants that begin setting fruit higher on the main stem have larger stalks prior to fruit set. These plants are subject to rank growth, particularly when early squares are lost. It is very important that practices to help retain squares be used under this situation. Monitor the field closely to determine the potential for using PIX®.

Early fruiting could potentially result in early cut-out if water and nitrogen are limited. When an early fruit set is noted, manage the plant to gain size and additional fruiting sites, thereby increasing yield potential.

Square Retention

Pre-bloom square retention is the most important factor in yield and also most easily controlled by management. Squares represent almost the entire developmental phase of the cotton boll. By the time squares reach bloom, a miniature boll has already formed. From square initiation, it takes about three weeks to reach the first visible stage (pinhead square); another three weeks is needed to reach bloom.

Squares have a complex growth pattern and are more sensitive to injury than bolls, but are not as sensitive as bolls to nutrient or carbohydrate stress. This difference in square sensitivity helps maintain an adequate supply of undamaged squares. Monitoring square retention and development provides a basis for determining the need for management practices to protect early squares and bolls.

Square retention on the first position of nodes 9 through 15 should be at least 80% for best production. Fields that average less than 80% retention at these fruiting sites should be examined closely to determine what is causing square shed.

The major cause of pre-bloom square shed is insect injury. Chances are good that any significant square loss at this time is the result of insect feeding. Retention of early squares may be as high as 90% when insect damage is avoided. After first bloom, squares become more sensitive to non-insect factors such as moisture stress. Moisture stress is not as serious prior to bloom, as young cotton has the ability to adapt to drought conditions, and the moisture requirement for seedling cotton is less.

Cotton with excessive square shed is difficult to manage; it tends to become rank and delay maturity. Close monitoring by early plant mapping can indicate potential insect problems and, when they are confirmed, control measures should be used. Irrigation and fertility should be managed to avoid excessive vegetative growth. It may be necessary to retard growth and encourage fruit set by applying PIX®.

Using plant mapping in early season cotton provides the opportunity to know how the crop is developing, and allows the manager the flexibility to consider management options available to give the crop the best opportunity to reach its potential.

*The use of the trade name does not constitute an endorsement for, or discrimination against any other products, by NMSU Cooperative Extension Service.