Breadcrumb

1. Home
2. Print
3. Pdf
4. Node
5. Entity Print

Additional Guidance on Agronomic Performance Data of Cotton

Last Modified:

Upland cotton (*Gossypium hirsutum*) is one of the four major crops that are grown in the United States, but one which is more limited geographically than the other crops.

Cotton can be grown only in those regions in which there are more than 180 frost-free days per year. Although cotton is basically a perennial tropical plant, selection has produced an annual crop able to produce quality fibers in a temperate climate. Key biological features of cotton are that it has some characteristics of a weed in southern Florida (Southern Weed Science Society. 1998. Weeds of the United States and Canada. CD ROM. Southern Weed Science Society. Champaign, Illinois) and is bee-pollinated and thus, pollen is readily dispersed. Although it has sexually compatible relatives in the United States, the potential for interbreeding is limited because the geographic distributions of cultivated plants and wild species do not closely overlap. In developing crop data proposals, APHIS considers the biology of the crop, interactions with the environment and the phenotype and significance of the inserted gene. Some data requirements may be specific to the function of the gene. Other data requirements are more general and are aimed at determining that the engineered crop does not have unanticipated effects that would that would render it phenotypically different from a near isogenic control.

Expand All

Suggested Parameters

The following list comprises agronomic characters of cotton which might be appropriate for inclusion in a data package. Analysis of these characters would support a decision that the engineered plant was unchanged from a near-isogenic control except for the desired change.

Growth Habit - Changes in the morphology or growth pattern of the plant would be assessed. Quantifiable morphological characters include, but may not be limited to the following: plant height (first node to the terminal bud), total numbers of nodes (numbers of main stem leaves), height of the plant divided by numbers of nodes, node number of the first fruiting branch, and total numbers of fruiting branches. Of proven usefulness in comparing cotton varieties has been the seasonal plant assessment tool, Final Plant Mapping (FPM). In addition to some of the previous measurements, and the yield data, the FPM includes numbers of fruiting branches, percent fruit retention by position on sympodial branches, and total numbers of bolls per plant. If this comparison is chosen, final mapping should be done when all

harvestable bolls are fifteen or more days old. A similar standard time for all the possible measurements of plant growth should likewise be chosen.

Germination and Seedling Emergence - Standard laboratory germination tests (860 for sixteen h/d) as well as cool germination tests (680 for 8h/d) indicate general seed quality and viability but may also detect changes in requirements for dormancy. Typically, the percentage of viable hard seed, of firm-swollen hard seed, of germinated and of degenerated seed would be measured. Plant stand counts and mean emergence rates could also be considered.

Overwintering Capacity of Plant - A change in the ability of the plant to withstand freezing temperatures might indicate a new characteristic that could change the ragne of wild populations. Changes in overwintering capacity could be measured by leaving representative transgenic and non-transgenic plants in the field during the fall and comparing survival following periods of freezing weather. Final observations could be made in the spring.

Vegetative Vigor - Any of various measurements could might be employed which would indicate accumulation of biomass.

Flowering Period/ Days to First Flowering - Changes in blooming period could be assessed by measuring days to 50% bloom (i.e. flowers are present on 50% of the plants). Other observations such as days to peak bloom might also be appropriate.

Maturity - Differences in maturation date of the crop might be assessed by comparing the numbers of days after planting at which the first cracked boll is observed*, or days to 50% open bolls* in the transgenic and nontransgenic lines.

Reproductive Potential of the Plant - Are there changes in the number of seeds produced per boll? Has there been an increase in the fruit retention or number of bolls per plant? Has a yield increase correlated with these changes, or have other compensations occurred in the plant's productivity?

Plant Quality - The quality of the cotton fiber in terms of length, color, strength, micronaire (fiber diameter), and color grade could be measured to assess unintended changes in plant quality.

Data Types and Descriptions

While objective, numerical data are most desirable, APHIS recognizes that not all parameters easily lend themselves to these types of measurements. In some cases data may be taken using subjective ratings using a descriptive scale. In other cases, data may be purely observational. What is required in all cases is that the methodologies are described in detail, such that the reader has an accurate understanding of the nature of the data and number of data points which make up a study and on which conclusions are drawn. For example, is the unit on which data is taken a leaf, a plant, a row, or some other unit? describe the total number of observations by describing numbers of replicate samples, rows, replicate blocks, locations, etc.

Number of Sites and Years

The above data should be collected on a number of sites sufficient to represent the major growing regions to be targeted by the product. In addition, the sites should be selected in such a way as to ensure exposure to a reasonably wide range of environmental conditions. One way to increase the likelihood that plants are exposed to varied environmental conditions is through multi-year testing. In general, APHIS recommends 6 sites minimum per year in multi-year (at least 2) data packages in which these sites would represent the major producing states in the target area for the product. If data are to be all from a single year, the geographic range should be expanded to include minor growing regions such that more varied environmental conditions are likely to be encountered. In general, a minimum of 12 sites representing both the major producing states and other climatologically varied regions is recommended if all data are from a single year. More sites can provide a better context in which to interpret field data, especially when anomalous data are encountered.

Print