

DEVELOPING A DECISION-AID FOR THE USE OF IN-FURROW FUNGICIDES

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Abstract

Seedling diseases are one of the major constraints to stand establishment in cotton. Cotton disease losses from seedling diseases from 1991-2000 for the United States Cotton Belt were estimated to average 3.1%. Losses from seedling diseases result from poor emergence and seedling death, which result in reduced stand and poor stand uniformity. In addition, seedling diseases can reduce early season plant vigor. In some situations, replanting may be required. All of these problems delay crop growth and result in additional management problems. The primary pathogens causing seedling diseases are *Pythium* spp., *Rhizoctonia solani*, *Thielaviopsis basicola*, and *Fusarium* spp. All of these pathogens, except *T. basicola*, are ubiquitous in cotton soils. Because seedling disease pathogens are found in every field, the most important factor in determining seedling disease severity for a field is the soil environment at and shortly after planting. Control practices used to limit seedling disease severity include planting high quality seed, planting in well drained soils on raised seedbeds, and delaying planting until soil temperatures and weather forecasts are favorable for rapid germination and emergence. It is common for growers to plant as early as possible in order to maximize the growing season, limit insect pressure, and allow for favorable weather at harvest. However, early planting is often associated with lower soil temperatures and increased rainfall, which may favor cotton seedling diseases. Cottonseed is almost universally treated with a number of seed treatment fungicides to protect against seed-borne and soilborne pathogens. Growers frequently are faced with the decision of whether to spend money for additional fungicides either on the seed at planting (planter-box or hopper-box treatments) or in the planting furrow (in-furrow treatments) to provide additional protection against seedling pathogens. The decision of growers regarding the need for additional cash inputs from the use of these fungicides, \$10-\$15 per acre for most in-furrow fungicides, must be balanced against the risk of replanting costs and yield reductions. If a decision-aid were developed for advising growers on when in-furrow fungicides should be used, growers could save money and still insure adequate stands. Data from 98 in-furrow and hopper-box studies from the midsouth (Arkansas and Louisiana) conducted on experiment station sites and growers' fields were included in the database. Registered hopper-box and in-furrow treatments were compared to fungicide treated seed. In addition, nontreated seed (no fungicides) were frequently included to estimate seedling disease pressure. Stand response, disease pressure, stand uniformity, and yield were collected for each study. In addition, weather data was collected, including soil temperatures at the time of planting and emergence and rainfall data 1 day, 3 days, and 5 days after planting. The database was used to determine conditions limiting stand establishment, separate seedling diseases as the cause for the stand losses from environmental factors, and determine the probability of in-furrow fungicides improving stand. As temperatures increased, seedling disease severity decreased. Increased rainfall after planting did have a small impact on seedling disease severity. The model indicated that below a minimal soil temperature at planting of about 60°F in-furrow fungicides consistently increased stands. Rainfall had a more complex response on stand, with fields having little or no rainfall or heavy rainfall (>2 inches) after planting increasing the likelihood of in-furrow fungicides improving stands. The Decision-aid will; 1) help producers make planting decisions to increase the likelihood of a uniform stand and 2) provide assistance for the economic use of in-furrow and hopper-box fungicides. Current research will focus on developing a site for growers to enter data on fields prior to planting and get a probability that in-furrow fungicides will be a good insurance policy, saving growers' money and insuring cotton stands.