

Crop Production Guide Series

Nitrogen Fertilization Considerations for High Plains Cotton

Randy Boman, Associate Professor & Extension Agronomist-Cotton, Lubbock, Texas
Kevin Bronson, Associate Professor - Soil Fertility, TAES, Lubbock, TX

Nitrogen Fertilization in Irrigated Fields: A one-bale cotton crop will actually remove about 45 lb of actual nitrogen (N) per acre, but due to inefficiencies in uptake and in the soil, about 50-60 lb N/acre are actually required. It is important to not over fertilize with N if reduced yield potential is anticipated. This is due to the fact that it makes late cotton more difficult to manage on the backside of the season. High N status plants can aggravate some late-season insect problems such as aphids and can delay crop maturity.

Fertilization is a practice that is gaining in popularity in the High Plains. Figure 1. shows a typical N uptake curve for cotton and corresponding crop development stages. Suggestions for applications of approximate percentages of total N are also shown. These have been slightly modified compared to previous years' newsletters due to recent data that have become available from Texas Agricultural Experiment Station (TAES) N uptake studies.

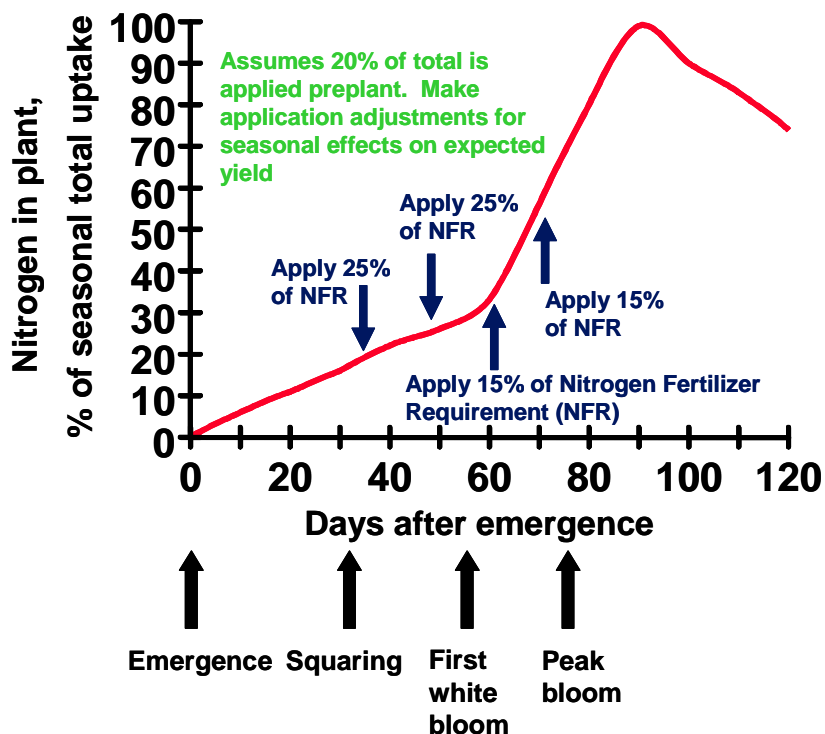


Figure 1. N fertigation strategy - AG-CARES LEPA model.

Where possible, N fertilizer (urea-ammonium nitrate - UAN, 32-0-0) can be applied through center pivots or "fertigated". This results in lower application costs. One should consider whether a LEPA system with drop hoses is used vs. a spray system. If a pivot rigged with spray nozzles has marginal water quality and extremely hot, dry conditions are encountered, then some salt burn may be encountered on foliage. To obtain maximum utilization of applied N, the total amount of N should probably be injected between first square and peak bloom. This type of N management fertigation scenario has been used and validated for the last several years at the Lamesa AG-CARES farm using alternate furrow LEPA irrigation.

Dryland Cotton Fertilization: Many dryland producers opt to sidedress or topdress N fertilizer after stand establishment in order to reduce front-loading of expenses. Applications of N are more likely to stimulate growth and promote fruit retention. Adjust N rates to fit yield potential. Where good soil moisture is available, producers should seriously consider N fertilization. Generally speaking, about 30-50 pounds of actual N per acre are adequate for dryland cotton. The higher rates should definitely be considered if the yield potential (stored soil moisture) is adequate for higher lint yields.

Sidedressing/topdressing should be completed before blooming, with extreme care taken to not prune roots during the application. If the fertilizer is broadcast, rainfall will be required to move the fertilizer into the root zone. Here lies the challenge. Many producers do not use preplant applications in dryland fields due to "weather unknowns" and sometimes have no rainfall after N fertilizer application. Benefits from low rates of foliar fertilizers are questionable.

High Plains Nitrogen Fertility Calculator: For those High Plains producers interested in the potential to fine-tune N management, there is a Microsoft Excel spreadsheet and an [HTML](#) version available on the Lubbock Center Web site. The Calculator is based upon the latest soil fertility research conducted in the Texas High Plains region. NOTE THAT THIS CALCULATOR HAS NOT BEEN EVALUATED OUTSIDE OF THE TEXAS HIGH PLAINS REGION.

Users enter a realistic yield goal in bales/acre, and then enter results from the soil nitrate-N test. Soil samples should ideally be tested for nitrate-N to a depth of 24 inches. Soil texture is also an input for the program. Irrigation water analysis results for nitrate-N can also be added, as well as the estimated amount of irrigation water that will be applied during the growing season. Manure applications can also be factored into the overall N management scheme. Manure should be analyzed at a commercial laboratory for N. The total (seasonal) N fertilizer amount needed in lb/acre is calculated. For dryland, this amount can be applied with a ground rig all in one dose, shortly after stand establishment. For center-pivots, the results indicate the number of 30 lb N/acre doses. Typical 1000 gallon tanks used to inject 32-0-0 (urea-ammonium nitrate solution) through a 120 acre center-pivot will provide about 30 lb N/acre. For subsurface drip systems, the Nitrogen Fertilizer Calculator provides an injection rate in lb N/acre for mid-June to mid-August. Dividing this number by 3.5 (lb N/gallon of 32-0-0) gives the gallons of 32-0-0/acre required to inject each day.



Additional Soil Fertility Management Information Is Available

These publications can be obtained at <http://lubbock.tamu.edu/>
Nutrient Management of Subsurface Drip Irrigated Cotton
Nutrient Management for Texas High Plains Cotton Production

Available N Fertilizer Sources: Anhydrous ammonia (82-0-0) contains more N per ton than any other source. It is the basic building block for the manufacture of other N sources. Overall, in terms of price per pound of actual N, it is the least expensive. Problems with handling, safety, application, toxicity, and illegal methamphetamine production combine to make this a less than desirable N source.

Urea (46-0-0) is manufactured using ammonia and carbon monoxide, a by-product of ammonia synthesis. It is generally the least expensive solid N source. It has excellent shipping and handling characteristics. Some

problems are encountered from an agronomic standpoint. In order to reduce possible N losses, it is important that urea be applied properly.



Ammonium sulfate (21-0-0-22S) is one of the oldest forms of N fertilizer, and is many times more expensive per pound of actual N than other sources. It can be manufactured from coke oven gas from steel and other metallurgical industries. It can also be manufactured by reacting anhydrous ammonia with sulfuric acid. The sulfur in ammonium sulfate is generally not needed in High Plains soils.

Urea-ammonium nitrate or UAN is the main fluid N source commonly marketed as 28-0-0 in winter months and 32-0-0 in the warm season. It is corrosive to many metals, and corrosion inhibitors are generally added. It is a mixture of 35% urea, 45% ammonium nitrate, and 20% water (by weight).

Ammonium thiosulfate (12-0-0-26S) or ATS is the main fluid fertilizer source of sulfur. It is compatible with fluid N sources and many times is blended with UAN to make a 28-0-0-5S mixture.

Ammonia loss problems from N fertilizers are mostly associated with anhydrous ammonia, urea, and urea-based fluids (UAN). Factors favoring ammonia volatilization from urea-based materials include:

1. High soil pH conditions
2. Low cation exchange capacity (such as in low organic matter sandy soils)
3. Large amounts of plant residues (urease enzyme present)
4. High temperatures
5. Moist conditions followed by rapid drying

In order to reduce ammonia loss from urea-based materials (this would also apply to broadcast or "dribbled" fluid UAN), the following strategies are suggested:

1. Incorporate into the soil by cultivation or at least by rotary hoeing after application.
2. Lightly irrigate immediately following a broadcast application if other soil incorporation is not used.

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James F. Leser, Editor
Michelle Coffman, Associate Editor & Graphic Designer

For more information call or e-mail:
806-746-6101 or m-coffman@tamu.edu

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