EVALUATION OF COMPACT ION METER FOR MEASUREMENTS OF NITROGEN IN COTTON PETIOLE

J. R. Johnson and J. R. Saunders

North Mississippi Branch Station; North Mississippi Research and Extension Center, Mississippi State University; Holly Springs, MS 38635

ABSTRACT: Having an on the site, easy field test for nitrogen is the desire of most cotton farmers. Minolta has marketed a N-N03$^-$ meter for years as a means to monitor nitrogen levels in a cotton field during the growing season. In previous studies using nitrogen rates we were able to distinguish between those plots that had nitrogen applied and those without nitrogen. In this study we followed the same protocol as previous studies except we relied on the Minolta N-N03$^-$ to distinguish between nitrogen levels applied in the soil. At first week of bloom the Minolta N-N03$^-$ showed a significant difference between those plots having more than 60 pounds of nitrogen and those with no nitrogen. There was no difference between nitrogen rates at the second week of bloom and the fourth week of bloom. There was however, a difference between no nitrogen plots and the 60, 90, and 120 pound level. Yields showed a difference between the plots with no nitrogen and all the plots with nitrogen regardless of the rate. However there was no yield difference between the rates of nitrogen.

CITATION: Johnson, J. R. and J. R. Saunders. 2003. Evaluation of Compact Ion Meter for Measurements of Nitrogen in Cotton Petiole. Annual Report 2002 of the North Mississippi Research and Extension Center, Mississippi Agriculture and Forestry Experiment Station Bulletin 398:157-158.

KEYWORDS: Cotton, Nitrogen, Minolta Ion Meter, Petiole

MATERIALS AND METHODS: The experiment was located on a Grenada Silt loam soil with less than 2% slope. The experimental design was a RCB with four replications. Plots were four rows spaced 38 in apart and fifty feet long. Treatments were 0, 30, 60, 90, and 120 lbs of nitrogen. The plot area was disked in late March and redisked in the second week of April before the plots were hipped. Five hundred pounds of 0-20-20 fertilizer was broadcast across the entire plot area in April prior to planting. Planting was the first week of May with a John Deere 7300 planter. Nitrogen rates were applied by hand application at two weeks after emergence. Sure-Grow 215 BG/RR cotton was planted at approximately four seed per foot of row. Terrachlor Super X 18.8G (Pentachloronitrobenzene) 1.5 lb ai/ac + Temik 15G (aldicarb) 0.75lb ai/ac were applied as granules in furrow at planting. Cotoran (fluometuron) 1.0 lb ai/ac was broadcast over the plot area. Roundup at 1.0 lb/ai/ac was sprayed over the entire plot area two weeks after emergence. CyPro (cyanazine) at 0.75 ai/ac was direct sprayed over the plot area as a lay by treatment Twenty petioles were collected from the same plot in each replication for evaluation of NO3-N status using a Minolta hand held nitrogen meter. Samplings of petioles were made at first week, second week, and fourth week of bloom. Petioles were collected from the fifth fully expanded leaf on the main stem below the plant terminal. Petioles were frozen immediately after collection. Analysis was conducted in an air-conditioned laboratory twenty-four hours after collection. This hopefully eliminated a variation in the meter reading from exposure to sunlight

or temperature variation. Petiole sap was extracted by thawing the petioles under an infrared light for five minutes before the stems were cut into lengths of approximately one inch. Petiole sap was extracted by placing the cut petiole stems into garlic press and squeezing out the petiole sap. One milliliter+ of sap was squeezed into a test tube representing a composite of the twenty petioles of each plot. Two or three drops of sap from each test tube were placed on the calibrated meters. Meter calibration was checked by running a standard at the start of each test period and after every twenty samples. Cotton was defoliated the first week of October with Superboll (ethephon) 1.5 lb. ai/ac + DEF 6 (tribufos) 1.5 lb ai/ac and picked the third week of October.

RESULTS: We have tried the Minolta N-NO3 meter in the field for several years with limited success. We attributed much of the variation in meter readings in the field to sunlight, temperature and a good petiole sap sampling. Often times the petioles produced very little sap in the field. We felt we were not getting a representative sap sample resulting in inconsistent readouts. We found that by freezing the petioles we were able to extract sap much better from the thawed petioles. In order to eliminated environmental variation all Minolta meter reading were conducted in a laboratory with controlled light and temperature. Meter reading were extremely variable from replication to replication in many of the nitrogen rates even though each replication contained a composite of twenty petioles taken at random within the plot. At each sampling standard deviation for some of the nitrogen rates was extremely high and without explanation (Table 1). At first bloom we were able to detect differences between plots with nitrogen and plots without nitrogen. Minolta N-N03 meter reading at first week of bloom corresponded closely to nitrogen rates. Yield ranged from 482 lb lint/ac for the 0 lb N/ac to 746 lb lint/ac for the 90 lb N/ac. Yields showed a difference between the plots with no nitrogen and all the plots with nitrogen regardless of the rate. However there was no yield difference between the rates of nitrogen.

Table 1. Minolta N-NO3 meter reading of PPM of N present in leaf petiole

N lbs/Acre	1st Wk Blm	Std. Dev	2nd Wk Blm	Std. Dev.	4th Wk Blm	Std. Dev.
0	1070	113	3825	1682	1525	602
30	2400	683	3100	740	2350	451
60	3625	1545	4525	1607	3300	1294
90	4200	1117	3875	699	3075	556
120	6500	2565	4625	492	4275	1909
150	6700	1673	5575	2076	3000	469
LSD 0.05	2228		2011		1536	

Table 2. Cotton yield response to nitrogen rates

Nitrogen rates in Pounds per Acre	Pounds of Lint per Acre
0	482
30	659
60	707
90	746
120	739
150	686
LSD 0.05	113