EFFECT OF NITROGEN APPLICATION RATE ON SOIL RESIDUAL N AND COTTON YIELD

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ABSTRACT

A long-term study was conducted on nitrogen application rate and its impact on soil residual nitrogen, cotton (FM 960 B2RF) lint yield and lint quality attributes under a sub-surface drip irrigation production system near Plainview, Texas. The data matrix was analyzed with principal component analysis to determine the contribution of each variable to total variation in the data. After seven years of continuous application of variable rate of N, residual N levels varied significantly between the 224 kg/ha treatment and lower nitrogen level (0 and 56 kg/ha) treatments. Lint yield varied with nitrogen level as expected. Micronaire decreased significantly with an increased nitrogen treatment.

KEY WORDS: Nitrogen, residual nitrogen, lint yield, lint quality

INTRODUCTION

Nitrogen (N) is said to be one of the most limiting factors in cotton production. Following the importance of water for crops, Morrow and Krieg (1990) described N near the top of the most important factors of production in the Texas High Plains (THP) region. Nitrogen can affect both lint yield and quality. THP typically follows a mono-cropping pattern of cotton production. Mono-cropping and high use of N increases the N stock available in the soil profile. N available in soil profile can be used by plants and should be considered into a cotton production system. Long term effects of N application on residual N and lint yield and quality parameters have been reported from THP.

MATERIAL AND METHODS

The study was conducted with various nitrogen application rates and its impact on soil residual nitrogen and cotton (FM 960 B2RF) lint yield and quality attributes under a drip irrigation production system near Plainview, Texas. The experiment was a randomized complete block design with five nitrogen application rates (0, 56, 112, 168 and 224 kg per ha) and five replications. Lint yield, seed yield, residual nitrate, and lint quality attributes such as micronaire, length, strength, uniformity, and elongation were measured each growing season

for 7 years (2002-2008). The data matrix was analyzed with principal component analysis to determine the contribution of each variable to total variation in the data. ANOVA was completed using PROC MIXED. The treatment means were separated using LSMEANS.

RESULTS AND DISCUSSION

Table 1. Effect of nitrogen treatments (kg/ha on soil nitrate residuals, cotton yield and quality parameters (2002-2008 averages)

Trt	N Residual	Lint	Seed	Mic.	Length	Uniformity	Strength	Elong.
0	33.32 B	1142.2 C	1744.8 C	3.9 A	35.1 AB	81.72 A	28.64 A	6.51 A
56	32.95 B	1394.2 B	2138.4 B	3.8 AB	35.3 AB	81.60 A	28.57 A	6.49 A
112	37.10 B	1514.0 AB	2399.4 A	3.7 ABC	35.4 A	81.62 A	28.34 A	6.56 A
168	46.40 AB	1573.2 A	2462.9 A	3.5 BC	34.8 B	81.08 A	28.31 A	6.59 A
224	54.52 A	1585.3 A	2561.4 A	3.5 C	35.14 AB	81.33 A	28.17 A	6.48 A
p-Value	0.0002	< 0.0001	< 0.0001	0.0005	0.0469	0.05	0.3	0.8

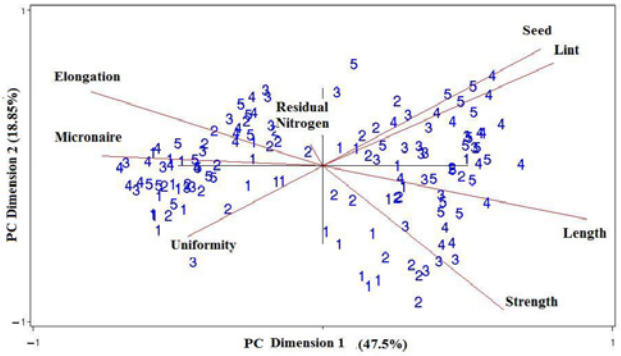

Figure 1. Bi-plot principal component analysis (PCA) (1=0, 2=56, 3=112, 4=168 and 5=224 kg/ha)

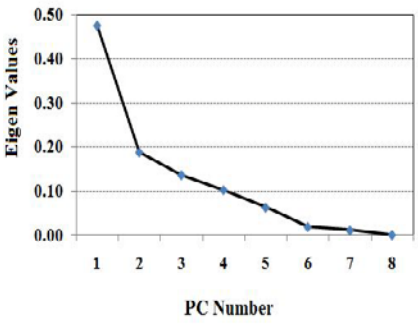

Fig 2. Scree Plot PCA

The first two principal components covered almost 66% of variation in the data. Lint and seed yield contributed most of the variations at 0.56 and 0.82, respectively in principal component 1 and 2 (Figure 2). The cluster analysis and bi-plot (Figure 1) showed elongation, micronaire and uniformity negatively correlated with lint yield, seed yield, fiber length, and strength. However, the cluster analysis did not show the effect of nitrogen treatment. Results from ANOVA (Table 1) showed a significant variation in yield with nitrogen level. Soil N residual was significant between the 0 kg and 224 kg N applications. Micronaire decreased significantly with increased nitrogen level treatments. Fiber length attribute showed a significant difference only with the 112 kg per ha N and 168 kg per ha N treatments. No significant effects of different N levels were observed for uniformity, strength and elongation attributes of lint. High N

application increases the lint and seed yield however, the quality (micronaire, elongation and uniformity) is compromised.

REFERENCES

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