COTTON LINT YIELD, FIBER QUALITY, AND WATER-USE EFFICIENCY AS INFLUENCED BY CULTIVAR AND IRRIGATION LEVEL

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Abstract

Cotton is produced in the Texas High Plains under a wide range of water levels, ranging from dryland to full irrigation. Irrigated cotton is grown under varying levels of deficit irrigation depending on well capacities. With declining well capacities, it is important to maximize water-use efficiency (WUE) by crop management and cultivar selection. The objective of this study was to determine lint yield, fiber quality, and water-use efficiency as influenced by cultivar and irrigation level at two locations with different soil textures and irrigation systems.

Field studies were conducted in 2011 and 2012 to evaluate new cultivars under varying irrigation inputs at the AG-CARES research farm near Lamesa, TX and Texas A&M Agrilife Research and Extension Center at Lubbock, TX. The experimental design of the trials was a split block design with irrigation as the main effect and cultivar as the split effect. In 2011 eight cultivars were evaluated including: DP 0912 B2RF, DP 1032 B2RF, DP 1044 B2RF, DP 1212 B2RF, DP 1219 B2RF, 11R110B2R2, 11R112B2R2 (DP 1321 B2RF), and 11R159B2R2 (DP 1359 B2RF). In 2011 AG CARES, the trial was conducted under a pivot equipped with a low energy precision application system. Plots were 4 rows by 95 feet with 3 replications. The soil type was an Amarillo fine sandy loam, and target irrigation levels were set at 40%, 60%, 80% evapotranspiration (ET) replacement. At Lubbock, plots were 4 rows by 70 feet, with 3 replications on a field with a subsurface drip irrigation system with laterals every 80 inches under every other middle. The soil type was an Acuff loam, and target irrigation levels were 30%, 60%, and 90% ET replacement. In 2012, twelve cultivars were evaluated including the eight from 2011 with the addition of four more experimental cultivars including: 11R124B2R2 (DP 1311 B2RF), 11R136B2R2, 11R154B2R2, and 12R242B2R2. At Lamesa, the trial was conducted in a nearby field with a similar soil type and equipped with a subsurface drip irrigation system with laterals every 80 inches under every other middle. Plots were 4 rows by 100 feet with four replications, and target irrigation levels were set at 30%, 60%, and 90% ET replacement. Similarly, the Lubbock trial in 2012 was on the same field as the previous year, with plots 4 rows by 40 feet and 4 replications. Irrigation treatments were set at the same 30%, 60%, and 90% ET replacement levels.

Due to the high temperatures and almost no rainfall in 2011, a reduction in yield and fiber quality was seen at both locations. In Lamesa, lint yield and WUE increased as irrigation increased, and loan values increased at the 90% level. DP 1032 B2RF, DP 1219 B2RF, and 11R159B2R2 (DP 1359 B2RF) had significantly higher loan values than other cultivars across irrigation levels. However, cultivars showed no differences in lint yield and WUE across irrigation levels. At the Lubbock location, lint yields increased as irrigation increased while WUE and loan values were similar across irrigation levels. Cultivars showed differences in lint yield at the 30% and 90% levels, and loan values differed between cultivars only at the 90% irrigation level. At Lamesa in 2012, lint yields and staple length increased as irrigation increased, but WUE decreased at the 90% level. Loan values increased at the 60% level, but not at the 90% level. Micronaire decreased as irrigation level increased, but all values were in the premium range. The experimental cultivar, 11R136B2R2, had a staple length that was >0.06 inches longer than any other cultivar across irrigation levels, and had the highest loan values as a result. Differences in lint yield and WUE were found

between cultivars across all irrigation levels. At the Lubbock location, differences in lint yield were observed with the highest lint yield at 60% level. No differences were observed for loan values or WUE between irrigation levels. When looking at cultivars averaged across irrigation levels, differences were observed for lint yield and WUE. The experimental cultivar, 11R136B2R2, had the highest loan value, followed by DP 1321 B2RF, DP 1359 B2RF, and DP 1044 B2RF. Further economic analysis will be conducted to assess the overall profitability of these cultivars in each management setting, and economic risk analysis will be used to rank the cultivars.