Yield limitations to irrigated grain sorghum at Emerald, Queensland.

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From agroclimatic analyses (1), optimal planting times for Irrigated grain sorghum at Emerald and Gatton are September and October respectively. Although similar crop growth indices occur for these plantings, maximum experimental yields of 13.0 t/ha have been reported at Gatton, compared with 8.2 t/ha at Emerald. This experiment examines whether higher irrigated yields may be obtained at Emerald under optimum management, and if not, what factors may be responsible for lower maximum yields there.

Methods

The trials were conducted at the Emerald Research Station, on a basaltic cracking clay (Ug 5.12), which holds 12.3 cm of available soil water in an active root zone depth of 80 cm. A complete basal fertilizer dressing (50P, 45N, 40K, 45S, 15Zn, 10 Cu, 10 Mn, 10 Fe kg/ha) was banded at a depth of 17.5 cm in the middle of the 1.0 m beds. Each treatment, replicated three times, occupied eight 12 m rows, two rows being planted 40 cm apart per bed. Sixteen hybrids were sown and furrow irrigated on August 29, 1986. The crop was thinned to 20.0 plants/m^2 after emergence. Nitrogen as nitram was sidedressed prior to floral initiation at a depth of 8.0 cm in the furrow, to provide an additional 300 kg/ha of N on September 22.Irrigation was applied whenever the cumulative daily total water requirement reached 65 mm. Insects, diseases and weeds were controlled. Data collected included phenology, dry matter production and partitioning, ground cover, grain yield and yield components. Grain yield was calculated from 16 m^2 quadrats from the inner four rows. Yields were compared with those obtained in 1.0 m rows (12.0 plants/m^2) from an adjacent experiment planted on August 29, 1986, and with those from a January 3, 1985 planting (5.0 plants/m^2 in 1.0 m rows) at the same site (2), for which otherwise identical cultural conditions were provided.

Results and discussion

The highest yields obtained in the three trials were 9.6, 8.3 and 6.8 t/ha respectively. Higher yields resulted from early plantings, higher densities, and closer rows. Yield rankings for the hybrids were consistent across the three trials. The highest yield exceeded the previous best at Emerald. This was lower than yields reported in temperate areas (13.0t/ha), comparable with winter plantings in the tropics (10.0t/ha), and higher than tropical wet season plantings (6.0 t/ha). Furrow irrigation may have reduced yield due to temporary aeration problems, although a recent review (3) and my experimental evidence (2) suggest that with good management, no problems should arise on the Emerald basaltic cracking clays. The best yield was lower than the 13.0 t/ha considered possible (1), estimated from agroclimatic analyses using 30 year mean data. The 1986 season was atypical, with rainy periods near flowering, and very high temperatures during grain filling. Reduced PAR conversion efficiency after anthesis, which has been associated with lower yields in the tropical wet season, may account in part for the lower yields obtained. Improved radiation interception and leaf area duration, using higher densities, closer rows and isometric arrangements, may be necessary to further increase yields (4). The data to confirm or deny these effects is being processed.

1. Wade, L.J. and Hammer, G.L. 1986. Sorg. Conf., Gatton. pp. 4.12-22

2. Wade, L.J. 1986. Proc. Sorg. Conf., Gatton, pp. 4.1-11.

3. Wade, L.J. 1986. Old. J. Agric. An. Sci. 43, 9-14.

4. Heslehurst, M.R. 1983. Field Crops Res. 7, 213-22.