Plant characteristics associated with high grain yield of sorghum

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More than 30 varieties of sorghum are recommended in Queensland, relative performance depending on the region in which they are grown. It is likely that several plant factors are involved in determining the relative performance of the various hybrids. This paper reports the results of an experiment in which the plant characteristics associated with high grain yield in a range of hybrids were examined.

Methods

Twenty commercial hybrids were grown in Black Earth at Gatton late in the season (Jan. - May 1981). Plants were grown under good moisture conditions resulting from adequate rainfall. A population density of 100,000 plants/ha was used in two planting patterns: 1 m and 0.33 m row widths. This density was low for good moisture conditions but was used to correspond with that proposed for later experiments in which the effects of water shortages will be examined. Several plant characteristics were measured at floral initiation, anthesis and maturity.

Results and Discussion

There was little difference in grain yield between the two planting patterns and data for the plant characteristics examined are represented for only the 1 m row width (Table 1). Yields varied from 2.7 to 4.6 t/ha. Grain yield was related to total plant weight at maturity but not to Harvest Index (H.I.).

Table 1. Grain yield and measurements of selected characteristics of sorghum varieties grown at 1 m row spacing

Variety	Yield (t/ha)	[1] T.D.W. (t/ha)	H.I.	Av. LAI (GS III)	[2] Rate of D.M. production (t/ha/day)	[3] Distrib. ratio	No. tillers per plant
Solo	4.63	13.17	0.35	2.41	0.063	1.57	0.35
Nugget	4.34	10.55	0.41	2.45	0.141	0.90	0.73
Dorado	3.56	9.99	0.36	2.27	0.072	1.07	0.29
Pride	3.20	8.57	0.37	1.92	0.048	1.49	0.47
Q5161	2.92	8.15	0.36	1.73	0.054	1.26	0.09
Yates 212	2.69	7.66	0.35	1.61	0.052	1.29	0.23

1. T.D.W. = Total dry weight at maturity
2. in GS III
3. Distribution ratio = $\frac{\text{grain yield}}{\Delta \text{ T.D.W. in GSIII}}$

Grain yield was closely related to increase in dry matter during grain filling stage (GS III) in most hybrids (i.e., distribution ratio of approximately 1.0). The latter was associated with average Leaf Area Index (IA.I.) during G.S. III. The duration of G.S. III had only a small effect on yield. Some varieties compensated for *low* rate of dry matter production by a high distribution ratio (e.g., Solo). A distribution ratio greater than 1.0 indicated that dry matter stored in the plant before anthesis was later translocated to the grain. High grain yield in some other varieties (e.g. Nugget) resulted mainly from the relatively large number of tillers produced. High tillering in the square planting pattern (0.33 m row width) was expected to increase relative yield of these varieties. However tillering was reduced by the environmental conditions of the experiment, and hence the effect was small.