

## Contrasting effects of population density on yield of irrigated grain sorghum in the Ord River Irrigation Area

M.A. Foale and D.B. Coates

CSIRO Div. Tropical Crops and Pastures, Lawes, Q 4345 & Townsville, Q 4810

Investigations were made at the Ord River Irrigation Area to determine factors limiting grain sorghum yield (1). One experiment included the cultivar NK 300F, a "tropical" 2-dwarf hybrid with a degree of daylength sensitivity, sown on three dates in the dry season.

### Methods

Seed was hand-sown on the 19th April (S1), 10th May (S2) and 31st May 1979 (S3) at densities of 10.0, 26.7, 43.3 and 60.0 plants/m<sup>2</sup>.

### Results and Discussion

Yield results for S1 and S2 are summarised in Table 1; results for S3 were not significantly different from S2. Seed size varied only slightly between sowings and densities. Seed index for early boot (EB) was calculated by dividing number of grain harvested by the total aerial dry matter at EB. Relative seed index (Table 1) is the seed index relative to the highest yielding density expressed as a percentage.

The duration of the period from initiation (I) to EB was 24 days (mean temp. 25.8°C) for S1 and 30 days (mean temp. 24.4°C) for S2. Besides the shorter duration of the I-EB phase in S1, an unseasonal period of overcast weather resulted in a 35% reduction in total solar radiation compared to the I-EB period of S2. A daylength-insensitive hybrid required 5 days and 3 days longer to reach EB in S1 and S2 respectively.

**Table 1. Grain yield (14% moisture), grain number and relative seed index (Early Boot) for NK 300F sown on 19th April (S1) and 10th May (S2) 1979**

		Population Density plants m <sup>-2</sup>				LSD (P=0.05)
		10.0	26.7	43.3	60.4	
Grain yield (t/ha)	S1	9.16	7.46	6.36	5.25	1.0
	S2	9.29	10.48	9.56	7.17	
Grain number/m <sup>2</sup> ('000)	S1	28.2	21.6	18.8	15.2	6.8
	S2	29.0	29.5	29.4	26.4	
Relative Seed Index (EB)	S1	100	66	47	35	
	S2	111	100	78	66	

The marked negative response to increasing density in S1 contrasts with the variable density response in S2. Plants at each density were 31% smaller at EB in S1 than in S2. The relative seed index shows that as density increased markedly fewer seeds were formed per unit of early boot dry matter in S1 than S2. Reduced assimilate supply due to the lower radiation level in S1 would have led to intensified competition between leaf growth and head growth at high density. Although the crop growth rate of S1 from emergence to maturity was not significantly less than S2, the early limitation imposed on head size and grain number resulted in the negative response of grain yield to population density.

1. Foale, M.A. and Coates, D.B. 1980. Proc. Australian Agronomy Conference, Lawes, Q, April 1980, 253.