

Effect of dry seeding and nitrogen level on improved genotypes of sorghum (*Sorghum bicolor*) under rainfed condition

A. BALASUBRAMANIAN, K. RAMAMOORTHY AND S. PURUSHOTHAMAN

Department of Agronomy, Tamil Nadu Agricultural University, Coimbatore 641 003

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ABSTRACT

A field experiment was conducted during north-east monsoon seasons of 1986–87 to 1990–91 at Coimbatore, to study the effect of dry seeding and nitrogen levels on some improved genotypes of sorghum [*Sorghum bicolor* (L.) Moench]. The dry seeding or premonsoon sowing, i.e. 1 week or 2 weeks before onset of monsoon (38th–39th standard week), was superior to normal seeding in increasing grain (33%) and straw (8.3%) yields of sorghum and rainfall-use efficiency (28%). N @ 40 kg/ha was economical for dry-seeded sorghum in rainfed Vertisol. Under moderate rainfall of 300 mm in the shorter growing season of 80–85 days, 'SPV 351' ('CSV 111', 102 days) performed better and was stable, followed by hybrid 'COH 4' (100–102 days) than 'SPV 462' ('Co 26' 110 days), which yielded better only under longer growing season.

The productivity of rainfed sorghum [*Sorghum bicolor* (L.) Moench] is very low in western zone of Tamil Nadu due to low and erratic distribution of rainfall during North-East monsoon season. In improved variety the high-rainfall-use efficiency and adequate N fertilization are the kingpins of the improved dryland technologies (Venkateswaralu, 1987). In rainfed sorghum, dry seeding (10–15 days before onset of monsoon) helps in early establishment, vigorous growth and results in increased sorghum yield (Periyathambi, 1980). However, most of the research work is confined to the individual production technology. Hence this study was undertaken to assess the effect of dry seeding and N levels and their intergration on some genotypes of sorghum under dryland conditions.

MATERIALS AND METHODS

The field experiment was conducted at

Coimbatore during north-east monsoon seasons for 5 years from 1986–87 to 1990–91 in factorial randomized block design with 3 replications. The soil was clay loam, with pH 8.1. It was low in available N, medium in available P and high in available K in all the 5 years. The treatments tried were 2 times of sowing, viz. pre-monsoon sowing or dry seeding during 38–39th standard week and normal sowing after receipt of sufficient rainfall (40th–41th standard week); 2 levels of N (20 and 40 kg/ha); and 4 genotypes ['CSH 9', 'SPV 351' ('CSV 11') and 'SPV 462' ('Co 26') and 'TNS 30']. These genotypes were tried during 1986–87, 1987–88 and 1988–89. Besides, 1 more genotype 'COH' was also used during 1988–89. However, during 1990–91, only 3 genotypes, viz 'CSH 9', 'SPV 351' and 'COH 4,' were taken for study. The seeds were pelletized with carbofuran @ 50 g/kg seed by using gum. The seeds were sown below 5 cm depth

adopting a spacing of 45 cm × 15 cm. N was applied in 2 splits, basal and top-dressing on 25–30 days depending on the rainfall. The crop was supplied with 20 kg P₂O₅/ha basal, whereas K₂O was not supplied to the crop, since the soil was rich in K. Data on grain and straw yields, rainfall-use efficiency and economics were recorded.

RESULTS AND DISCUSSION

Effect of dry seeding

The grain yield showed that pre-monsoon sowing or dry seeding during 38–39th standard week (second week of September) was superior to normal sowing in all the 5 years of study and also in the pooled analysis. It increased the mean grain yield by 33% over normal sowing. Similar trend was observed in respect of straw yield also. Increased yield of grain and straw was also observed by Periyathambi (1980) and Vishnumurthy (1986).

Effect of N

Application of N significantly increased the grain yield of sorghum. N @ 40 kg/ha was superior to 20 kg/ha in all the years and in pooled mean except during 1988–89, in which grain yield of sorghum was higher at 20 kg/ha. Reduced yield at 40 kg N/ha was due to low soil moisture as a result of poor receipt of rainfall (121 mm) during the crop season. In all the years and also in pooled mean, N @ 40 kg/ha significantly increased the straw yield of sorghum.

Performance of genotype

The length of growing season for western zone of Tamil Nadu during north-east monsoon season is only 85 days, if there is normal onset of monsoon. 'SPV 462' ('Co 26') having 110 days recorded higher yield only during 1987–88 and yielded on a par

with 'SPV 351' and these were superior to the other genotypes. The increased yield of 'SPV 462' only during 1987–88 was due to higher rainfall (488 mm) with more rainy days. Though 'CSH 9' performed well during 1987–88, it was highly susceptible to downy mildew, when there was low night temperature and cloudy days during flowering period. 'SPV 351' having duration of 100–102 days was more stable and performed well even under low-, medium- and high-rainfall situation. The short-duration hybrid, 'COH 4' (102 days) tried during 1989–90 and 1990–91 gave the highest grain yield in both the seasons. Data on pooled mean showed that 'SPV 351' and hybrid 'COH 4' are the best for rainfed condition of western Zone of Tamil Nadu having mean seasonal rainfall of 300 mm with growing season of 80–85 days. For straw yield, 'SPV 462' and 'TNS 30' gave higher mean yield of 72.1 and 70.8 q/ha respectively.

Rainfall and rainfall-use efficiency

The western region receives a mean annual rainfall of 640 mm in 49 rainy days. During the cropping period (1986–87 to 1990–91) 310, 489, 121, 315 and 265 mm rainfall was received in 20, 25, 11, 22 and 15 rainy days respectively.

The rainfall-use efficiency was maximum under dry seeding (5.11 kg/mm/ha) than that under normal sowing (3.98 kg/mm/ha). The dry seeding increased the rainfall-use efficiency by 28% over the normal sowing. N @ 40 kg/ha significantly increased the rainfall-use efficiency over 20 kg/ha. Among the genotypes, 'SPV 351' gave higher rainfall-use efficiency of 4.90 kg/mm/ha, followed by 'CoH 4' (4.81 kg/mm/ha). Umrani *et al.* (1988) also observed increased rainfall-use efficiency by optimum time of

Table 1. Effect of dry seeding and N on yield, rainfall-use efficiency (RUE) and net return in sorghum

Treatment	Grain yield (q/ha)						Straw yield (q/ha)*	Mean RUE (kg/mm/ha)	Net return (Rs/ha)	Benefit : cost ratio
	1986-87	1987-88	1988-89	1989-90	1990-91	Pooled mean				
<i>Time of sowing</i>										
Dry seeding	29.07	14.30	5.28	16.05	10.01	14.92	70.32	5.11	2,934	1.88
Normal seeding	17.54	13.30	3.55	13.57	3.02	11.20	64.94	3.98	1,684	1.51
CD (P = 0.05)	0.60	0.40	0.18	0.37	0.40	0.46	2.11	0.39		
<i>N (kg/ha)</i>										
20	22.60	13.12	4.55	14.78	8.44	12.70	65.66	4.47	2,252	1.70
40	24.61	14.19	4.28	14.82	9.59	13.50	69.59	4.70	2,499	1.80
CD (P = 0.05)	0.60	0.40	0.18	NS	0.40	0.46	2.11	0.39		
<i>Genotype</i>										
'CSH 9'	29.40	11.59	4.56	14.43	7.68	13.53	69.85	4.69	2,405	1.70
'SPV 351'	24.81	14.46	4.39	17.72	9.28	14.13	62.08	4.90	2,491	1.75
'SPV 462'	18.78	15.06	4.67	8.46		11.74	72.14	4.09	2,026	1.61
'TNS 30'	20.26	13.50	4.05			12.60	70.82	4.44	2,251	1.68
'CoH 4'				18.31	10.10	14.21	67.05	4.81	2,539	1.75
CD (P = 0.05)	0.85	0.57	0.26	0.56	0.49	0.59	2.60	0.54		

* Pooled mean

sowing, NPK application and improved sorghum genotypes.

Net economic return

Maximum net return was obtained from dry seeding and the dry seeding increased the net return by Rs 1,250/ha over normal seeding. N @ 40 kg/ha was economical for dry-seeded sorghum in rainfed Vertisol, with rainfall 216–315 mm. 'CoH 4' and 'SPV 351' gave higher net return and benefit : cost ratio than the other genotypes. Increased net return and benefit : cost ratio were obtained by improved agro-techniques of dry seeding at 38–39th standard week, N @ 40 kg/ha and short-duration genotypes 'SPV 351' and 'CoH 4'. Similar results were obtained by Swindale (1982).

It was concluded that pre-monsoon or dry seeding, i.e. 1 or 2 weeks before onset of monsoon (second week of September), application of 40 kg N/ha and short-duration

genotypes, (viz.), 'SPV 351' and 'CoH 4', registered higher yield, net return, benefit : cost ratio and also higher rainfall-use efficiency under rainfed Vertisol of western region of Tamil Nadu.

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