https://doi.org/10.29321/MAJ.10.A02484

Madras agric. J. 71 (6) 365—370 June 1984.

EFFECT OF PLANTING METHODS ON GRAIN YIELD AND ITS ATTRIBUTES OF RAINFED SORGHUM VARIETIES*

P. THIAGARAJAN[1] and S. RAMIAH[2]

Field experiments conducted at Tamil Nadu Agricultural University farm at Coimbatore with different methods of land shaping during the two monsoon seasons of 1979-80, revealed that none of the methods tried influenced the grain yield of sorghum during south west monsoon season. But during north-east monsoon season bed-furrow systems recorded significantly increased grain yield than planting in the flat bed, top of ridge, middle of ridge and at the bottom of furrow. Among the varieties tried, CO. 23 sorghum was found superior to CO. 22 and CO. 21 with regards to grain yield and net income.

In the semi-arid tropics, the main factor that limits crop production is moisture. Farming in these areas is risky for want of suitable techniques to conserve and utilize the rainfall to maximum efficiency for crop production. More-over, the rainfall is either inadequate or in excess and not well distributed. With a view to find a suitable method of planting to reduce the ill-effects of excess or deficit of moisture, different planting methods such as bed furrow, ridges and furrow were attempted in rainfed sorghum varieties during two different monsoon seasons of 1979-80.

MATERIAL AND METHODS

Field experiments were conducted during the south-west (SW) and north-east (NE) monsoon seasons of 1979-80, under rainfed conditions in Tamil Nadu Agrl. University farm at Coimbatore. The rainfall received during south west and north east monsoon seasons were 244.2 and 762.7 m m respectively with 21 rainy days in each season (Table 1). The soils of two different fields were low, medium and high in available N, P and K respectively.

Planting in the flat bed (S_1) on the top of ridge (S_2) in the middle of ridge (S_3) at the bottom of furrow(S_4) in the bed furrow (S_5) and in the raised bed-furrow (S_6) systems were tried in main plot (Fig. 1) and sorghum varieties viz., CO. 21 (V_1), CO. 22 (V_2) CO. 23 (V_3) were in sub-plot. The design adopted was spilt plot and replicated thrice.

Ridges and furrows were formed with ridge plough at 45 cm apart and with 15 cm ridge height for planting on the top, middle of the ridge and at the bottom of furrow. For planting in the bed-furrow system, furrows were opened at 135 cm inter-furrow

*Forms a part of M. Sc. (Ag.) thesis of the first author submitted to the Tamil Nadu Agrl. University, Coimbatore-641 003. 1. Field Officer, United Commercial Bank, Coimbatore-641 001. 2. Professor, and Head, Department of Agronomy, Agrl. College and Research, Institute, Madurai-625 104.

Table-1 : Rainfall and number of rainy days

South west monsoon			North east monsoon		
std week	Total rainfall (m m.)	No. of rainy days	Std. week	Total rainfall (m.m.)	No. of rainy days
27	13.9	2	43'	88.0	4
28	16.1	2	44	56.4	3
29	—	—	45	21.7	3
30	3.8	—	46	83.0	5
31	7.9	1	47	93.6	4
32	19.7	3	48	15.2	1
33	—	—	49	0.7	—
34	0.8	—	50	3.7	1
35	1.0	—	51	—	—
36	4.3	—	52	0.4	—
37	28 6	4	1	—	—
38	68.4	3	2	—	—
39	—	—	3	—	—
40	19.8	1			
41	46.2	2	4	—	—
42	3.4	1	5	—	—
43	10.3	2	6	—	—
Total	244.2	21		762.7	21

43rd/std week was included for the north east monsoon crop, since it was sown in that week

distance in the flat bed with the help of country plough and the soil was left as such; and in the case of raised bed furrow system, the furrows were opened by ridge plough and the soil left after opening was thrown inside the bed and levelled by manual labour using spade.

Sowing was done after getting soaking rainfall on July 2, and October 24, 1979 for south west and north east monsoon crops, and harvested on 26th October, 1979 (CO 22 on 17 October, 1979) and 12th February, 1980 (CO 22 on 8th February, 1980) respectively.

Table-2 : Effect of planting methods on grain yield and its attributes of rainfed sorghum varieties

Treatments	No. of panicles/ plot	Panicle length (cm)	Panicle weight (g)	No. of primary rachii/ earhead	1000 grain weight (g)	Grain yield (kg/ha)	Straw yield (kg)	Net income (Rs/ha)
			South West Monsoon Crop					
S_1	301	13.7	29.4	40.0	22.60	1280	6226	902
S_2	288	13.1	28.4	38.7	22.66	1135	6269	682
S_3	312	13.2	29.2	36.1	22 61	1295	6129	828
S_4	309	14 8	29.9	37 4	22.51	1207	6717	799
S_5	298	13.3	30.0	35.8	22.57	1208	6775	846
S_6	306	13.0	28 2	38.2	22.73	1214	6957	845
CD (5%)	NS	NS	NS	NS	NS	NS	NS	125
V_1	303	12.5	28.0	34 5	25.48	1149	7690	861
V_2	293	15.1	27 4	39.5	20.10	1128	5391	608
V_3	311	13.0	32.1	39.0	22.26	1393	6455	982
CD (5%)	NS	1.1	1.7	2.9	0.5 0	76	312	84
			North East Monsoon Crop					
S_1	340	16.7	39 2	40.2	26.33	1655	7653	1420
S_2	259	16.9	37.5	40 2	26.43	1289	6123	831
S_3	332	16.9	36 8	37.6	26.28	1648	6209	1188
S_4	319	16 8	32.8	38.4	26 41	1574	6777	1172
S_5	347	17.8	42.3	43.7	26.38	1873	8116	1644
S_6	355	18.0	40.8	46 0	26.61	1879	8656	1685
CD (5%)	47.7	NS	3.9	4.5	NS	277	988	319
V_1	317	14.3	33.1	36.8	29.54	1244	8978	1086
V_2	327	21.2	41.5	46:4	21.90	1793	5463	1282
V_3	333	16.1	40.1	39.8	27.78	1922	7326	1511
CD (5%)	NS	0.6	2.3	2 2	0.65	127	565	290

RESULTS AND DISCUSSION

In the south west monsoon crop, planting methods had not significantly influenced the grain yield and yield components. This is mainly due to the lesser quantity of rainfall and its even distribution. The planting methods under severe moisture stress at pre-flowering and flowering stages had behaved similarly and not exhibited any difference on yield components The receipt of heavy rainfall of 84.6 mm in five rainy days after the stress period had more or less soaked the soil to saturation point more uniformly in all the planting methods, and there was not much difference in the moisture content of surface soil among different planting methods. Hence, the yield and yield components were not affected by different planting methods in south west monsoon. Shams (1977) had similar results of no significant difference in sorghum grain yield between flat bed and bed-furrow system of planting (Table 2 and Fig. 2).

In the north east monsoon crop, the planting methods had favourably influenced the yield (Table 2) and its attributes. Planting in raised bed-furrow and bed-furrow systems produced significantly better yield attributes namely number of panicles per plot, primary rachii per earhead, earhead weight, earhead length, and 1000 grain weight.

With reference to grain yield raised bed-furrow system (1879 kg/ha) was similar to bed-furrow system (1873 kg/ha) and both were superior to all other methods. Planting in the flat bed system (S_1) was similar in yield as that of planting in the middle of ridge (1648 kg/ha) and planting at the bottom of furrow (1574 kg/ha) The planting on the top of ridge had recorded significantly lower grain yield (1289 kg/ha) than all the other planting methods.

The influence of planting methods on crop performance at the initial stage had a bearing on the grain yield in the north-east monsoon crop. Heavy rainfall of 511.9 mm in 10 rainy days between 16 and 30 DAS caused the major problem of water logging. Due to more stability of raised bed-furrow(S_6) and bed-furrow (S_4) systems to heavy downpour of rain, the water drained off from bed to furrow automatically in S_6 and S_4, which were formed with an inter furrow distance of 135 cm and the furrow behaved like a mini drainage pond. Hence in S_6 and S_4 the water logging problem was reduced to minimum in the crop rows. Minimum lodging apart from better establishment and growth of crop were observed in S_6 and S_4. So planting in raised bed-furrow and bed-furrow systems produced significantly higher grain yield and yield attributes than other planting methods. Similar results were obtained at ICRISAT, Hyderabad, where bed-furrow system significantly increased the grain yield than flat bed system (Anon., 1979).

Although the height of the ridge was reduced considerably in planting at the bottom furrow (S_4) and in middle of ridge (S_3) water logging was the major problem, since water was

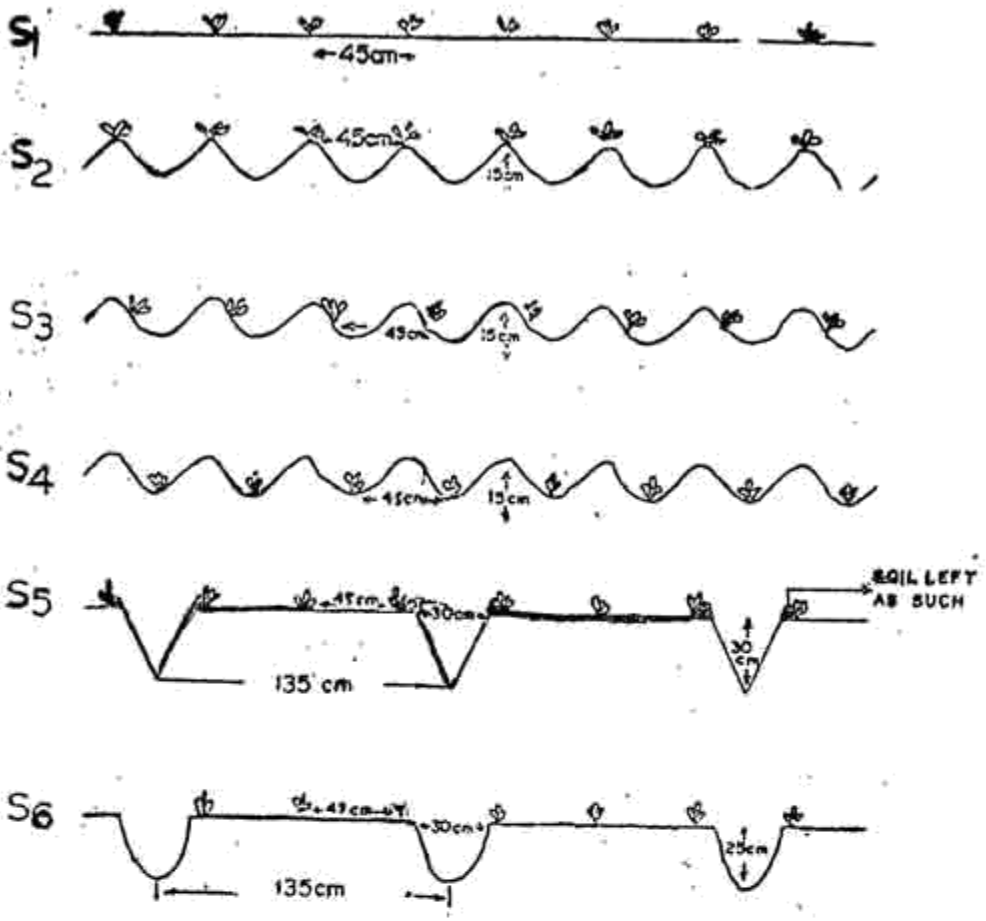
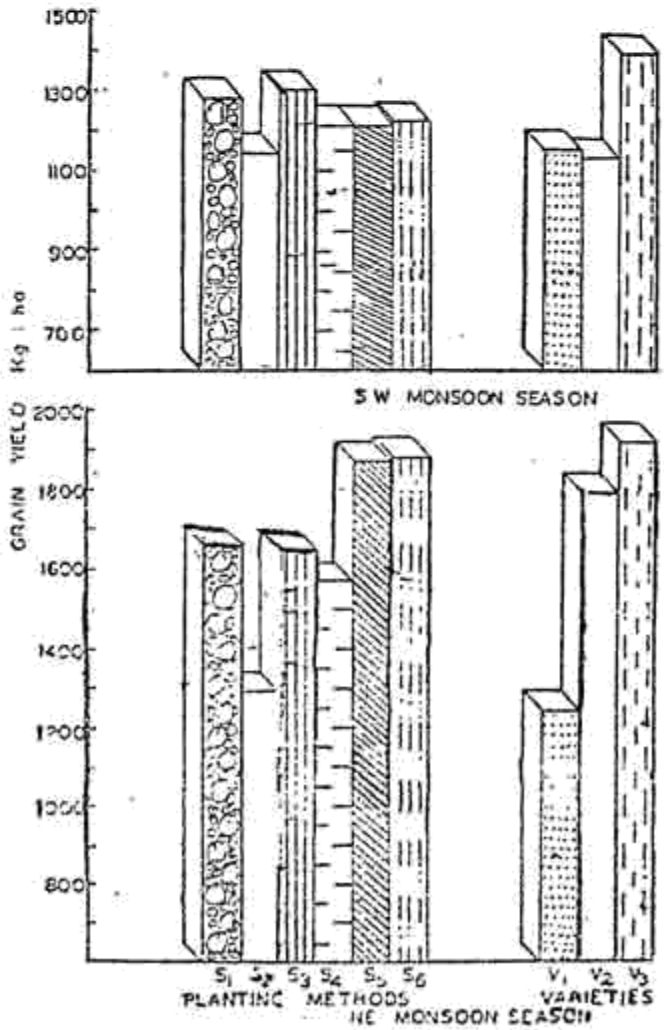


Fig 1. SOWING PLAN



collected in each crop row in the furrow. The same resulted in retardation of root and shoot growth and lower values for yield components. Hence, plantingat the bottom of furrow and in the middle of ridge recorded lesser grain yield than planting in flat bed system, where water was evenly collected, distributed and caused relatively reduced water logging. In S_1, apart from water logging problem, lodging of seedling was a major problem due to poor anchorage of roots, as soil on the top of ridge was washed down by heavy consecutive rains, exposing the root system. Hence S_3 recorded significantly lower yield and its components.

Among the varieties, CO.23 registered significantly higher yield in both the seasons. Variety CO. 22 had markedly more earhead length and higher number of primary rachii/earhead and CO.21 had lowest of them. (Table 2); the weight of earhead was highest in CO.23 in the south west monsoon and in CO.22 in the north east monsoon seasons. CO.21, CO.23 and CO.22 registered higher, medium and lower thousand grain weight respectively. The difference in yield and its attributes among varieties are due to their genetic potential (Palanisamy *et al.* 1979 and Prasad *et al.* 1979).

Straw yield and net income (Table 2) followed the same trend as that of grain yield due to planting methods. The variety CO.21 recorded highest straw yield than CO.23 and CO 22 in both seasons. CO.23 registered higher net income than other varieties

Summarising the results, during heavy rainfall in north east monsoon season, the raised bed-furrow syetems performed well with maximum grain yield, yield attributes and net income. Variety CO.23 was the best for both grain yield and net income.

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