P-ISSN: 2349-8528

E-ISSN: 2321-4902

www.chemijournal.com

IJCS 2020; 8(5): 615-618

© 2020 IJCS

Received: 10-06-2020

Accepted: 15-07-2020

DK Patel

Department of Agronomy,
College of Agriculture, Navsari
Agriculture University, Bharuch,
India

JD Thanki

Department of Agronomy, N.M.
College of Agriculture, Navsari
Agricultural University, Navsari,
Gujarat, India

Production potential of rainfed sorghum as influenced by *in situ* soil moisture conservation practices and FYM

DK Patel and JD ThankiDOI: <https://doi.org/10.22271/chemi.2020.v8.i5i.10361>**Abstract**

A field experiment was conducted during the *Kharif* season of the year 2017-2018 and 2018- 2019 at College Farm, College of Agriculture, Navsari Agriculture University, Bharuch, Gujarat, to study the production potential of rainfed sorghum as influenced by *in situ* soil moisture conservation practices and FYM. Two levels of tillage (Deep tillage with mould board plough and planking with cultivator and shallow tillage with cultivator), three levels of seed bed preparation (raised bed with three rows, raised bed with six rows and flat bed sowing) and two levels of FYM (No FYM, FYM 10 t/ha) were evaluated in split plot design and replicated four times. Deep tillage with mould board plough and planking with cultivator recorded significantly the highest plant height, number of leaves/plant, number of internodes/plant, length of ear head, grain yield, straw yield, net return and BCR. Raised bed with three rows were recorded significantly higher growth attributes, yield attributes and yield but remained at par with raised bed with six rows. Application of FYM 10 t/ha recorded significantly higher plant height, number of leaves/plant, number of internodes/plant, length of ear head, grain yield, straw yield and net return and BCR.

Keywords: Tillage, seed bed preparation, FYM, sorghum, growth, yields**Introduction**

In India, Sorghum occupies about 5.02 million hectares of area with an annual production of 4.8 million tonnes and productivity of 956 kg/ha during the year 2017-18. Sorghum crop is known as camel crop. Nevertheless, it can be produced on wide range of soil pH ranging from 5.0 to 8.5, but the production is influenced by various factors, among them, moisture, temperature, soil type, irrigation water, fertilizers and soil pH. Grain sorghum thrives relatively well under drought conditions and is grown under wide range of climatic conditions. This crop gained significance as a grain crop after development of high yielding varieties and hybrids. Rainfed areas have been facing historical neglect and discrimination in terms of public investments. Rainfed agriculture relies on local knowledge and experience and facilitates extensive systems of production which are mutually dependent. Rainfed agriculture accounts for 60% of total cropped area, 48% of the area under food crops and 68% of that under non-food crops. In terms of crop groups, 77% of pulses, 66% of oilseeds and 45% of cereals are grown under rainfed conditions. Tillage practices can greatly affect soil water content both at planting and during the growing season. Different tillage practices may influence the growth and yield of grain sorghum. Tillage practices are critical components of soil management systems. An inappropriate tillage practice inhibits crop growth and yield. The selection of an appropriate tillage practice for the production of crop is very important for optimum growth and yield. Efficient utilization of rainwater through adoption of in-situ moisture conservation measure is more feasible and practicable proposition under most situations in rainfed regions. Moreover, many of the farmers in arid and semi-arid regions do not afford large water harvesting systems. Farm yard manure is the source of primary, secondary and micronutrient to the plant growth. Organic matter with respective groups such as hydroxyl, phenolic and carboxyl effectively controls the adsorption and complexation of heavy metal and the activity of metal in the soil (Kaihura *et al.* 1999) [5].

Corresponding Author:**DK Patel**

Department of Agronomy,
College of Agriculture, Navsari
Agriculture University, Bharuch,
India

Materials and Methods

The present study entitled "Production potential of rainfed sorghum as influenced by *in situ* soil moisture conservation practices and FYM" will be carried out during the *Kharif* season 2017-18 and 2018-2019 and will comprised of a field experiment which will be laid out at College Farm, College of Agriculture, Navsari Agricultural University, Bharuch (Gujarat) India, which is located about one kilometre away from the Narmada river towards East and geographically at 21° 7' N latitude and 72° 97' E longitude with altitude of 2.5 metres above mean sea level. The detail of the experimental site, soil and climate is described in this chapter together with the experimental design, layout plan, cultural practice and techniques employed for the parameters. According to agro-climatic conditions, Bharuch is placed under South Gujarat Zone. The climate of this region is characterized by the fairly hot summer, moderately cold winter, humid and warm monsoon with medium to heavy rain. The maximum temperature of the location reaches up to 29.10 to 36.50°C and 28.30 to 37.80°C. The relative humidity ranged between 20.60 to 86.40%. The average rainfall in this area is around 900 mm annually. The minimum temperature during the crop season was to be 17.00°C and the maximum is to be 37.80°C. The minimum humidity was 20.60% and maximum was to be 91.10%. The experiment was laid out with split plot design having four replications. The treatments comprised *viz.* A₁: Shallow tillage with cultivator, A₂: Deep tillage with mould board plough and planking with cultivator, B₁: Flat bed sowing, B₂: Raised bed with three rows, B₃: Raised bed with six rows, C₁: No FYM and C₂: FYM 10 t/ha, respectively. The net plot size was 2.70 m x 5.00 m during the experiment. The variety of sorghum was GJ-42 and seed rate 12 kg/ha. The recommended dose of fertilizer is 80+40+00 kg N+P₂O₅+K₂O/ha.

Results and Discussion

Effect of tillage

The plant height, number of leaves/plant and number of internodes/plant were significantly influenced due to effect of different tillage. Significantly higher values of all these parameters were recorded when sorghum was sown on deep tillage with mould board plough and planking with cultivator (Table 1). The maximum plant height, number of leaves/plant and number of internodes/plant was recorded in deep tillage with mould board plough and planking with cultivator (T₂). The minimum plant height (cm), number of leaves/plant and number of internodes/plant was found in shallow tillage with cultivator (T₁). Tillage brings about a suitable tilth which results into desirable physical conditions required for better plant growth. This may be due to deep ploughing which provides favourable conditions for plant growth. Similar results were reported by Anjum *et al.* (2019) [1].

Yield attributes, *viz.*, length of ear head, grain and straw yield of sorghum were significantly influenced by different tillage treatment (Table 2). Significantly higher values of length of ear head, grain and straw yield were recorded under deep tillage with mould board plough and planking with cultivator (T₂) as compared to shallow tillage with cultivator (T₁). This may be due to the plants got maximum exposure to sunlight which enhanced the photosynthetic activity. It also improved the plant vigour, resulted in producing the wider and bigger ear head. The length and girth of ear head was positively correlated with the weight of ear head/plant and number of primary spikelets/ear head. The findings are in closely vicinity of those reported by Bikshu *et al.* (2019) [2].

Sorghum sown on deep tillage with mould board plough and planking with cultivator accrued more realization of Rs. 95142/ha with B:C ratio of 3.19 (Table 3) than shallow tillage with cultivator. This treatment increased the net realization to Rs. 9046/ha over shallow tillage with cultivator. The increase in net profit was attributed to large yield differences with lesser differences in cost of production under deep tillage with mould board plough and planking with cultivator. The results with respect to net realization corroborate the earlier findings by Anjum *et al.* (2019) [1].

Effect of seed bed preparation

Plant height, number of leaves/plant and number of internodes/plant of different seed bed preparation were found significant (Table 1). Significantly maximum plant height (171.21 cm), number of leaves/plant (8.03) and number of internodes/plant (7.50) were recorded under raised bed with three rows (B₂) which remained at par with raised bed with six rows (B₃), while lower plant height (158.64 cm), number of leaves/plant (7.48) and number of internodes/plant (6.27) were recorded under flat bed sowing (B₁). This might be due to maintenance of proper air moisture regimes under raised bed sowing which might have good moisture condition, available nutrients, soil aeration, soil environment and better growth and development of crop. Similar results have been reported by Munish *et al.* (2008) [7].

The results pertaining to length of ear head, grain yield and straw yield varied significantly due to different seed bed preparation (Table 2). Raised bed with three rows (B₂) significantly increased length of ear head (20.82 cm), grain yield (4908 kg/ha) and straw yield (13050 kg/ha) of sorghum but remained at par raised bed with six rows (B₃), while lowest length of ear head (18.88), grain yield (4467 kg/ha) and straw yield (11566 kg/ha) of sorghum was recorded under flat bed sowing (B₁) during both the years and in pooled analysis. This might be due to the raised bed practice that would have created a favourable physical environment for increased mineralization and mobility of fertilizer, as noticed in improvement in available N, resulting in higher nutrient uptake and crop growth, thus leading to higher ear head length, girth of ear head and weight of ear head/plant. The present findings are in accordance with those of Deshmukh *et al.* (2013) [3] and Yadav *et al.* (2019) [10].

Maximum net returns Rs. 96656/ha and B:C ratio 3.50 were recorded with raised bed with three rows (B₂) followed by raised bed with six rows (B₃) with net returns Rs. 94254/ha and B:C ratio 3.46. The lowest net returns Rs. 85580/ha and B:C ratio 3.18 were recorded with flat bed sowing (B₁). The increase in net profit was attributed to large yield differences with lesser differences in cost of production under raised bed sowing. Similar results were reported by Kasana *et al.* (2018) [6].

Effect of FYM

Among different growth parameters studies during the course of investigation were significantly influenced due to different treatments of FYM (Tables 1). Higher plant height, number of leaves/plant and number of internodes/plant was observed with the application of FYM 10 t/ha as compared to no FYM. This might be due to soil treated with manure was found to be loose, which probably provided adequate aeration into the soil and improved soil microbial activities. Higher soil microbial activities may release nutrients from the farmyard manure as well as soil for better plant growth. The results are in conformity with those reported by Tomar *et al.* (2017) [9].

Results of study indicated that effect of various seed bed preparation treatments on length of ear head, grain yield and straw yield was found to be significant (Table 2). The highest length of ear head, grain yield and straw yield of sorghum were recorded with application of FYM 10 t/ha (C_2). While no FYM application (C_1) resulted in the lowest length of ear head, grain yield and straw yield during both the years of

experimentation and in pooled analysis. The findings corroborated the results Patel *et al.* (2018) ^[8].

Economics of different levels of FYM revealed that application FYM 10 t/ha recorded maximum gross realization of Rs. 122166/ha, followed by Rs. 116654/ha with no FYM. These results are in conformity with those reported by Jat *et al.* (2013) ^[4] for net realization.

Table 1: Plant height (cm) at harvest, number of leaves/plant and number of internodes/plant of sorghum as influenced periodically by tillage, seed bed preparation and FYM

Treatments		Plant height (cm) at harvest			Number of leaves/plant			Number of internodes/plant		
		2017-18	2018-19	Pooled	2017-18	2018-19	Pooled	2017-18	2018-19	Pooled
Main Plot										
Tillage										
A ₁ :	Shallow tillage with cultivator	158.55	162.16	160.35	7.20	7.91	7.55	6.29	6.58	6.44
A ₂ :	Deep tillage with mould board plough and planking with cultivator	169.98	174.23	172.10	7.68	8.47	8.07	7.45	7.71	7.58
	SEm±	2.74	2.90	1.99	0.11	0.13	0.09	0.15	0.16	0.11
	CD (P=0.05)	8.26	8.73	5.76	0.34	0.39	0.25	0.46	0.50	0.32
Seed bed Preparation										
B ₁ :	Flat bed sowing (45 cm)	156.81	160.48	158.64	7.13	7.84	7.48	6.11	6.44	6.27
B ₂ :	Raised bed with three rows (furrow after three rows)	169.09	173.34	171.21	7.65	8.42	8.03	7.38	7.63	7.50
B ₃ :	Raised bed with six rows (furrow after six rows)	166.89	170.77	168.83	7.54	8.30	7.92	7.13	7.38	7.25
	SEm±	3.35	3.55	2.44	0.14	0.16	0.11	0.19	0.20	0.14
	CD (P=0.05)	10.11	10.69	7.05	0.42	0.48	0.30	0.56	0.61	0.40
	CV (%)	8.17	8.44	8.31	7.42	7.78	7.62	10.87	11.29	11.09
Sub Plot										
FYM										
C ₁ :	No FYM	161.27	165.20	163.24	7.32	8.04	7.68	6.58	6.83	6.71
C ₂ :	FYM 10 t/ha	167.25	171.19	169.22	7.56	8.34	7.95	7.16	7.46	7.31
	SEm±	1.78	1.85	1.28	0.08	0.09	0.06	0.10	0.11	0.08
	CD (P=0.05)	5.28	5.49	3.68	0.23	0.28	0.18	0.31	0.33	0.22
	CV (%)	5.30	5.38	5.34	5.15	5.66	5.44	7.37	7.53	7.45
	Interactions	NS	NS	NS	NS	NS	NS	NS	NS	NS

Table 2: Length of ear head (cm), grain yield (kg/ha) and straw yield (kg/ha) of sorghum as influenced periodically by tillage, seed bed preparation and FYM

Treatments		Length of ear head (cm)			Grain yield (kg/ha)			Straw yield (kg/ha)		
		2017-18	2018-19	Pooled	2017-18	2018-19	Pooled	2017-18	2018-19	Pooled
Main Plot										
Tillage										
A ₁ :	Shallow tillage with cultivator	18.74	19.63	19.19	4502	4533	4517	11592	11955	11774
A ₂ :	Deep tillage with mould board plough and planking with cultivator	20.51	21.18	20.84	4907	4967	4937	12879	13315	13097
	SEm±	0.38	0.40	0.38	95	97	68	265	284	194
	CD (P=0.05)	1.14	1.21	1.14	285	293	196	799	857	561
Seed bed Preparation										
B ₁ :	Flat bed sowing (45 cm)	18.51	19.24	18.88	4453	4482	4467	11323	11808	11566
B ₂ :	Raised bed with three rows (furrow after three rows)	20.42	21.22	20.82	4877	4938	4908	12860	13239	13050
B ₃ :	Raised bed with six rows (furrow after six rows)	19.94	20.75	20.35	4782	4829	4806	12523	12858	12691
	SEm±	0.46	0.49	0.46	116	119	83	325	348	238
	CD (P=0.05)	1.39	1.48	1.39	349	358	240	979	1049	688
	CV (%)	9.42	9.61	9.52	9.85	10.01	9.93	10.62	11.02	10.83
Sub Plot										
FYM										
C ₁ :	No FYM	19.18	19.89	19.53	4603	4642	4622	11886	12328	12107
C ₂ :	FYM 10 t/ha	20.07	20.92	20.50	4806	4858	4832	12585	12942	12763
	SEm±	0.25	0.28	0.25	63	68	47	178	188	129
	CD (P=0.05)	0.73	0.84	0.73	188	203	134	528	558	371
	CV (%)	6.17	6.81	6.51	6.60	7.05	6.83	7.11	7.29	7.20
	Interactions	NS	NS	NS	NS	NS	NS	NS	NS	NS

Table 3: Economics of sorghum as influenced by tillage, seed bed preparation and FYM

Treatment		Gross realization (Rs./ha)	Net realization (Rs./ha)	BCR
Main Plot				
Tillage				
A1:	Shallow tillage with cultivator	113888	86096	3.10
A2:	Deep tillage with mould board plough and planking with cultivator	124934	95142	3.19
Seed bed Preparation				
B1:	Flat bed sowing (45 cm)	112472	85580	3.18
B2:	Raised bed with three rows (furrow after three rows)	124260	96656	3.50
B3:	Raised bed with six rows (furrow after six rows)	121502	94254	3.46
Sub Plot				
FYM				
C1:	No FYM	116654	89762	3.34
C2:	FYM 10 t/ha	122166	85274	2.31

Conclusion

Based on the results of two years investigation, conclusion can be made that for getting higher grain yield and profit of sorghum crop, land should be prepared by deep tillage with mould board plough followed by planking with cultivator. Further, crop should be sown on raised bed with six rows (furrow after six rows) and be nourished with FYM 10 t/ha (considering common application of RDF 80+40+00 kg N+P₂O₅+K₂O/ha).

for sustainable production system of maize (*Zea mays* L.) in indo-gangetic plain zone of India. International Journal of Chemical Studies. 2017; 5(2):310-316.

- Yadav AC, Husain K, Verma VK, Tiwari US, Khan N, Siddiqui MZ. Effect of land configuration and nutrient management on growth and yield of hybrid maize. Journal of Pharmacognosy and Phytochemistry. 2019; 8(4):602-606.

References

- Anjum SA, Raza MM, Ullah S, Yousaf MM, Mujtaba A, Hussain M *et al.* Influence of different tillage practices on yield of autumn planted maize (*Zea mays* L.). Pakistan Journal of Agricultural Research. 2019; 32(2):293-301.
- Bikshu A, Swaroop N, Thomas T, Rao S. Effect of deep tillage practices under the recommended dose of fertilizer on growth and yield of wheat (*Triticum aestivum* L.). International Journal of Chemical Studies. 2019; 7(3):3640-3643.
- Deshmukh SP, Patel JG, Patel AM. Ensuing economic gains from summer pearl millet (*Pennisetum glaucum* L.) due to different dates of sowing and land configuration. African Journal of Agricultural Research. 2013; 8(49):6409-6415.
- Jat MK, Purohit HS, Singh B, Garhwal RS, Choudhary M. Effect of integrated nutrient management on yield and nutrient uptake in sorghum (*Sorghum bicolor*). Indian Journal of Agronomy. 2013; 58(4):543-547.
- Kaihura BS, Kullaya IK, Kilasara M, Aune JB, Singh BR, Lal R. Soil quality effects of accelerated erosion and management systems in three eco-regions of Tanzania. Soil Tillage Research. 1999; 53:59-70.
- Kasana BS, Dixit JP, Tomar RKS. Effect of sowing method, variety and weed management practices on yield and economics of pearl millet (*Pennisetum Glaucum* L.) crop. International Journal of Agriculture Sciences. 2018; 10(13):6592-6596.
- Munish K, Singh RA, Singh SP. Performance of moisture conservation practices and levels of nitrogen on sorghum under rainfed ecosystem of central Uttar Pradesh. Indian Journal of soil conservation. 2008; 36(1):22-23.
- Patel BK, Patel PB, Naik VR, Patel AP, Patel DS, Parmar VT. Study the effect of land configuration and integrated nutrient management on yield attributes and yield of different varieties of sorghum (*rabi*) grown on coastal salt affected soils. International Journal of Chemical Studies. 2018; 6(2):1034-1037.
- Tomar SS, Singh A, Dwivedi A, Sharma R, Naresh RK, Kumar V *et al.* Effect of integrated nutrient management