

Original Research Article

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## Effects of Genotypes and Fertility Levels on Growth Parameters and Yield of Single-cut Fodder Sorghum [*Sorghum bicolor* (L.) Moench]

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### ABSTRACT

#### Keywords

Single-cut fodder sorghum genotypes, Fertility levels, Growth parameters, Green and dry fodder yield

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A field experiment was conducted at Instructional Farm, Rajasthan College of Agriculture, MPUAT, Udaipur during *Kharif*, 2018 on sandy clay loam soil to evaluate the effect of fertility levels on single-cut fodder sorghum genotypes. Fifteen treatment combinations consisted of five genotypes SPV 2296, SPV 2316, SPV 2445, CSV 21F and CSV 30F, three fertility levels 75%, 100% and 125% RDF (\*100% RDF 80 kg N + 40 kg P<sub>2</sub>O<sub>5</sub> + 40 kg K<sub>2</sub>O ha<sup>-1</sup>) were laid out in Factorial Randomized Block Design with three replications. Results indicated that among the genotypes, SPV 2445 of single-cut fodder sorghum performed better in respect to growth parameters and green fodder (57.34 t ha<sup>-1</sup>) as well as dry fodder (14.22 t ha<sup>-1</sup>) yield than other genotypes. The crop fertilized with 125 per cent RDF performed better in respect to growth parameters and recorded significantly higher green (55.78 t/ha) and dry (13.87 t/ha) fodder yield.

### Introduction

India is the largest livestock economy as it supports 512.05 million of livestock animals which is almost 17 per cent of world's livestock population. This livestock population comprises of 37.28 per cent cattle, 21.23 per cent buffalo, 12.71 per cent sheep, 26.40 per cent goat and 2.01 per cent pig (Govt. of India, 2014). Livestock production is largely dependent upon grazing pasture because forages are the major as well as

important content of animal feed and the backbone of livestock industry. The mainstay of animal health and their production depends on availability of fodder; this is particularly true in case of dairy enterprises where consistent supply of green fodder is vital to sustained milk production. The projected shortage of dry and green fodder are 23.46 and 62.76 per cent compared to the requirement of 589 and 1061 million tonnes for the current livestock population, respectively (ICAR, 2014). Hence, all efforts

should be focused for achieving higher fodder yield.

Sorghum [*Sorghum bicolor* (L.) Moench] is a popular fodder crop of Gramineae family grown throughout India because of its fast growing nature and is adaptive to vast environmental conditions. It provides palatable and nutritious fodder to the animals. It is the fifth major cereal produced in the world and is preceded by wheat, rice, maize and barley (FAO, 2016). Sorghum is known as the king of millets and fourth important crop in the country after rice, wheat and maize. Introduction of multi-cut sorghum hybrids, single-cut and dual-purpose sorghum which can be grown for quality green fodder production in most of the states of India is helping to sustain livestock security. The fodder supply situation in India is extremely precarious and the gap is very wide. In fact, the contribution of feed and fodder is upto 50% towards livestock productivity and production. So, it is rational to evaluate the relative performance of single-cut fodder sorghum genotypes in conjunction with various fertility levels. Keeping this in view, the field investigation was carried out to find out suitable single-cut genotype of sorghum for maximum fodder production and its balance nutrient requirement.

### **Materials and Methods**

A field experiment was conducted at Instructional Farm, Rajasthan College of Agriculture, MPUAT, Udaipur during *Kharif*, 2018 which is situated at 24°35' N latitude, 73°42' E longitude and altitude of 579.5 m above mean sea level. The experimental soil was sandy clay loam in texture, moderate alkaline in reaction (pH 8.1), low in available nitrogen (247.2 kg ha<sup>-1</sup>), phosphorus (20.8 kg ha<sup>-1</sup>), high in available potassium (375.9 kg ha<sup>-1</sup>) and medium in organic carbon (0.69%). The experiment consisted of 15 treatment

combinations comprising five single-cut fodder sorghum genotypes (SPV 2296, SPV 2316, SPV 2445, CSV 21F and CSV 30F) and three fertility levels 75%, 100% and 125% RDF (\*100% RDF 80 kg N + 40 kg P<sub>2</sub>O<sub>5</sub> + 40 kg K<sub>2</sub>O ha<sup>-1</sup>) replicated thrice in "Factorial Randomized Block Design". As per treatment, full dose of phosphorus and potassium and half dose of nitrogen were applied at the time of sowing. Remaining ¼ dose of nitrogen was top dressed at crop 35 DAS and ¼ dose of nitrogen was top dressed at crop 47 DAS. The sorghum genotypes were sown as per treatment on 5<sup>th</sup> July, 2018 in opened furrows at 25 cm apart using seed rate of 25 kg/ha. Other agronomic and plant protection measures were adopted as and when crop needed. The crop was harvest at 50 per cent flowering stage.

### **Results and Discussion**

The results obtained from investigation as well as relevant discussion have been summarized below in following heads:

#### **Effect of genotypes**

A perusal of data in Table 1 showed that genotype SPV 2445 recorded significantly maximum plant height at 45 DAS and at harvest (153.38 cm & 316.31 cm) over rest of genotypes but found statically at par with CSV 30F (146.08 cm & 315.81 cm). Genotype CSV 30F took highest days to 50% flowering (77.44), which was significantly higher over rest of genotypes. However, maximum number of leaves plant<sup>-1</sup> (11.11), stem girth (1.50 cm) and leaf to stem ratio (32.00) at harvest were observed but these were found at par with the genotype CSV 30F. The growth of genotypes is interactive outcome of genetic milieu, environmental conditions and agronomic support which provided during crop life cycle (Singh et al., 2016).

**Table.1** Effect of single-cut fodder sorghum genotypes and fertility levels on plant height, days to 50% flowering, number of leaves plant<sup>-1</sup>, stem girth (cm) and leaf to stem ratio

Treatments	Plant height (cm)			Days to 50% flowering	No. of leaves plant <sup>-1</sup> at harvest	Stem girth at harvest (cm)	Leaf-stem ratio at harvest
	30 DAS	45 DAS	At harvest				
<b>Genotypes</b>							
<b>SPV-2296</b>	82.84	139.31	280.09	71.22	8.67	1.33	29.27
<b>SPV-2316</b>	83.55	142.98	283.98	72.89	9.11	1.35	29.39
<b>SPV-2445</b>	88.44	153.38	316.31	75.11	11.11	1.50	32.00
<b>CSV-21F</b>	86.42	144.91	298.42	76.00	10.00	1.37	29.48
<b>CSV-30F</b>	86.84	146.08	315.81	77.44	10.67	1.49	31.67
<b>S. Em.±</b>	4.08	2.54	5.19	0.34	0.35	0.04	0.82
<b>CD (P= 0.05)</b>	NS	7.36	15.03	0.98	1.03	0.12	2.38
<b>Fertility levels</b>							
<b>75 % RDF</b>	80.43	137.74	289.57	76.40	9.27	1.35	27.71
<b>100 % RDF</b>	86.48	147.70	300.03	74.27	9.87	1.39	31.18
<b>125 % RDF</b>	89.95	150.55	307.17	72.93	10.60	1.49	32.20
<b>SEm.±</b>	3.16	1.97	4.02	0.26	0.27	0.03	0.64
<b>CD (P= 0.05)</b>	NS	5.70	11.64	0.76	0.79	0.10	1.85

\*RDF = 80 kg N ha<sup>-1</sup>, 40 kg P<sub>2</sub>O<sub>5</sub> ha<sup>-1</sup> and 40 kg K<sub>2</sub>O ha<sup>-1</sup>

**Table.2** Effect of single-cut fodder sorghum genotypes and fertility levels on dry matter accumulation, LAI, green and dry fodder yield

Treatments	Dry matter accumulation (g/m row length)			Leaf Area Index			Fodder yield (t ha <sup>-1</sup> )	
	30 DAS	45 DAS	At harvest	30 DAS	45 DAS	At harvest	Green	Dry
<b>Genotypes</b>								
SPV-2296	80.44	639.30	1555.24	1.78	2.30	2.95	48.68	11.21
SPV-2316	81.48	656.85	1636.68	1.80	2.35	2.98	49.73	11.94
SPV-2445	93.82	806.93	1911.36	2.08	2.48	3.22	57.34	14.22
CSV-21F	82.48	684.98	1668.44	2.00	2.35	3.00	51.08	13.20
CSV-30F	90.10	730.80	1747.78	2.01	2.45	3.09	54.07	13.76
SEm.±	3.12	40.88	71.34	0.10	0.04	0.06	1.55	0.20
CD (P= 0.05)	9.05	118.42	206.67	NS	0.12	0.17	4.48	0.57
<b>Fertility levels</b>								
75 % RDF	76.96	638.83	1475.47	1.83	2.23	2.84	47.93	11.16
100 % RDF	87.23	710.93	1760.77	1.88	2.45	3.09	52.82	13.56
125 % RDF	92.81	761.55	1875.46	2.09	2.48	3.22	55.78	13.87
SEm.±	2.42	31.66	55.26	0.08	0.03	0.05	1.20	0.15
C.D. (P= 0.05)	7.01	91.73	160.09	NS	0.09	0.13	3.47	0.45

\*RDF = 80 kg N ha<sup>-1</sup>, 40 kgP<sub>2</sub>O<sub>5</sub>ha<sup>-1</sup> and 40 kg K<sub>2</sub>O ha<sup>-1</sup>

**Table.3** Interaction effect of single-cut fodder sorghum genotypes and fertility levels on dry fodder yield

Genotypes	Fertility levels		
	75 % RDF	100 % RDF	125 % RDF
SPV-2296	9.16	12.36	12.12
SPV-2316	10.21	13.39	12.22
SPV-2445	13.26	14.29	15.10
CSV-21F	10.94	13.74	14.93
CSV-30F	12.26	14.02	15.00
SEm.±	0.344		
CD (P= 0.05)	0.996		

Data dissert on the plant dry matter accumulation per meter row length at 30, 45 DAS and at harvest (Table 2) proved significantly higher with genotype SPV 2445 (93.82, 806.93 & 1911.36 g) over rest of genotypes except CSV 30F. All the genotypes did not show any significant impact on leaf area index at 30 DAS, whereas genotype SPV 2445 proved significantly higher in leaf area index at 45 DAS and at harvest over rest of genotypes but found at par with CSV 30F.

The genotype SPV 2445 recorded higher green (57.34 t ha<sup>-1</sup>) and dry (14.22 t ha<sup>-1</sup>) fodder yields, which was significantly higher than rest of the genotypes under test (Table 2) but statically found at par with the genotype CSV 30F (54.07 t ha<sup>-1</sup> & 13.76 t ha<sup>-1</sup>). The higher fodder yield of genotype SPV 2445 could mainly be attributed to comparatively higher plant height, leaf to stem ratio, number of leaves and stem girth of genotype. Similar finding were also reported by Trivadi *et al.*, (2010), Rana *et al.*, (2013), Shinde *et al.* (2015), Singh *et al.*, (2016), Himani *et al.* (2017), Meena *et al.*, (2017) and Verma *et al.*, (2017).

### Effect of fertility levels

A reference data (Table 1) indicate that fertility levels brought about significant variation in plant height at 45 DAS and at

harvest. Application of 125% RDF recorded maximum plant height (150.55 cm & 307.17 cm) which was proved significantly higher over 75% RDF (137.74 cm & 289.57 cm) but found at par with 100% RDF (147.70 cm & 300.03 cm). The crop fertilized with the 125 per cent RDF observed minimum days to 50% flowering (72.93), maximum numbers of leaves per plant at harvest (10.60), maximum stem girth (1.49 cm) and maximum leaf to stem ratio (32.20), which was significantly higher over 75 per cent RDF but found at par with 100 per cent RDF.

Data (Table 2) indicated that an application of 125 per cent RDF produced significantly higher dry matter accumulation per meter row length at 30, 45 DAS and at harvest (92.81 g, 761.55 g & 1875.46 g), which was significantly higher over 75% RDF but at par with 100% RDF. At harvest corresponding increase in dry matter accumulation with 125% RDF over 100 and 75% RDF was 6.51 and 27.10 per cent, respectively. Varied fertility levels failed to record any significant impact on leaf area index at 30 DAS. It is clarify from the data (Table 2) that fertility levels had significant impact on LAI at 45 DAS and at harvest. An application of 125% RDF brought significant increase in LAI at 45 DAS and at harvest (2.48 & 3.22) over 75% RDF (2.23 & 2.84) by 11.21 & 13.38 per cent, respectively. Further 100% RDF

remained at par with 125% RDF at 45 DAS & at harvest. The results obtained corroborate with the findings of Singh *et al.* (2016), Yadav *et al.* (2016) and Meena *et al.* (2017).

The maximum green (55.78 t ha<sup>-1</sup>) and dry (13.87 t ha<sup>-1</sup>) fodder yield were observed by the conjoint application of 125 per cent RDF which was significantly higher over 75% RDF but resulted at par with 100% RDF. These results are in close agreement with the finding of Bhatt *et al.* (2012), Satpal *et al.* (2016), Yadav *et al.* (2016) and Meena *et al.* (2017).

### **Interaction effect of genotypes and fertility levels**

Data presented in Table 3 revealed that the interaction effect between various genotypes and fertility levels on dry fodder yield was found significant. Maximum dry fodder yield was produced by genotype SPV 2445 (15.10 t ha<sup>-1</sup>) when crop was fertilized with 125% RDF (G<sub>3</sub>F<sub>3</sub>) and it was closely followed by G<sub>5</sub>F<sub>3</sub>, G<sub>4</sub>F<sub>3</sub> and G<sub>3</sub>F<sub>2</sub>. Significantly minimum dry fodder yield (9.16 t ha<sup>-1</sup>) was noted under treatment G<sub>1</sub>F<sub>1</sub>.

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