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SHORT COMMUNICATION

PRODUCTION CAPACITY OF SINGLE CUT FODDER SORGHUM (*SORGHUM BICOLOR)* GENOTYPES UNDER VARYING FERTILITY LEVELS

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SUMMARY

A field experiment was conducted during **kharif** season of 2016 at Udaipur, Rajasthan on clay loam soil to assess the effect of fertility levels (60 N+30 P_2O_5+30 K_2O kg/ha, 80 N+40 P_2O_5+40 K_2O kg/ha and 100 N+50 P_2O_5+50 K_2O kg/ha) on single cut genotypes (SPH 1725, SPH 1794, SPH 1797, SPV 2317, CSH 13 and CSV 21F) of fodder sorghum. Amongst genotypes, SPH 1752 proved most efficient as it gave significantly higher green (47.73 t/ha) and dry (14.24 t/ha) fodder yields, net returns (Rs. 41150/ha) and B : C ratio 1.60. The crop fertilized with 100 N+50 P_2O_5+50 K_2O kg/ha recorded significantly higher green (41.08 t/ha) and dry (12.26 t/ha) fodder yield as well as net returns (Rs. 30803/ha) over application of 60 N+30 P_2O_5+30 K_2O kg/ha and 80 N+40 P_2O_5+40 K_2O kg/ha.

Key words : Single cut sorghum genotypes, fertility levels, growth characters, fodder yield and economics

Sorghum (*Sorghum bicolor*), belonging to family Poaceae, is an important **kharif** season crop which is widely grown to meet the green as well as dry fodder requirement of the livestock. It is fast growing, adaptive to vast environmental conditions and provides palatable nutritious fodder to the animals. India has the largest livestock population which accounts for 17 per cent of the world's livestock populace. However, livestock productivity is constrained by an acute shortage of feed and fodder. A general agreement is that there is a shortage of 40.4 per cent dry fodder and 24.7 per cent green fodder against the requirement of 650.7 and 761.5 million tonnes for dry and green fodder, respectively (Singh *et al*., 2011). 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. In addition to energy, green fodder provides vitamins and minerals and helps in digestion (Surve *et al*., 2012). Genetic exploitation of sorghum for increasing yield and quality fodder sorghum has played a significant role (Aruna *et al*., 2015). Balanced use of fertilizer has played a key role in the modernization of Indian agriculture and in making the country sufficient in fodder production for animals (Meena *et al*., 2012). Genotypes of sorghum play an important role in increasing fodder production but information on the response of newly evolved genotypes to fertilizer levels is required. These genotypes need to be tested against the check for their performance under various fertility conditions because the information on the response of newly evolved genotypes to fertility levels is scanty (Rana *et al*., 2013). So, it is rational to assess the relative performance of single cut sorghum genotypes in conjunction with different levels of fertility. Keeping this in view, the present investigation was carried out to find out suitable single cut genotype of sorghum for higher fodder production and its nutrient requirement and to assess economic viability.

A field experiment was conducted during **kharif** season of 2016 at Instructional Farm, Rajasthan College of Agriculture, Udaipur (Rajasthan) situated at 24º35' N latitude, 74º42' E longitude and altitude of 579.5 m above mean sea level. The soil of the experimental field was clay loam in texture, slightly alkaline in reaction (pH 8.20), low in available nitrogen (248.1 kg/ha) medium in organic carbon (0.61%) and phosphorus (20.60 kg/ha) and high in available potassium (355.9 kg/ha). The experiment consisted of 18 treatment combinations comprising six single cut fodder sorghum genotypes (SPH 1752, SPH 1794, SPH 1797, SPV 2317, CSH 13 and CSV 21F) and three fertility levels (60 N+30 P_2O_5+30 K_2O kg/ha, 80 N+40 P_2O_5+40 K_2O kg/ha and 100 N+50 P_2O_5+50 K_2O kg/ha) 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 half dose of nitrogen was top dressed at crop knee high stage. The sorghum genotypes as per treatment were sown on 9 July, 2016 in opened furrows at 30 cm apart using seed rate of 30 kg/ha. A plant to plant distance of 10 cm was maintained by thinning and gap filling operation at 15 DAS. Other agronomic and plant protection measures were adopted as and when crop needed. The crop was harvested at 50 per cent flowering stage.

Effect of Genotypes

The data (Table 1) showed that at 45 DAS genotype CSH 13 recorded maximum plant height (149.1 cm), which was significantly higher over rest of the genotypes but at par with SPH 1752, whereas SPH 1752 recorded maximum plant height (325.0 cm) at harvest, days to 50 per ent flowering (76.7) and stem girth (2.04 cm), which was significantly higher over rest of the genotypes. However, maximum number of leaves/plant (10.8) was also recorded in the genotype SPH 1752, but it was at par with the genotypes SPV 2317 and CSV 21F. The differential behaviour of these genotypes could also be explained solely by the variation in their genetic constituent (Meena *et al.*, 2012). The growth of genotypes is interactive outcome of genetic milieu, environmental conditions and agronomic support which provided during its life cycle (Singh *et al.*, 2016).

At 30 DAS genotype CSH 13 produced the highest dry matter accumulation (12.7.0 g/ plant) which was significantly higher over the genotypes SPH 1794, SPH 1797, SPV 2317 and CSV 21F, while it was at par with the SPH 1752. The genotype SPH 1752 accumulated highest dry matter (73.50 g/plant) at 45 DAS, and (151.50 g/plant) at harvest, which was significantly higher over rest of the genotypes except CSH 13 at harvest. Dry matter production efficiency of genotype determines its potential to produce economic yield (Rana *et al.*, 2013). The genotype SPH 1752 recorded higher green (47.73 t/ha) and dry (14.24 t/ha) fodder yields, net returns (Rs. 41150/ha) and B : C ratio (1.60) which was significantly higher than rest of the genotypes under test (Table 2). The highest fodder yield of genotype SPH 1752 could mainly be attributed to comparatively higher plant height and stem girth of genotype. Several workers have also noticed the variation in the genotypes of sorghum for fodder yield and growth (Meena *et al.*, 2012; Singh *et al.*, 2016).

Effect of Fertility Levels

The data (Table 1) indicated that fertility levels brought significant variation in growth character of single cut fodder sorghum genotypes. Increase in fertility level from 60 kg N+30 kg P_2O_5+30 kg K_2O/ha to 80 kg N+40 kg P_2O_5+40 kg K_2O/ha tended to significantly increase the plant height from 123.4 to 132.4 cm at 45 DAS. Further increase in fertility level failed to exhibit significant response. However, at harvest higher fertility level of 100 kg N+50 kg P_2O_5+50 kg K_2O/ha had significant effect over medium and lower fertility level. The crop fertilized with the

TABLE 1
Effect of single cut fodder sorghum genotypes and fertility levels on growth characters

Treatment	Plant height (cm)		Dry matter accumulation (g/plant)			Days to 50% flowering	No. of leaves/plant	Stem girth (cm)
	45 DAS	At harvest	30 DAS	45 DAS	At harvest			
Genotypes								
SPH 1752	142.8	325.0	12.30	73.50	151.50	76.7	10.8	2.04
SPH 1794	125.3	243.5	10.30	58.69	130.65	66.0	9.6	1.78
SPH 1797	130.2	265.3	10.70	60.31	133.86	63.7	9.3	1.57
SPV 2317	111.2	251.3	8.50	51.35	116.20	74.7	10.3	1.44
CSH 13	149.1	293.6	12.70	68.46	149.92	68.0	9.8	1.72
CSV 21F	128.7	237.4	7.80	48.49	110.58	72.7	10.4	1.15
S. Em±	3.75	3.97	0.39	1.41	2.66	0.27	0.20	0.04
C. D. (P=0.05)	10.8	11.40	1.15	4.05	7.65	0.77	0.58	0.11
Fertility Levels ($N+P_2O_5+K_2O$ kg/ha)								
60+30+30	123.4	254.2	9.10	53.79	121.02	72.1	9.7	1.54
80+40+40	132.4	270.9	10.55	60.91	133.18	69.9	10.1	1.57
100+50+50	137.9	283.0	11.50	65.71	142.16	68.9	10.3	1.75
S. Em±	2.65	2.80	0.28	1.00	1.88	0.19	0.14	0.03
C. D. (P=0.05)	7.61	8.06	0.81	2.86	5.40	0.54	0.41	0.08

NS–Not Significant.

TABLE 2
Effect of single cut fodder sorghum genotypes and fertility levels on fodder yield and economics

Treatment	Fodder yield (t/ha)		Net return	B : C ratio
	Green	Dry		
Genotypes				
SPH 1752	47.73	14.24	41150	1.60
SPH 1794	34.62	10.33	22788	0.89
SPH 1797	34.72	10.36	22936	0.89
SPV 2317	32.58	9.72	19939	0.77
CSH 13	42.55	12.70	33894	1.32
CSV 21F	36.30	10.83	25138	0.98
S. Em±	1.37	0.41	1917	0.08
C. D. (P=0.05)	3.94	1.17	5511	0.22
Fertility Levels				
($N+P_2O_5+K_2O$ kg/ha)				
60+30+30	34.92	10.42	24244	0.98
80+40+40	38.25	11.41	27876	1.09
100+50+50	41.08	12.26	30803	1.15
S. Em±	0.97	0.28	1356	0.05
C. D. (P=0.05)	2.78	0.83	3897	NS

NS–Not Significant.

application of 100+50+50 kg/ha of $N+P_2O_5+K_2O$ accumulated highest dry matter (11.50 g/plant), (65.71 g/plant) and (142.16 g/plant) at 30, 45 DAS and at harvest, respectively, which was significantly higher over 80+40+40 kg/ha of $N+P_2O_5+K_2O$ and 60+30+30 kg/ha of $N+P_2O_5+K_2O$. The corresponding increase in dry matter accumulation with application of 100+50+50 kg/ha of $N+P_2O_5+K_2O$ over 80+40+40 kg/ha of $N+P_2O_5+K_2O$ and 60+30+30 kg/ha of $N+P_2O_5+K_2O$ was of the order of 26.37 and 9.00 per cent, 13.24 and 7.88 per cent and 10.05 and 7.47 per cent, respectively. Application of 100 kg N+50 kg P_2O_5+50 kg K_2O/ha resulted in minimum days to 50 per cent flowering (68.9), which was significantly lower than lower fertility levels. The maximum number of leaves/plant (10.3) was observed with the application of 100+50+50 kg/ha of $N+P_2O_5+K_2O$, but at par with the application of 80+40+40 kg/ha of $N+P_2O_5+K_2O$. However, application of 80+40+40 kg/ha of $N+P_2O_5+K_2O$ was significantly superior over 60+30+30 kg/ha of $N+P_2O_5+K_2O$. Increase in fertility level from 60+30+30 to 80+40+40 kg/ha of N, P_2O_5 and K_2O did not affect stem girth of sorghum, but significantly higher stem girth was obtained by conjoint application of 100 kg N, 50 kg P_2O_5 and 50 kg K_2O/ha over lower and medium fertility levels. The results obtained corroborate with the findings of Satpal *et al.* (2015) and Singh *et al.*, (2016).

The maximum green (41.08 t/ha) and dry (12.26 t/ha) fodder yields were observed by the conjoint application of 100 kg N, 50 kg P_2O_5 and 50 kg K_2O/ha, which were significantly higher over the application of all preceding fertility levels. The magnitude of increase was 9.54 and 7.40 per cent in green fodder and 9.50 and 7.45 per cent in dry fodder yield by raising fertility level from 60+30+30 to 80+40+40 and 80+40+40 to 100+50+50 kg/ha of N, P_2O_5 and K_2O, respectively. The significant increase in fodder yield with increase in fertility levels was due to the fact that all these nutrients were involved in increasing protoplasmic constituents, root, shoot growth and accelerating the process of cell division, enlargement and elongation which in turn showed luxuriant vegetative growth and resulted in higher green and dry fodder yield. Similar results were also obtained by Rana *et al.* (2013) and Singh *et al.* (2016). Nutrient application rate from 60+30+30 to 80+40+40 kg/ha of N, P_2O_5 and K_2O tended to result in non-significant increase, while further enhancement to 100+50+50 kg/ha of N, P_2O_5 and K_2O (Rs. 30803/ha) gave significant increase in net returns and the fertility levels failed to record significant variation in B : C ratio.

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