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SHORT COMMUNCATION

EFFECT OF FERTILITY LEVELS ON GROWTH AND YIELD OF MULTI-CUT FORAGE SORGHUM GENOTYPES

DURGESH KUMAR AND P. C. CHAPLOT*

Department of Agronomy,
Rajasthan College of Agriculture,
Maharana Pratap University of Agriculture & Technology,
Udaipur-313001 (Rajasthan), India
**(e-mail : pcchaplot@gmail.com)*

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SUMMARY

A field experiment was conducted during the *zaid* season of 2013 at Udaipur, Rajasthan on clay loam soil to assess the effect of fertility levels viz., control, 50% recommended dose of fertilizer (RDF), 75% RDF and 100% RDF (80 Kg N + 40 Kg P_2O_5 + 40 Kg K_2O/ha) on multi-cut genotypes of forage sorghum (SPH 1697, SPH 1698, CSH 20 MF, CSH 24 MF and SSG 59-3). Among genotypes, SPH 1697 proved significantly superior in respect to plant height, stem girth, leaves/plant, fresh leaf and stem weight/plant and dry matter accumulation/plant during 1st and 2nd cut. These improvements in growth led the genotype SPH 1697 to produce significantly higher green and dry fodder yield during both the cuts over genotypes SPH 1698, CSH 20 MF, CSH 24 MF and SSG 59-3. The maximum plant height, stem girth, leaves/plant, fresh leaf and stem weight/plant, dry matter accumulation/plant, green and dry fodder yield were recorded at 100% RDF application which were significantly higher than lower doses of fertilizer and control during both the cuts.

Key words : Multi-cut sorghum, genotypes, fertility levels, growth, fodder yield

Indian rural economy with more than 90 percent population of ruminants with small and marginal farmers strongly backed by livestock supported agriculture. We, with the largest livestock population of the world (512 million) and only 2.4 percent of the world's geographical area are facing tremendous pressure on the availability of feed and fodder for the livestock. Only 4.4 percent of the cultivated area in the country is under fodder crops. The projected shortages of dry and green fodder are 40 and 36 percent compared with the requirement of 416 and 222 million tones for the current livestock population, respectively. Thus there is an urgent need to narrow down gap between demand and supply of good quality fodder to improve health and productivity of vast livestock by enhancing production and productivity of forage crop especially forage sorghum.

Sorghum (*Sorghum bicolor* L.) is an important crop widely grown for forage. In summer, under irrigated condition multi-cut sorghum is very popular. The crop is adaptive to vast environmental condition and in India it provides green fodder to the animals for a considerable length of period from May to September (Sumeriya and Singh, 2014). During last few years, a number of high yielding multi-cut forage sorghum genotypes have been developed. The results showed that sorghum genotypes are only able to express their inherent genetic production potential for producing green fodder when they are supplemented with proper amount of fertilizer. Keeping these in view, the present investigation was carried out to find out suitable multi-cut genotype of sorghum and its nutrient requirement.

A field experiment was conducted during *zaid* season 2013 at Instructional Farm, Rajasthan College of Agriculture, Udaipur (Rajasthan) situated at 24º34′ N latitude, 73º42′ E longitude and altitude of 579.5 m above mean sea level. The soils of the experimental field was clay loam in texture, slightly alkaline in reaction (pH 8.0), medium in available nitrogen (295.3 kg/ha) and phosphorus (16.6 kg/ha) while high in available potassium (270.7 kg/ha). The experiment consisted of 20 treatment combinations comprising five multi-cut forage sorghum genotypes (SPH 1697, SPH 1698, CSH 20MF, CSH 24MF and SSG 59-3) and four fertility levels *viz*., control, 50% recommended dose of fertilizer (RDF), 75% RDF and 100% RDF (80 kg N+40 kg P_2O_5+40 kg K_2O/ha). These treatments were tested in factorial randomized block design with three replications. As per treatment,

full dose of phosphorus and potassium and one third dose of nitrogen was applied at the time of sowing. Remaining nitrogen dose was splitted into two equal parts, first half was applied at knee high stage while second half at 30 days after first cutting. The sorghum genotypes as per treatment were sown on 25th April, 2013 in opened furrows at 30 cm apart using seed rate of 40 kg/ha. A plant to plant distance of 10 cm was maintained by thinning and gap filling operation at 15 DAS. The crop was irrigated at 10-15 days interval as per need during summer. Other agronomic and plant protection measures were adopted as and when crop needed. The 1st and 2nd cutting for green fodder were taken at 55 days after sowing and 40 days after 1st cuttings, respectively.

Effect of Genotypes

The maximum plant height and leaves/plant were obtained in genotype SPH 1697 which were significantly higher over CSH 24 MF and SSG 59-3 in 1st cut and SPH 1698, CSH 20 MF and SSG 59-3 in 2nd cut (Table 1). The variation in plant height of the genotype might be related to inherent difference and their high vigour. The maximum stem girth was recorded in SPH 1697 which was significantly higher than SPH 1698, CSH 20 MF and CSH 24 MF at the time of 1st cut but the differences were non significant during 2nd cut. Further genotype SPH 1697 produced higher leaf and stem weight/plant during 1st and 2nd cut and dry matter accumulation in 1st cut which were significantly higher over rest of genotypes viz., SPH 1698, SPH 20 MF, SPH 24 MF and SSG 59-3. But in 2nd cut, genotype SPH 1697 at par with SPH 1698 and CSH 20 MF however all these genotypes significantly enhanced dry matter accumulation over genotype CSH 24 MF and SSG 59-3. The differential behavior of these genotypes could also be explained solely by the variation in their genetic constituent (Meena *et al.*, 2012). Dry matter production efficiency of genotypes determines its potential to produce economic yield (Rana *et al.*, 2013). Green and dry fodder yields were influenced significantly by genotypes and higher yield were recorded during 1st cut as compared to 2nd cut. Genotype SPH 1697 at par with CSH 20 MF during 1st cut and both genotypes gave significantly higher green and dry fodder yield. While in 2nd cut, genotype SPH 1697 recorded significantly higher green and dry fodder yield than other genotypes under test. Thus when compared to genotypes CSH 20 MF, SPH 1698, CSH 24 MF and SSG 59-3, genotype SPH 1697 significantly enhanced total green fodder yield by 5.4, 18.0, 29.9, 80.9 percent and dry fodder yield by 4.1, 16.1, 28.1, 75.8 per cent, respectively (Table 2). The higher fodder yield registered by genotype SPH 1697 appeared to be a resultant of remarkable improvement in plant height, stem girth, leaf and stem weight and dry matter accumulation. Several workers have also

TABLE 1
Effect of multi-cut forage sorghum genotypes and fertility levels on growth characters

Treatment	Plant height (cm)		Stem girth (cm)		Fresh weight (g/plant)				Leaves/ plant		DMA (g/plant)	
					Stem		Leaf					
	1st cut	2nd cut	1st cut	2nd cut	1st cut	2nd cut	1st cut	2nd cut	1st cut	2nd cut	1st cut	2nd cut
Genotypes												
SPH 1697	230.4	151.7	7.05	5.35	416.5	300.3	106.9	82.05	16.9	11.0	104.8	55.5
SPH 1698	225.4	137.0	6.58	5.30	361.0	230.4	100.1	78.15	16.8	10.8	93.5	53.1
CSH 20 MF	225.0	132.7	6.18	5.30	345.4	221.7	97.7	76.50	16.2	10.2	92.2	53.2
CSH 24 MF	214.7	149.6	6.36	5.17	336.1	218.7	93.2	71.50	16.1	10.0	97.8	46.2
SSG 59-3	193.7	129.5	4.48	3.30	294.8	175.6	74.2	53.6	15.4	9.7	81.7	44.2
S. Em+	3.79	1.86	0.12	0.072	6.54	4.33	2.13	1.37	0.26	0.12	3.09	1.04
C. D. (P=0.05)	10.86	5.32	0.36	0.190	18.74	12.40	6.11	3.92	0.74	0.34	9.47	2.98
Fertility Levels												
Control	209.1	128.5	5.87	4.74	282.5	194.6	71.1	64.5	15.7	9.7	81.0	45.8
50% RDF	216.3	136.0	6.01	4.86	346.7	228.9	84.8	71.2	16.0	10.5	91.6	49.3
75% RDF	218.8	143.9	6.27	4.92	369.7	241.4	94.7	75.0	16.7	10.7	100.0	52.0
100% RDF	227.0	152.1	6.37	5.01	404.2	252.4	103.1	78.9	16.8	10.7	111.3	54.7
S. Em+	3.39	1.66	0.11	0.06	5.84	3.87	1.90	1.22	0.23	0.10	2.86	0.93
C. D. (P=0.05)	9.66	4.73	0.32	0.17	16.66	11.03	5.43	3.48	0.66	0.30	8.42	2.65

TABLE 2
Effect of multi-cut forage sorghum genotypes and fertility levels on fodder yield

Treatment	Fodder yield (t/ha)					
	Green			Dry		
	1st cut	2nd cut	Total	1st cut	2nd cut	Total
Genotypes						
SPH 1697	45.6	25.0	70.6	13.2	7.2	20.4
SPH 1698	37.1	22.7	59.8	10.9	6.4	17.6
CSH 20 MF	44.4	22.6	67.0	13.0	6.6	19.6
CSH 24 MF	31.3	23.0	54.3	9.2	6.8	16.0
SSG 59-3	21.2	17.8	39.0	6.3	5.3	11.6
S. Em+	0.48	0.58	0.80	0.25	0.15	0.25
C. D. (P=0.05)	1.37	1.68	2.29	0.73	0.42	0.71
Fertility Levels						
Control	26.8	16.7	43.6	7.8	4.9	12.7
50% RDF	31.3	20.6	51.9	9.7	6.1	15.7
75% RDF	39.9	24.7	64.6	11.8	7.3	19.1
100% RDF	45.6	26.9	72.5	12.8	7.9	20.7
S. Em+	0.43	0.53	0.71	0.23	0.13	0.22
C. D. (P=0.05)	1.22	1.50	2.04	0.65	0.37	0.63

noticed the variation among the genotype of sorghum for forage yield and growth characteristics (Sumeriya and Singh, 2007 and Dhakar *et al.*, 2009).

Effect of Fertility Level

Data further show that fertility levels had significant influence on growth and fodder yield of genotypes. Plant height, stem girth and leaves/plant of sorghum increased with increase in fertility level up to 75% RDF in both the cut over control and 50% RDF. Further increase in fertility level to 100% RDF though increased above growth parameters but failed to attain statistical significance. The crop under the influence of 100% RDF recorded maximum fresh leaf, stem weight and dry matter accumulation/plant during both cuttings which were significantly higher over control, 50 and 75% RDF application. This improvement in growth parameters led the sorghum genotypes to produce significantly higher green and dry fodder yield in 1st cut, 2nd cut and total over control, 50 and 75% RDF. The corresponding increases in total green and dry fodder yield due to 100% RDF were to the tune of 66.4, 39.8, 12.2, and 62.9, 31.3, 8.2 per cent, respectively. The higher level of fertility increased the availability and absorption of nutrient to plants which resulted in more vegetative growth due to increase in plant height on account of increased division, enlargement and elongation of cells and dry matter accumulation on account of enhanced photosynthesis due to better interception, absorption and utilization of radiant energy. This view is in cognizance with finding of Duhan (2013). Satpal *et al.* (2017) also observed the increasing response of forage sorghum in terms of fodder yield with increasing levels & fertility from 50 to 100% RDF.

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