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Response of Different Seed Rate on the Productivity of Hybrid Fodder Sorghum (*Sugar graze*) in South East Rajasthan

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A B S T R A C T

A field experiment was conducted during two consecutive years from 2014 and 2015 at Agricultural Research Station, Kota, Significantly higher green fodder yield (907 q/ha) and dry fodder yield (245 q/ha) were observed with sowing of Sugargraze by 9.5 kg seed/ha over local chari sowing by 10.0 kg seed/ha green fodder yield (668 q/ha) and dry fodder yield (168 q/ha). However, it was found at par with sowing of Sugargraze by 7.5 kg seed/ha green fodder yield (896 q/ha) and dry fodder yield (242 q/ha).

Introduction

Sorghum [*Sorghum bicolor* (Linn.) Moench] is an important crop in the world, used for food (as grain or sorghum molasses), fodder, the production of alcoholic beverages and biofuels. Most varieties are drought and heat tolerant, and are especially important in arid regions, where the grain is one of the staple foods for poor and rural people. It is an important food and fodder crop grown in India, and among cereals, it is the fourth most important crop after rice, wheat and maize (Dehinwal *et al.*, 2016).

Sorghum grain is used as staple food by millions of people and is grown for grain in southern and central states of India, whereas in northern states of the country (Punjab, Haryana, Uttar Pradesh, Rajasthan, etc.) it is mainly grown as fodder during *summer* and *kharif* seasons as a single as well as multicut crop. Among forage crops, forage sorghum could be a strategic option because of the crop's xerophilic characteristics, adaptation potential, quick growing habit, good ratoon ability, palatability, digestibility and wide range of potential uses as green fodder, dry roughage, hay and silage (Kumar and Chaplot, 2015).

Among crop management practices seeding densities or plant population greatly affect crop growth and then finally grain yield. Therefore seeding density is a key factor in assessing the flexibility and yielding ability of cultivars. Both over and substandard plant population is the major cause of low yield (Jan *et al.*, 2000).

Optimum seed rate plays an important role in contributing to the high yield because in case of thick plant population, most plants remain sterile, easily attacked by diseases as compared to normal population (Robert and Singh, 1981). To obtain high quality preserved forage (silage or hay), harvest sugargraze at knee height stage. For silage, let plants wilt prior to ensiling and lower moisture content will reduce effluent losses from silage. In the India, two to three subsequent harvests are possible. To stimulate recovery growth, fertilize with N immediately following the initial harvest (Smith *et al.,* 2005).

Materials and Methods

Field experiment was conducted during two consecutive years from 2014 and 2015 at Agricultural Research Station, Kota. T_1: Sugargraze (seed rate 3.5 kg/ha), T_2: Sugargraze (seed rate 5.5 kg/ha), T_3: Sugargraze (seed rate 7.5 kg/ha), T_4: Sugargraze (seed rate9.5 kg/ha), T_5: Sugargraze (seed rate11.5 kg/ha) andT_6: Local chari (seed rate 10.0 kg/ha). The experimental field was well prepared by two ploughing followed by harrowing and cultivator and one planking for uniform leveling, etc were performed for sowing of sorghum crop. The experiment was laid-out in RBD with four replications and six treatments. The recommended dose of nitrogen, phosphorus and potash i.e.125 kg N/ha, 60 kg P_2O_5 / ha and 60 kg K_2O /ha was given in the form of urea, di-ammonium phosphate (DAP) and muriate of potash (MOP). Full dose of DAP and MOP and half N were drilled just before sowing and remaining half-N was applied in two split doses as per recommendation.

The bulk density, pH and cation exchange capacity of these soils varies between 1.30-1.60 Mg/m^3, 7.75-8.50 and 30-40 Cmol/kg, respectively. The soils of the region are poor in organic carbon (0.50±0.08) and available nitrogen (275±5 kg/ha) but are low to medium in available P_2O_5 (24.2± 1.0 kg/ha) and medium to high in available K_2O (290 ± 8 kg/ha).

Results and Discussion

Plant population

The plant population and growth parameters of sugargraze were significantly influenced by sowing of different seed rate (Table 1). Pooled data of two years showed that the significantly higher plant population (491886/ha) of sugargraze was recorded with the sowing of 11.5 kg seed/ha which was significantly superior over rest of the treatments.

Ist cutting

Two years pooled data indicated that(Table 1) the maximum plant height (154cm), leaf weight/plant (93.75g) and stem weight/plant (280.65 g) were recorded with the sowing of sugargraze by 3.5 kg seed/ha over local chari plant height (132cm), leaf weight/plant (70.6g) and stem weight/plant (214.15 g). However, it was found at par with sowing of sugargraze 5.5 and 7.5 kg seed/ha. Pooled data of two years shows that the fodder yield was significantly influenced by sowing of different seed rate of sugar graze (Table 1). Sowing of sugargraze with 9.5 kg seed/ha were observed maximum green fodder yield (568q/ha), dry fodder yield (153q/ha) and dry matter (26.86%) but it was found at par with the sowing of sugargraze 7.5 kg seed/ha over local chari sowing with 10.0 kg seed/ha green fodder yield (413q/ha), dry fodder yield (109q/ha) and dry matter (25.80%) table 3. These results are in close proximity with those of Dehinwal *et al.,* (2016), Smith *et al.,* (2005) and Jan *et al.,* (2000).

Table.1 Effect of different seed rate on plant population, growth and fodder yield of sugargraze (Ist cutting)

Treatments	Plant population (thousand/ha)			Plant height (cm)			Weight of leaves/ plant (g)			Weight of stem/plant (g)			Green fodder yield (q/ha)			Dry fodder yield (q/		
	2014	2015	Pooled	2014	2015	Pooled	2014	2015	Pooled	2014	2015	Pooled	2014	2015	Pooled	2014	2015	Poo
T1: Sugargraze (seed rate 3.5 kg/ha)	156667	158400	157534	153.2	153.7	153.50	93.7	93.8	93.75	280.0	281.3	280.65	386	388	387	107	109	1
T2: Sugargraze (seed rate 5.5 kg/ha)	245313	247375	246344	152.2	152.5	152.38	92.7	92.8	92.75	279.0	280.0	279.50	424	427	426	113	115	1
T3: Sugargraze (seed rate 7.5 kg/ha)	328750	330750	329750	150.7	151.2	151.00	92.4	92.5	92.45	277.8	279.3	278.55	558	562	560	150	151	1
T4: Sugargraze (seed rate 9.5 kg/ha)	408854	410900	409877	141.2	143.2	142.25	91.3	91.4	91.35	275.3	276.0	275.65	566	569	568	152	153	1
T5: Sugargraze (seed rate 11.5 kg/ha)	490729	493042	491886	135.5	136.5	136.03	73.5	73.7	73.6	252.5	253.8	253.15	516	519	518	135	137	1
T6: Local variety (seed rate 10.0 kg/ha)	417188	419025	418107	131.2	132.7	131.99	70.6	70.6	70.6	213.4	214.9	214.15	411	414	413	106	111	1
SEm ±	1102	1088	1007	1.0	1.2	1.0	0.74	0.73	0.67	1.23	1.31	1.16	3.88	4.03	3.63	1.11	1.09	1
CD at 5 %	3318	3276	2909	3.2	3.4	2.9	2.22	2.19	1.93	3.70	3.93	3.35	11.70	12.14	10.48	3.34	3.29	2

Table.2 Effect of different seed rate on plant growth and fodder yield of sugargraze (IInd cutting)

Treatments	Plant height (cm)			Weight of leaves/ plant (g)			Weight of stem/ plant (g)			Green fodder yield (q/ha)			Dry fodder yield (q/ha)		
	2014	2015	Pooled	2014	2015	Pooled	2014	2015	Pooled	2014	2015	Pooled	2014	2015	Pooled
T1: Sugargraze (seed rate 3.5 kg/ha)	133	134	134	66.08	66.30	66.19	159.8	161.3	160.55	247	250	249	62	64	63
T2: Sugargraze (seed rate 5.5 kg/ha)	132	133	133	65.75	66.08	65.92	157.3	158.5	157.9	263	266	265	68	69	69
T3: Sugargraze (seed rate 7.5 kg/ha)	131	132	132	64.75	65.05	64.90	156.0	157.3	156.65	334	337	336	90	91	91
T4: Sugargraze (seed rate 9.5 kg/ha)	125	126	126	62.00	62.23	62.12	155.6	157.1	156.35	338	340	339	91	93	92
T5: Sugargraze (seed rate 11.5 kg/ha)	120	121	121	55.50	55.68	55.59	135.3	136.8	136.05	265	268	267	67	68	68
T6: Local variety (seed rate 10.0 kg/ha)	117	118	118	51.75	52.02	51.89	118.3	120.3	119.3	253	256	255	57	60	59
SEm ±	0.67	0.84	0.69	1.01	0.98	0.91	1.28	1.65	1.34	3.00	2.87	2.70	0.58	0.71	0.59
CD at 5 %	2.02	2.52	2.00	3.05	2.96	2.64	3.86	4.98	3.89	9.05	8.66	7.79	1.74	2.13	1.71

Table.3 Effect of different seed rate on dry matter (%) and total green and dry fodder yield of sugargraze (Ist cutting and IInd cutting)

Treatments	Dry matter (%) Istcutting			Dry matter (%) IInd cutting			Green fodder yield (q/ha)			Dry fodder yield (q/ha)		
	2014	2015	Pooled	2014	2015	Pooled	Ist cutting	IInd cutting	Total	Ist cutting	IInd cutting	Tot
T1: Sugargraze (seed rate 3.5 kg/ha)	27.72	27.73	27.73	25.10	25.12	25.11	387	249	636	108	63	17
T2: Sugargraze (seed rate 5.5 kg/ha)	26.65	26.67	26.66	25.85	25.86	25.86	426	265	691	114	69	18
T3: Sugargraze (seed rate 7.5 kg/ha)	26.88	26.90	26.89	26.94	26.96	26.95	560	336	896	151	91	24
T4: Sugargraze (seed rate 9.5 kg/ha)	26.85	26.86	26.86	26.92	26.94	26.93	568	339	907	153	92	24
T5: Sugargraze (seed rate 11.5 kg/ha)	26.16	26.18	26.17	25.28	25.29	25.29	518	267	785	136	68	20
T6: Local variety (seed rate 10.0 kg/ha)	25.79	25.81	25.80	22.52	22.57	22.55	413	255	668	109	59	16
SEm ±	0.14	0.14	0.12	0.20	0.20	0.18	3.63	2.70	-	1.01	0.59	-
CD at 5 %	0.42	0.42	0.37	0.59	0.60	0.53	10.48	7.79	-	2.92	1.71	-

General View of Experimental plot

II[nd] cutting

During II[nd] cutting plant growth was significantly influenced (Table 2) by sowing of different seed rate of sugargraze. The maximum plant height(134cm), leaf weight/ plant (66.19g) and stem weight/ plant (160.55g) of sugargraze were recorded with the sowing of 3.5 kg seed/ha of sugargraze over local chari plant height (118cm), leaf weight/ plant (51.89g) and stem weight/ plant (119.3 g) sowing with 10 kg seed/ha. However, it was found at par with sowing of sugargraze 5.5 and 7.5 kg seed/ha, respectively. Fodder yield of sugargraze was significantly influenced by sowing with different seed rates. The maximum green fodder yield (339 q/ha), dry fodder yield (92q/ha) (Table 2) and dry matter (26.93%) were observed under sowing of sugargraze 9.5 kg seed/ha but it was found at par with the sowing of sugargraze 7.5 kg seed/ha green fodder yield (336q/ha), dry fodder yield (91q/ha) and dry matter (26.95%) over rest of treatments (Table 3). These results are in close proximity with those of Satpal *et al.*, 2016; Kumar and Chaplot.

In conclusion, significantly higher green fodder yield (907 q/ha) and dry fodder yield (245 q/ha) were observed with sowing of sugargraze by 9.5 kg seed/ha over local chari sowing by 10.0 kg seed/ha green fodder yield (668 q/ha) and dry fodder yield (168 q/ha). However, it was found at par with sowing of sugargraze by 7.5 kg seed/ha green fodder yield (896 q/ha) and dry fodder yield (242 q/ha).

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