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FODDER YIELD, QUALITY AND HCN CONTENT OF SORGHUM CV. HC 308 AS INFLUENCED BY SOWING TIME AND SEED RATE UNDER PUNJAB CONDITIONS

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ABSTRACT

A field experiment was conducted at Forage Research Farm, Punjab Agricultural University, Ludhiana during *kharif* seasons of 2007 and 2008 to study the effect of sowing time and seed rate on the fodder yield, quality and HCN content of sorghum cv. HC 308. Mid-May sown crop gave significantly higher green fodder and dry matter yields over rest of the sowing dates. The magnitude of increase was 11.1, 43.6, 121.1 and 202.6 % in green fodder yield and 15.7, 52.7, 143.6 and 243.5 % in dry matter yield over end-May, mid-June, end-June and mid-July sown crop, respectively. With increase in seed rates, the green fodder and dry matter yield increased significantly but significant response was obtained up to 62.5 kg seed/ha. The crop sown with 62.5 kg seed/ha recorded 460.3 q/ha green fodder yield and 127.6 q/ha dry matter yield as compared to 438.8 q/ha green fodder yield and 122.2 q/ha dry matter yield with 50 kg seed/ha. The crude protein, ash and IVDMD contents increased and crude fibre decreased with delay in sowing from mid-May to mid-July during both the years of study. The CP, ash and IVDMD contents increased with increase in seed rates. Whereas, the trend was reverse in case of crude fibre content. The N content increased and N uptake decreased with delay in sowing from mid-May to mid-July. The N content decreased and N uptake increased with increase in seed rate up to 75 kg/ha. The highest N uptake was observed with 75 kg seed/ha which was significantly higher over 50 and 62.5 kg seed/ha. The HCN content was highest at 50 DAS and decreased rapidly with the advancement of the crop stage. The HCN content increased with delay in sowing from mid-May to mid-July and decreased with increase in seed rate.

Key words : *Sorghum, green fodder, dry matter, sowing time, HCN*

Sorghum (*Sorghum bicolor* L.) is the principle non-legume fodder crop grown in 50 % area during *kharif* season in Punjab. The leaves of sorghum remain green up to the maturity. It is highly palatable, nutritious and is liked by all kinds of animals. The high yielding varieties and agronomic techniques are very helpful to obtain its higher productivity of good quality herbage to fulfill feeding requirements of dairy cattle. But the shortage of seed of fodder crops in general and of this cultivar in particular is the major constraint for popularization among the farmers. The agronomic practices such as sowing time, seed rate etc. are the most important factors which influence the seed yield of a crop. The delay in sowing may not permit proper vegetative growth of a crop, hence poor yields. (2) reported that the yield and quality of sweet sorghum varies with different sowing dates. Increase in seed rate decreased stem diameter but produced maximum amounts of leaves resulting in higher fodder yield of sorghum (3). The information on the effect of sowing time and seed rate on the fodder yield, quality and HCN content of sorghum cv. HC 308 under Punjab conditions is meager. Therefore, the present study was planned.

MATERIALS AND METHODS

The experiment was conducted at Forage research Farm, Punjab Agricultural University, Ludhiana during *kharif* seasons of 2007 and 2008 with sowing times (mid-May, end-May, mid- June, end-June and mid-July) in main plots and seed rates (50, 62.5 and 75 kg/ha) in sub-plots replicated thrice. The experimental site was sandy loam, low in organic carbon and available N and medium in available P and K with a pH of 8.2. The values of organic carbon, available N, P and K during 2007 were 0.36%, 207, 21.8 and 186 kg/ha. The corresponding values during 2008 were 0.34%, 162, 17.5 and 157 kg/ha indicating that the field was slightly less fertile than during 2007. The half dose of nitrogen (50 kg N/ha) in the form of urea and full dose of

phosphorus (50 kg P_2O_5/ha) in the form in the form of single superphosphate were drilled at sowing time. The remaining half dose of nitrogen (50 kg/ha) was top dressed at 30 days after sowing. The crop was sown in a plot size of 6.0 x 3.5 m^2 during 2007 and 5.0 x 4.0 m^2 during 2008; and was harvested at 50% flowering irrespective of the treatments. The all other cultural practices were applied uniformly to all the treatments. The samples from each treatment were dried in the sun followed by hot air oven at 60°C. The dried samples were grinded through 1 mm sieve and were processed for the estimation of crude protein, crude fibre, ash and IVDMD contents by the methods as given by (4). The HCN content from fresh samples was determined by using the method as prescribed by (5).

RESULTS AND DISCUSSION

Fodder yield

During 2007, sorghum Cv. HC 308 sown in mid-May gave significantly higher green fodder and dry matter yields over rest of the sowing dates (Table 1). In 2008, the mid-May sown crop recorded the highest green fodder and dry matter yield which was at par with end-May sown crop but was significantly higher over rest of the sowing dates. The fodder yield of sorghum was slightly higher during the first year of study. Fertile soil and better environmental conditions prevailed during first year might have increased the fodder yield. On an average of two years data, mid-May sown crop gave significantly higher green fodder and dry matter yields over rest of the sowing dates. The magnitude of increase was 11.1, 43.6, 121.1 and 202.6 % in green fodder yield and 15.7, 52.7, 143.6 and 243.5 % in dry matter yield over end-May, mid-June, end-June and mid-July sown crop, respectively. Higher plant height and more tillers/plant (Table 2) in mid-May sown crop might have contributed towards fodder yield. Poornima *et al.*, 2008 also observed that June 8th sown sweet sorghum gave 7, 9 and 12 % higher cane yield over June 30, July 8 and July 23 sown crop, respectively. Tiwana *et al* 1999 also reported low fodder yield in delayed sowing of maize.

The seed rates influenced the green fodder and dry matter yield of sorghum Cv. 308 significantly. With increase in seed rates, the green fodder and dry matter yield increased significantly but significant response was obtained up to 62.5 kg seed/ha. The crop sown with 62.5 kg seed/ha recorded 460.3 q/ha green fodder yield and 127.6 q/ha dry matter yield as compared to 438.8 q/ha green fodder yield and 122.2 q/ha dry matter yield with 50 kg seed/ha. The higher fodder yield with 62.5 kg seed/ha was might be due to taller plants and more tillers/ meter row length. Mid-May sown crop gave significantly higher fodder yield with 62.5 kg/ha but delayed sowings recorded higher fodder yield with 75 kg seed /ha. The stem diameter decreased and number of leaves increased with increase in seed rate from 50 to 75 kg/ha. (6) also observed 16 Mg/ha higher dry fodder yield of maize with higher plant density. (3) also reported similar results in fodder sorghum.

Table-1: Effect of seed rate on the fodder yield and HCN content of sorghum HC 308 under different sowing dates

Treatments	Green fodder yield (q/ha)			Dry matter yield (q/ha)			HCN content (ppm)		
	2007	2008	Mean	2007	2008	Mean	50 DAS	At harvest	% increase over 50 DAS
Sowing dates									
May 15	743.8	598.3	671.1	225.4	164.8	195.1	78.2	35.9	54.1
May 30	617.9	590.0	603.9	177.0	160.1	168.6	82.9	39.4	52.5
June 15	474.7	460.0	467.3	131.6	123.9	127.8	86.3	45.3	47.5
June 30	393.2	211.9	302.6	103.8	56.4	80.1	89.9	57.6	35.9
July 15	272.2	171.4	221.8	68.4	45.2	56.8	91.1	64.9	28.8
CD 5 %	33.3	30.6	22.7	9.8	8.1	5.8	1.11	0.93	-
Seed rate (kg/ha)									
50	491.8	385.8	438.8	104.3	104.1	122.2	87.6	50.2	42.7
62.5	506.3	414.3	460.3	143.6	111.5	127.6	85.4	48.8	42.9
75	502.9	418.8	460.9	139.9	114.6	127.3	83.9	46.8	44.2
CD 5 %	NS	23.7	17.6	NS	6.2	4.5	0.70	0.56	-

Table-2 : Effect of seed rate on the plant characteristics of sorghum HC 308 under different sowing dates.

Treatments	Plant height (cm)		Tillers/m row length		Leaf: stem ratio		Stem diameter (cm)		Leaves/plant	
	2007	2008	2007	2008	2007	2008	2007	2008	2007	2008
Sowing dates										
May 15	269.4	224.6	14.7	17.4	0.30	0.32	1.03	1.02	9.33	8.78
May 30	258.2	217.3	12.8	15.8	0.35	0.34	0.96	0.98	9.13	8.22
June 15	234.2	203.5	12.3	13.1	0.41	0.43	0.90	0.90	8.67	7.67
June 30	230.6	191.8	12.1	12.0	0.50	0.48	0.86	0.84	7.32	7.17
July 15	187.8	162.6	10.8	10.4	0.63	0.61	0.81	0.80	7.04	6.81
CD 5 %	6.1	17.5	1.0	1.06	-	-	0.09	0.08	0.80	0.77
Seed rate (kg/ha)										
50	231.8	196.6	11.0	12.8	0.46	0.47	1.01	0.99	8.12	7.58
62.5	236.3	199.2	12.8	13.6	0.44	0.44	0.92	0.91	8.27	7.70
75	240.1	204.1	13.9	14.9	0.42	0.41	0.79	0.84	8.51	7.91
CD 5 %	4.5	11.7	0.6	0.65	-	-	0.06	0.05	0.54	0.46

Fodder quality

Quality parameters such as crude protein, ash, crude fibre and IVDMD were influenced with seed rates and sowing periods (Table-3). The crude protein, ash and IVDMD contents increased and crude fibre decreased with delay in sowing from mid-May to mid-July during both the years of study. On an average of two years, the CP, ash and IVDMD contents increased from 6.64 to 9.20, 7.44 to 9.29 and 53.0 to 59.4 %, respectively with delay in sowing from mid-may to mid-July. Whereas, the crude fibre content decreased from 33.5 to 26.9 %. The crude protein content, ash and IVDMD in sorghum cv. HC 308 increased with delay in sowing time might be due to low dry matter yield in the later. (7) reported that CP content of forage maize increased from 9.33 to 9.60 % with delay in sowing from first week of July to forth week of July.

Seed rates also influenced the quality parameters appreciably. The CP, ash and IVDMD contents increased with increase in seed rates. Whereas, the trend was reverse in case of crude fibre content. (6) also observed that as the plant density increased from 64,200 to 88,900 plants/ha, the CP content decreased from 76 to 72 g/kg and ADF and NDF increased from 259 to 270 and 441 to 456 g/kg, respectively.

N uptake

Sowing dates influenced the N content and uptake in sorghum cv. HC 3308. The N content increased with delay in sowing from mid-May to mid-July. On the basis of two years average, the N content increased from 1.08 to 1.49 % with delay in sowing sorghum up to mid-July. The lower N content in early sown crop may be due to dilution effect as the dry matter yield was higher in early sown crop. Whereas, the N uptake in sorghum fodder

Table-3: Effect of seed rate on the fodder quality and N uptake in sorghum HC 308 under different sowing dates

Treatments	Crude protein (%)		Crude fibre (%)		Ash (%)		IVDMD (%)		N content (%)		N uptake (kg/ha)	
	2007	2008	2007	2008	2007	2008	2007	2008	2007	2008	2007	2008
Sowing dates												
May 15	6.56	6.72	33.8	33.2	7.38	7.43	52.7	53.2	1.05	1.11	236.7	182.9
May 30	7.04	7.12	32.5	31.8	7.72	7.81	54.0	54.6	1.13	1.17	200.1	187.3
June 15	7.91	8.00	30.9	29.6	8.13	8.26	55.6	57.1	1.27	1.31	167.1	162.3
June 30	8.63	8.72	29.4	27.9	8.68	8.82	57.2	58.4	1.38	1.43	143.2	80.7
July 15	9.12	9.28	27.1	26.6	9.26	9.31	59.0	59.8	1.46	1.51	99.9	68.3
CD 5 %	0.17	0.19	0.42	0.41	0.11	0.95	1.32	1.27	0.03	0.03	17.2	15.4
Seed rates (kg/ha)												
50	7.94	8.09	29.4	28.6	8.31	8.46	56.4	57.2	1.27	1.33	178.2	138.5
62.5	7.85	8.02	31.0	29.8	8.24	8.34	55.8	56.8	1.24	1.31	178.1	146.1
75	7.76	7.80	31.8	31.0	8.14	8.19	54.9	55.8	1.26	1.28	176.3	146.7
CD 5 %	0.10	0.12	0.28	0.26	0.08	0.07	0.76	0.70	0.02	0.02	10.7	9.3

decreased with delay in sowing. On the basis of two years average, the highest N uptake (209.8 kg/ha) was observed in mid-may sown crop and decreased significantly with delay in sowing up to mid-July (84.1 kg/ha). This increase in N uptake was might be due to higher dry matter yield in early sowing dates. (8) also reported highest N uptake in first week of July sown cowpea which decreased significantly with delay in sowing to first week of August sown crop by a margin of 10.7 and 65.6 %, respectively.

Seed rates also influenced the N content and N uptake in sorghum cv. HC 308. The N content slightly decreased with increase in seed rate up to 75 kg/ha. On an average of two years data, the N content decreased from 1.30 to 1.27 % with increase in seed rate from 50 to 75 kg/ha. On the other hand, the N uptake increased with increase in seed rate up to 62.5 kg/ha. On the basis of two years mean, the highest N uptake (162.1 kg/ha) was observed with 62.5 kg seed/ha as compared to 158.4 kg/ha with 50 kg seed/ha. Similar results have also been observed by (8) in cowpea.

HCN content

HCN content was influenced appreciable with stage of harvest, sowing dates and seed rates (Table 1). The HCN content was highest at 50 DAS and decreased rapidly with the advancement of the crop stage irrespective of sowing dates and seed rates. The HCN content at harvest decreased between 28.8 to 54.1 % than at 50 days after sowing. The reduction in HCN content at harvest was might be due to more dry matter yield at later stages of growth.

The HCN content increased with delay in sowing from mid-May to mid-July from 78.2 to 91.1 ppm at 50 days after sowing and from 35.9 to 64.9 ppm at harvest. The increase in HCN content in delayed sowings was might be due to the proportional increase in weight of palnt parts that contain low HCN i.e. stem in early sown crop (9). Similar results have also been reported by (10).

With increase in seed rate the HCN content decreased from 87.6 to 83.9 ppm at 50 days after sowing and from 50.2 to 46.8 ppm at harvest. This slight reduction in HCN content with higher seed rates was might be due the dilution effect as the dry matter yield was more with higher seed rates.

It may be concluded that agronomic practices such as sowing dates and seed rates influence the fodder yield, quality and HCN content of sorghum cv HC 308. Therefore, it should be sown in mid-July with a seed rate of 62.5 kg/ha to obtain the nutritious higher fodder free from HCN content.

REFERENCES

1. Kaur A., Pannu R. K. and Butter G. S. (2010). Impact of nitrogen application on the performance of wheat and nitrogen use efficiency under different dates of sowing. *Indian J. Agron. 55 :* 45-55.
2. Poornima S., Geethalakshmi V. and Leelamathi M. (2008). Sowing dates and nitrogen levels on yield and juice quality of sweet sorghum. *Res. J. Agri. & Biol. Sci.* 4: 651-654.
3. Ayub M., Tanveer A., Nadeem M. A. and Tayyub M. (2004). Fodder yield and quality of sorghum as influenced by different tillage methods and seed rates. *Pakistan J. of Agron.* (www.cababstractsplus.org).
4. A.O.A.C. (1990). Association of official analytical chemists. *Official method of analysis*. 15th Ed Washington, D.C.
5. Hogg P. G. and Ahlgren H. L. (1942). A rapid method for determining hydrocyanic acid content of single plant of sudan grass. *J Am Soc Agron 34* : 199-200.
6. Widdicombe W. D. and Thelen K. D. (2002). Row width and plant density effect on corn forage hybrids. *Agron. J. 94 :* 326-330.
7. Tiwana U. S., Tiwana M. S., Puri K. P. and Thind I. S. (1999). Forage production potential of maize varieties under different dates of sowing and nitrogen levels. *Forage Research 36 :* 5-8.
8. Tiwana U. S., Chaudhary D. P. and Pritpal Singh (2010). Seed production potential and quality of cowpea cv. CL 367 as influenced by sowing time, seed rate and row spacing under Punjab conditions. *Range Mgmt. & Agroforestry*, *Symposium Issue:* 31-22.
9. Sultan A. L. S. I. (2003). Sorghum halepenses and its cyanide content. *Pakistan Journal of Nutrition* 2 : 123-124.
10. Kaur A. and Tiwana U. S. (2009). Effect of irrigation and nitrogen levels on fodder yield and quality of sorghum under different cutting managements. In: Proc. *Forage Symposium-2009: Emerging Trends in Forage Research and Livestock Production.* Jaisalmer 215-216.