EFFECT OF DIFFERENT ROW SPACING ON HYBRIDS OF SUMMER PEARL MILLET (*Pennisetum glaucum* L.) UNDER SOUTH GUJARAT CONDITION

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ABSTRACT

The study was undertaken at Department of Agronomy, Navsari Agricultural University, Navsari, Gujarat, India during summer season of 2018 to study the effect of different row spacing on hybrids of summer pearl millet (Pennisetum glaucum L.) under south Gujarat condition. The results revealed that row spacing of 60 × 15 cm recorded significantly higher plant height at 60 DAS and at harvest, number of total tillers per plant, number of effective tillers per plant, ear head length, ear head girth, grain weight per ear head, but row spacing of 45 × 15 cm showed significantly higher grain and straw yield (4775 and 7828 kg/ha) and net realization of Rs.81295/ha with BCR of 3.07. Significantly higher number of effective tillers per plant and ear head length was recorded by hybrids GHB – 538 and GHB – 732, respectively, but significantly higher ear head girth and grain weight per ear head were recorded by hybrid GHB – 558. Significantly the highest grain and straw yield (4579 and 7536 kg/ha) and the maximum net realization of Rs.77014/ha were recorded by hybrid GHB – 732.

KEY WORDS: BCR, Economics, Hybrids, Pearl millet, Row spacing

INTRODUCTION

Predominant millets grown in India are sorghum (jowar), pearl millet (bajra), finger millet (ragi), kodo millet (kodo), proso millet (cheena), little millet (kutki), foxtail millet (kangni) and barnyard millet (sawa), Little millet and kodo millet are endemically domesticated in Indian subcontinent. Millets are warm weather grasses belonging to C_4 group of plants and considered as physiologically efficient. Their cultivation in India extends from sea-level up to 2,000 m above mean sea-level and often grown in diverse soils, climates and harsh environments. Millets have been important food and feed crops producing more reliable harvests than many other crops.

Pearl millet is commonly known as Bajri or Bajra in India. It is also known as 'bull rush millet', originated in tropical western Africa, where the greatest number

of both wild ancestors and cultivated forms occur. It belongs to family gramineae (poaceae). In India, it is annually grown on 7.12 million ha area producing nearly 8.06 million tones of grains with productivity of 1132 kg/ha (Anon., 2017) and Gujarat occupies an area of 7 lakh ha and production of 12 lakh tones with productivity of 1,868 kg/ha (Anon., 2014). The nutritive value of pearl millet is fairly high and it is fairly rich in fat content as compared to other cereals and imparts substantial energy to the body with good digestibility. Pearl millet having good grain contains of moisture (12.4 %), protein (11.6 %), fat (5 %), carbohydrates (67 %) and mineral matters (2.7 %) and gives 360 calories per 100 g grain with high amount of vitamin A and B.

Row spacing is one of the most important factors affecting crop productivity. The optimum row spacing varies depending on genotypes or environmental factors such as soil fertility, moisture supply and sowing time. Narrow spacing may be one of the possible ways of suppressing weeds as the soil surface is covered and consequently leaving a meager chance for weed growth. It also has the higher leaf photosynthesis and suppresses weeds growth compared with wider row spacing. Keeping all these points in view, the present research work entitled "Effect of different row spacing on hybrids of summer pearl millet (*Pennisetum glaucum* L.) under south Gujarat condition" was conducted.

MATERIALS AND METHODS

The field experiment was conducted at College Farm, N. M. College of Agriculture, Navsari Agricultural University, Navsari during summer 2018. Normally, the summer season commences from the middle of February and ends by the middle of June. The weekly mean maximum and minimum temperature varied from 30.9^{0}C to 37.3^{0}C and 14.1^{0}C to 26.7^{0}C, respectively during the course of investigation. The relative humidity ranged from 76.5 to 92.8 per cent at morning and 22.4 to 66.4 per cent at evening. Bright sunshine hours per day were in the range of 5.7 to 11.1 during the crop period. The soil of experimental field was clay in texture, low in available nitrogen, medium in available phosphorus and high in available potassium. The soil was slightly alkaline in reaction with normal electrical conductivity. Total nine treatment combinations consisting of three treatments of hybrid (H_1: GHB – 538, H_2: GHB – 558 and H_3: GHB – 732) and three treatments of spacing (S_1: 30 x 15 cm, S_2: 45 x 15 cm and S_3: 60 x 15 cm) were evaluated in factorial RBD with four replications. The crop was sown with 3.75 kg/ha seed rate at different row spacing and different hybrid with line sowing method. The fertilizer dose used throughout experiment was 120-60-00 NPK kg/ha, wherein full dose of phosphorus (60 kg/ha) and half dose of nitrogen (60 kg/ha) was applied as basal just prior to sowing in the form of SSP and Urea. The remaining half dose of nitrogen (60 kg/ha) was applied in the form of urea as top dressed at 35 DAS.

RESULTS AND DISCUSSION

Effect of row spacing

Growth attributes

The periodical observation on plant height (Table 1) at 30 DAS, 60 DAS (124.28 cm) and at harvest (203.35 cm) and number of total tillers per plant (4.60) showed significantly higher due to wider row spacing except at 30 DAS. Thus there was an increase in plant height and number of total tillers per plant with wider row spacing due to the optimum plant population attributed to minimum intra species competition which help in proper utilization of natural resources *i.e.* space, light, moisture, nutrient uptake and translocation, which ultimately linked with the plant growth and development in terms of plant height. The study was close conformity as

observed by Kumari *et al*. (2017)**.** The effect of different row spacing was found non-significant on days to 50 per cent flowering.

Yield attributes and yield

The result pertaining to yield attributes (Table 1) showed that ear head length (25.25 cm), ear head girth (10.59 cm) and grain weight per ear head (26.98 g) were also improved significantly due to wider row spacing (60 × 15 cm) over narrow row spacing (30 × 15 cm). It was remained at par with treatment S_2 (45 × 15 cm) except in number of effective tillers per plant. The effect of different row spacing was found non-significant on 1000 seed weight. The beneficial effect of row spacing on yield attributes was also reported by Kumari *et al*. (2017)**.**

The result pertaining to yield (Table 1) showed that grain and straw yield of pearl millet were influenced significantly due to different row spacing. Significantly higher grain yield (4775 kg/ha) and straw yield (7828 kg/ha) found under treatment S_2 (45 × 15 cm) over treatments S_1 (30 × 15 cm), but it was at par with S_3 (60 × 15 cm). This might be due to fact that proper row spacing or plant population might be attributed to minimum intra-species competition in crop plants and proper utilization of natural resources *i.e*. space, light, moisture and nutrients which might have remained underutilized due to mutual plant competition developed by more plants in closer row spacing. These results are also in agreement with finding of Rathore (2009). The effect of different row spacing was found non-significant on harvest index, but it was numerically the maximum in treatment S_2 (45 × 15 cm).

Economics

The result presented in Table 2 indicated that the treatment S_2 (45 × 15 cm) was found superior by recording the maximum net realization of Rs.81295/ha with BCR of 3.07. The treatment S_1 (30 × 15 cm) produced the minimum net realization of Rs.52492 /ha with BCR of 1.98. It is obvious that realization of higher net returns and benefit: cost (B: C) ratio was the result of higher productivity of pearl millet under S_2 (45 × 15 cm) treatment. These results are in agreement with finding of Rathore (2009).

Effect of hybrids

Growth attributes

An appraisal of data on growth parameters in Table 1 revealed that the plant height recorded in different hybrids at 30 DAS was non-significant, while plant height showed significant difference at 60 DAS and at harvest due to different pearl millet hybrids. Significantly higher plant height was observed by hybrid H_2 (GHB-558) *i.e.* 121.23 cm at 60 DAS and 194.78 cm at harvest, The differences in plant height might be due to genetically make up of plant itself, which is governed by vegetative growth of crop, as it was played vital role in accelerating all the physiological process in plants. These finding are in accordance with those reported by Detroja *et al*. (2018).

The results pertaining to number of total tillers per plant and days to 50 per cent flowering (Table 1) indicated that hybrid H_3 (GHB - 732) produced significantly higher number of total tillers per plant (3.92) and days to 50 per cent flowering (52.07), but it was statistically at par with hybrid H_2 (GHB - 558) with total tillers per plant (3.75) and days to 50 per cent flowering (50.52 days). This increase was attributed to the genetically characteristics of hybrid GHB-732. These results are already in agreement with those reported by Bikash *et al*. (2013).

Yield and yield attributes

The result pertaining to the yield attributes are presented in Table 1. Significantly higher ear head length (25.23 cm) and grain weight per ear head (26.65 g) were recorded by hybrid H_3 (GHB - 732). In case of ear head girth (10.80 cm) was

recorded significantly higher by hybrid H_2 (GHB - 558), but it was remained at par with hybrid H_3 (GHB - 732). Test weight was found non-significant among different pearl millet hybrids. Such a differences observed in yield attributing characters among the different hybrids might be due to genetic constitution of these hybrids or due to climatic conditions. The similar results have also been reported by Divya *et al*. (2017) and Chaudhari *et al*. (2018).

The data presented in Table 1 indicated that significantly higher grain yield (4579 kg/ha) and straw yield (7536 kg/ha) were recorded by hybrid H_3 (GHB - 732), but it was remained at par with hybrid H_2 (GHB - 558). These increases in case of grain yield was also due to higher value for yield attributes *viz*., ear head length, ear head girth, 1000 seed weight and grain weight per ear head. Straw yield which owing to significant increase of number of total tillers per plant and plant height. Similar results were also reported by Divya *et al*. (2017) and Gupta *et al*. (2017). Harvest Index was found non-significant among different pearl millet hybrids.

Economics

The result presented in Table 2 indicated that hybrid H_3 (GHB - 732) was found superior by recording the maximum net returns Rs.77014/ha with BCR 2.91, while hybrid H_1 (GHB - 538) recorded the minimum value of net realization Rs.63933/ha with BCR 2.42. It is obvious that realization of higher net returns and benefit: cost (B: C) ratio was the result of higher productivity. These results are in agreement with finding of Chaudhari *et al*. (2018).

CONCLUSION

The highest yield, net realization and BCR can be obtained from summer pearl millet through sowing of hybrid GHB – 732 or GHB – at 558 at row spacing 45 × 15 cm or 60 × 15 cm in south Gujarat heavy rainfall Agro-ecological situation.

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Table 1: Effect of hybrids and row spacing on growth, yield and yield attributes on summer pearl millet

Treatments	Plant Height			Number of Total Tillers Per Plant	50 % Flowering (days)	Ear Head Length (cm)	Ear Head Girth (cm)	1000 Seed Weight (g)	Grain Weight Per Ear Head (g)	Grain Yield (kg/ha)	Straw Yield (kg/ha)	Harvest Index (%)
	30 DAS (cm)	60 DAS (cm)	At Harvest (cm)									
Row Spacing (S)												
S_1: 30 × 15 cm	24.07	107.93	155.98	2.15	47.22	23.06	9.66	9.42	24.25	3500	5749	37.84
S_2: 45 × 15 cm	25.26	116.87	191.35	4.50	51.78	24.66	10.25	9.55	25.95	4775	7828	37.89
S_3: 60 × 15 cm	25.67	124.28	203.35	4.60	50.12	25.25	10.59	9.96	26.98	4500	7391	37.84
S.Em.±	0.88	4.02	6.70	0.09	1.26	0.56	0.22	0.17	0.60	157.74	259.81	0.09
C.D. at 5 %	NS	11.74	19.56	0.27	NS	1.64	0.65	NS	1.77	460.41	758.33	NS
Hybrids (H)												
H_1: GHB – 538	24.43	107.4	170.53	3.57	46.53	23.15	9.20	9.44	24.45	4008	6552	37.95
H_2: GHB – 558	25.42	121.23	194.78	3.75	50.52	24.59	10.80	9.60	26.09	4187	6881	37.83
H_3: GHB – 732	25.15	120.46	185.67	3.92	52.07	25.23	10.52	9.90	26.65	4579	7536	37.79
S.Em.±	0.88	4.02	6.70	0.09	1.26	0.56	0.22	0.17	0.60	157.74	259.81	0.09
C.D. at 5 %	NS	11.74	19.56	0.27	3.67	1.64	0.65	NS	1.77	460.41	758.33	NS
Interaction (S x H)												
S.Em.±	1.53	6.96	11.61	0.16	2.18	0.97	0.22	0.29	1.05	273.21	450.00	0.16
C.D. at 5 %	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
C.V. %	12.25	11.97	12.64	8.56	8.78	8.04	7.62	6.10	8.20	12.83	12.87	0.85

Table 2: Economics of summer pearl millet as influenced by hybrids and different row spacing

Treatments	Yield (kg/ha)		Gross Realization (₹/ha)	Total Cost of Cultivation (₹/ha)	Net Realization (₹/ha)	B: C Ratio
	Grain	Straw				
Row Spacing (S)						
S_1: 30 × 15 cm	3500	5749	78997	26505	52492	1.98
S_2: 45 × 15 cm	4775	7829	107722	26427	81295	3.07
S_3: 60 × 15 cm	4500	7392	101566	26278	75288	2.87
Hybrids (H)						
H_1: GHB – 538	4008	6552	90337	26403	63933	2.42
H_2: GHB – 558	4188	6881	94531	26403	68128	2.58
H_3: GHB – 732	4579	7537	103417	26403	77014	2.91

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