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Response of inorganic fertilizers and biomix inoculation on various growth parameters in pearl millet hybrids

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ABSTRACT

The experiment was conducted at research area of Department of Agronomy, Chaudhary Charan Singh Haryana Agricultural University, Hisar, Haryana during kharif 2016 to assess the effect of Biomix inoculation and chemical fertilizers on plant height, plant population, dry matter accumulation and number of tillers per plant. Plant population at 20 days after sowing (DAS) and at harvest revealed that various combinations of recommended dose of fertilizer (RDF) and Biomix inoculation and pearl millet hybrids did not markedly influence the plant population at both the stages of crop growth. At 40 and 60 DAS and at harvest plant height was maximum in treatment F_6 (185.1, 221.5 and 234.5 cm respectively) which was statistically at par with F_4 and F_5 but significantly superior over all other treatments. Dry matter accumulation per plant was affected significantly at 20 DAS and at harvest due to various combinations of RDF and Biomix inoculation. The number of tillers per plant decreased with the advancement of crop age ie from 30 DAS to harvest. Inoculation of bacteria had synergistic and additive effects on plant growth besides reducing the cost of cultivation.

Keywords: Pearl millet; growth parameters; Biomix; fertilizers; hybrid

INTRODUCTION

Pearl millet, *Pennisetum glaucum* (L) R Br Emend Stuntz is one of the most cultivated cereal crops in dryland areas of India due to its capacity to perform well under drought, high temperature, low soil fertility and medium salinity. It ranks first under the category of millets in India in terms of area, production and productivity. The states of Rajasthan, Maharashtra, Uttar Pradesh, Haryana and Gujarat account for more than 90 per cent of the total area and production under pearl millet. There has been decrease in area of coarse cereals over the years and shift towards pulses and oilseeds in kharif season. Pearl millet being an important dual-purpose kharif crop plays an important role in the integrated agricultural and animal husbandry economy of the drier regions of the country. The average yield at farmers' fields is low due to poor plant stand. Pearl millet also suffers badly due to low soil fertility and scarce water availability thereby reducing the yield potential. It is obvious to generate site-specific information on performance of pearl millet under differential water and fertilizer regimes which are meager in Indian conditions. Keeping the above points in view the present investigations were undertaken on response of inorganic fertilizers and Biomix inoculation on various growth parameters in pearl millet hybrids.

MATERIAL and METHODS

The experiment was conducted during kharif 2016 at research area of Department of Agronomy, Chaudhary Charan Singh Haryana Agricultural University, Hisar, Haryana situated at 29°10' N latitude and 75° 46' E longitude at an elevation of 215.2 m amsl. The treatments used in main plot were F_1 (Control), F_2 [Biomix (*Azotobacter* + *Azospirillum* + PSB)], F_3 (75% RDF), F_4 (RDF, 150 kg N/ha and 62.5 kg P_2O_5/ha), F_5 (75% RDF + Biomix), F_6 (RDF + Biomix) and in sub-plots were H_1 (HHB 234), H_2 (HHB 197) and H_3 (HHB 223) laid out in a split plot design. Five kg seed was sown per ha keeping 45 cm row to row spacing. For taking plant population ('000/ ha) number of plants per running meter row length

were recorded by counting the number of plants from three randomly selected spots of one meter row length marked with wooden sticks in each plot at 20 days after sowing (DAS) and at harvest. The height of main shoot was recorded at 20, 40 and 60 DAS and at harvest from the base of the plant up to the whorl during vegetative phase and up to the base of head during reproductive phase. For this five randomly selected tagged plants in each plot were selected. For calculating dry matter accumulation (g/plant) the plants which were taken for leaf area measurement at periodical growth stages were kept for dry matter accumulation and data were recorded after drying them first in the sun and then in oven at 60-70°C till constant weight was realized. Total number of tillers per plant was counted in each plot from five tagged plants. The number of tillers thus recorded was divided by five and average number of tillers per plant was calculated. These observations were recorded at 30 DAS and at harvest.

RESULTS and DISCUSSION

A perusal of data in Table 1 on plant population at 20 DAS and at harvest reveal that various combinations of RDF and Biomix inoculation and pearl millet hybrids did not markedly influence the plant population at both the stages of crop growth. Non-significant differences in plant population due to cultivars were also reported by Abdullahi et al (2014). Irrespective of the treatments height of pearl millet plants increased with the advancement of crop age. Plant height was significantly affected from 40 DAS onwards up to harvesting. At 40 and 60 DAS and at harvest plant height was maximum in the treatment F_6 (185.1, 221.5 and 234.5 cm respectively) which was statistically at par with F_4 and F_5 treatments but significantly superior over all other treatments. At harvest the plant height was 9.89, 10.54 and 14.89 cm more in F_4, F_5 and F_6 treatments respectively compared to the control. Significantly taller plants at all the growth stages were recorded in hybrid H_3 (HHB 223) than H_1 and H_2 (HHB 197 and HHB 234). However the differences in plant height of hybrid H_2 and H_3 at 40 DAS and H_1 and H_2 at 60 DAS were statistically at par. Yakadri and Reddy (2009) also reported more plant height and dry matter accumulation in the genotype HHB 223 under irrigated environment whereas under rainfed situation genotypes HHB 234 and HHH 67 'improved' recorded taller plants and more dry matter per plant.

Dry matter accumulation per plant was affected significantly at 20 DAS and at harvest due to various combinations of RDF and Biomix inoculation. Dry matter accumulation per plant at 40 to 60 DAS did not differ significantly.

Table 1. Effect of different fertilizers with or without Biomix on plant height, plant population, dry matter accumulation and number of tillers/plant in pearl millet

Treatment	Plant height (cm)				Plant Population ('000/ha)		Dry matter accumulation (g/plant)				Number of tillers/plant	
	20 DAS	40 DAS	60 DAS	At harvest	20 DAS	At harvest	20 DAS	40 DAS	60 DAS	At harvest	30 DAS	At harvest
Fertilizer/Biomix												
F_1 (Control)	29.8	158.3	199.3	219.6	165.7	161.2	3.07	23.8	121.9	149.6	4.33	3.16
F_2 (Biomix)	31.5	160.4	203.7	223.0	166.7	161.8	3.32	27.3	125.3	169.4	4.88	3.72
F_3 (75% RDF)	31.6	165.2	204.3	224.1	166.9	161.9	4.73	27.4	125.0	183.9	4.83	3.66
F_4 (RDF)	31.5	182.0	220.4	229.5	167.9	161.6	4.92	27.7	125.7	195.1	5.05	3.88
F_5 (75% RDF + Biomix)	31.4	180.6	216.2	230.2	167.0	161.4	5.24	27.0	125.4	191.7	5.33	4.11
F_6 (RDF + Biomix)	34.2	185.1	221.5	234.5	167.8	161.1	5.36	28.5	126.5	208.0	5.27	4.16
SEm±	1.9	4.8	2.2	2.0	0.37	0.11	0.47	1.23	1.25	1.63	0.27	0.27
$CD_{0.05}$	NS	15.4	7.1	6.5	NS	NS	1.51	NS	NS	5.21	NS	NS
Hybrid												
H_1 (HHB 234)	28.3	154.5	204.3	217.8	166.9	161.6	3.47	24.5	122.5	178.1	4.63	3.47
H_2 (HHB 197)	32.0	178.5	209.5	226.3	167.2	161.2	5.01	27.7	125.7	182.3	5.04	3.88
H_3 (HHB 223)	34.8	182.8	219.0	236.3	167.0	161.7	4.84	28.7	126.8	188.5	5.16	4.0
SEm±	0.9	3.2	3.2	2.3	0.15	0.06	0.25	0.91	0.91	1.13	0.20	0.20
$CD_{0.05}$	2.7	9.5	9.5	6.9	NS	NS	0.74	2.69	2.68	3.47	NS	NS

The seed inoculation of pearl millet hybrids with Biomix in association with RDF resulted in significant increase in dry matter accumulation/plant. At harvest treatment F_1 produced significantly lower dry matter/ plant (149.6 g/plant) whereas treatment F_6 produced significantly higher dry matter/plant (208.0 g/plant) which was followed by F_4, F_5 and F_3. Among different hybrids H_3 (HHB 223) accumulated significantly higher dry matter per plant followed hybrid H_2 (HHB 197) from 20 DAS till maturity except at 20 DAS where the difference in dry matter accumulation of hybrids H_2 and H_3 was not significant. H_1 (HHB 234) recorded lowest dry matter at all the growth stages. It might be attributed to the variation in genetic makeup of various hybrids. Similar were the findings of Kumar (2001) and Sewhag et al (2003). The number of tillers per plant decreased with the advancement of crop age ie from 30 DAS to harvest. However number of tillers per plant at 30 DAS and at harvest was not influenced due to various treatments. Lowest number of tillers per plant was recorded in hybrid H_1 (4.63 at 30 DAS and 3.47 at harvest) and highest in hybrid H_3 (5.16 at 30 DAS and 4.0 at harvest).

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