Original Research Article   https://doi.org/10.20546/ijcmas.2020.909.225

Performance of Released Hybrid Varieties of Pearl Millet (*Pennisetum glaucum* L.) under Rainfed Condition of Odisha

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A B S T R A C T

The field experiment was carried out at Regional Research and Technology Transfer Station (OUAT), Semiliguda of Koraput district in acidic sandy loam soils under Eastern Ghat High Land zone of Odisha during *kharif* 2019 to evaluate the performance of released hybrid varieties of pearl millet under rainfed condition. The experiment consisted of sixteen released hybrid varieties of pearl millet *viz.* HHB 229, AHB 1200, 86 M 01, NBH 5767, Pratap (MH 1662), NBH 4903, NBH 5061, 86 M 86, Kaveri Super Boss, 86 M 64, GHB 558, Dhanshakti, ICMV 221, Pusa Comp 612, ABV 04 and ICMV 155. It was laid out in randomized block design with three replications. The results revealed that Kaveri Super Boss recorded highest grain yield of 4667 kg/ha among all the varieties/ hybrids evaluated and it was statistically at par with the yield of NBH 4903 (4536 kg/ha) and NBH 5061 (4195 kg/ha). The hybrid ICMV 155 recorded the lowest grain yield of 567 kg/ha under rainfed condition.

Introduction

Pearl millet (*Pennisetum glaucum* L.) is a C_4 plant with very high photosynthetic efficiency and dry matter production capacity. Its growing areas are Africa and Indian subcontinent where it is the only suitable and efficient crop for arid and semi-arid regions because of its efficient utilization of soil moisture, high level of heat tolerance and low fertility than other typical dry land crops like sorghum and maize (Shah *et al.,* 2012). Due to its tolerance to abiotic stress, pearl millet can be grown in areas where other cereal crops such as maize and wheat would not

survive (Basavaraj *et al.,* 2010). It is the rich source of fibers and minerals especially iron, calcium, zinc and high in fats among cereals and hence can provide all the nutrients at the least cost compared to wheat and rice. It is also noted that demand for pearl millet from the health-conscious food products industry is increasing as it contains more fibre and is good for diabetic and heart patients. Other diverse use includes the use of straw to feed livestock as well as in house building fencing and for fuel (Saba *et al.,* 2015). However due to the high instability in grain yield and decline in prices of pearl millet, farmers might shift to other competing crops.

Improving crop yield under rainfed condition is important to maintain food security and improve livelihoods of the poor. Economical grain yield of 600–700 kg/ha can easily be produced from pearl millet under marginal and low management conditions, with an additional ability to produce a grain yield of 4000-5000 kg/ha when hybrids (80-85 days maturity) are grown as summer crop under irrigated and high fertility conditions (Chaudhari *et al.,* 2018). Hence production of pearl millet can be improved through growing high yielding varieties/hybrids with tolerance to drought, resistance to diseases and responding to higher rates of fertilizer applications. Sharma (2014) reported that hybrid cultivation is more profitable than indigenous OPVs of pearl millet in arid Rajasthan. Screening of hybrid varieties suitable for a particular region and climatic condition can help in boosting the production of pearl millet. Therefore the present experiment was conducted to evaluate the performance of released hybrid varieties of pearl millet under rain fed conditions of Odisha.

Materials and Methods

The field experiment was conducted at Regional Research and Technology Transfer Station (OUAT), Semiliguda, Koraput under Eastern Ghat High Land zone of Odisha, India during *kharif* 2019. The farm is located in the geographical parallels of $18^0$42'N latitude, $82^0$30'E longitude and an altitude of 884 meter above mean sea level. The region is marked by its wet and humid climate with an average annual rainfall of 1521 mm most of which is received from mid-June to mid-October. The soil of experimental site was characterized as sandy loam in texture with pH 3.9 (acidic), low in both organic carbon (0.11%) & N (248 kg/ha) and high in both P (48 kg/ha) & K (519 kg/ha). The experiment was laid out in randomized block design with three replications consisting of sixteen released hybrid varieties as treatments *viz.* T1- HHB 229, T2- AHB 1200, T3- 86 M 01, T4- NBH 5767, T5- Pratap (MH 1662), T6- NBH 4903, T7- NBH 5061, T8- 86 M 86, T9- Kaveri Super Boss, T10- 86 M 64, T11- GHB 558, T12- Dhanshakti, T13- ICMV 221, T14- Pusa Comp 612, T15- ABV 04 and T16- ICMV 155. Seeds were sown with seed rate of 5 kg/ha, spacing 50 cm x 15 cm and fertilizer dose of 60:30:00 NPK kg/ha on 20th July 2019. The data collected were subjected to statistical analysis in the randomized complete block design following the method of Gomez and Gomez (1984).

Results and Discussion

Effect on growth parameters of pearl millet hybrids

Plant population

The number of plants/ha at the time of harvest is one of the most contributing factor for grain yield. Statistical analysis revealed that final plant population at harvest differed significantly among the hybrids. Plant population was recorded maximum in NBH 5061 [87.3 ('000/ha)] and minimum in 86 M 86 [25.3('000/ha] (Table 1). The marked variation in plant population might be due to variation in seed viability and/or1000 seed weight. The result confirmed the findings of Dhedhi *et al.,* (2016) and Gupta *et al.,* (2017).

Plant height at harvest

The plant height is a significant growth parameter directly involve with inter nodal distance and number of leaves which ultimately influence yield of grain and forage. Highest plant height was recorded in NBH 4903 (182 cm) followed by Kaveri Super Boss (179 cm) and NBH 5061 (178 cm) while lowest plant height was observed in GHB 558

(129 cm) (Table 1). The variation in plant height in different hybrid varieties of pearl millet might be due to genetic makeup and environmental factor. Taller plants intercepted more solar radiation than shorter plants. Similar finding was reported by Yadav *et al.,* (2014) and Sharma *et al.,* (2019).

No. of tiller/plant

Hybrids showed a significant effect on no. of tillers/plant under favorable environment and soil conditions. Number of tiller per plant was found maximum in Kaveri Super Boss (3.7) followed by GHB 558 (3.3) and minimum in 86 M 01(1.6) (Table 1). These results are in conformity with the findings of Detroja *et al.,* (2018).

Effect on yield attributing parameter of pearl millet hybrids

Panicle length and panicle diameter

Panicle length and structure is an important agronomic trait in acceptance of variety by the farmers. Most pearl millet cultivars are characterized by long and compact panicles. Panicle length in most of the hybrids was significant (P<0.05). Data in Table 1 showed that longest panicle was found in NBH 4903 (24.5 cm) which was at par with NBH 5061 (23.3 cm) and Pusa comp 612 (22.8 cm) and shortest panicle in ICMV 221 (14.8 cm). Higher potentials were also exhibited by 86 M 64, Kaveri Super Boss and NBH 5767 for production of longer panicles (Table 1). Pearl millet varies in panicle length, seed size, colour and plant height depending upon cultivars and environment. Significantly higher panicle diameter was recorded in NBH 5061 (11.2 cm) statistically higher than NBH 4903 (11.0 cm), ABV 04 (10.2 cm) and Kaveri Super Boss (10.1 cm). Lowest panicle diameter was observed in ICMV 155 (7.0 cm). The results are in agreement with the

findings of Choudhari *et al.,* (2018) and Detroja *et al.,* (2018).

Days to 50% flowering

Days to 50% flowering among all the sixteen pearl millet hybrid varieties was significantly different (p<0.05) as shown in (Table 1). Number of days to 50% flowering ranged between 63 and 71 (Table 1). The average day to 50% flowering was 67.1 days. This was an indication that the seasonal rainfall distribution affected days to 50% flowering among millet varieties. Similar results have been reported by Sharma (2014).

1000 seed weight

Data showed in Table 1 indicated that there was significant effect of varieties on 1000 seed weight. Dhanshakti recorded the maximum seed weight of 15.2 g followed by NBH 4903 (11.0 g), Kaveri Super Boss (13.7 g) and NBH 4903 (13.4g) and minimum in ICMV 155 with seed weight 7.0 g. The results are in agreement with the findings of Yadav *et al.,* (2014) and Detroja *et al.,* (2018).

Yield

Among the 16 hybrid varieties tested Kaveri Super Boss recorded the highest grain yield of 4667 kg/ha statistically at par with NBH 4903 (4536 kg/ha) and NBH 5061 (4195 kg/ha). The hybrid ICMV 155 recorded lowest grain yield (567 kg/ha) under rain fed condition. An increased in grain yield to a tune of 87.9%, 87.5 %, 86.5% were recorded with the hybrid varieties Kaveri Super Boss, NBH 4903 and NBH 5061 respectively over the lowest yielding hybrid ICMV 155. It might be due to potential difference of varieties, plant population, panicle diameter, panicle length and 1000 grain weight. These findings were in concurrence with the results of Yadav *et al.,* (2014), Detroja *et al.,* (2018) and Choudhuri *et al.,* (2018).

Table.1 Growth parameters and yield attributes of released hybrid varieties of pearl millet

Varieties	Days to 50 % flowering	Days to maturity	Plant population ('000/ha)	Plant height (cm)	Productive tillers/ plant	Panicle length (cm)	Panicle diameter (cm)	1000 seed wt.(g)	Grain yield (kg/ha)	Harvest index (%)
T1: HHB 229	70	113	32.0	147	2.6	18.0	9.4	9.9	1237	44.33
T2: AHB 1200	64	105	58.6	146	2.2	19.5	9.3	11.9	1407	59.35
T3: 86 M 01	71	110	62.0	151	1.6	19.9	9.4	12.5	2493	53.81
T4: NBH 5767	69	110	68.0	166	2.4	20.6	10.0	11.2	2100	50.68
T5: Pratap (MH1662)	70	108	62.7	141	2.4	17.9	9.4	11.5	1604	50.26
T6: NBH 4903	69	106	83.3	182	2.6	24.5	11.0	13.4	4536	52.81
T7: NBH 5061	69	106	87.3	178	2.3	23.3	11.2	12.9	4195	58.66
T8: 86 M 86	68	107	25.3	159	1.5	19.2	9.6	12.1	1124	55.34
T9: Kaveri Super Boss	70	106	85.3	179	3.7	21.2	10.1	13.7	4667	52.73
T10: 86 M 64	69	106	48.0	166	3.2	21.6	9.8	13.6	1666	57.52
T11: GHB 558	65	112	13.3	129	3.3	18.0	9.2	10.4	630	69.24
T12: Dhanshakti	63	105	52.0	144	2.2	17.9	8.5	15.2	1137	58.40
T13: ICMV 221	63	104	38.0	134	2.0	14.8	8.6	10.8	910	55.38
T14: Pusa Comp 612	65	106	32.0	171	2.8	22.8	8.1	9.0	1089	46.63
T15: ABV 04	66	107	42.0	166	3.1	18.1	10.2	11.4	1850	44.83
T16: ICMV 155	63	105	26.7	161	2.3	18.5	7.0	9.7	567	34.21
Grand Mean	67.1	107.3	38.3	157.3	2.5	19.7	9.4	11.8	1950.6	-
SEm(±)	1.2	0.8	5.5	5.7	0.2	0.8	0.3	1.1	247.5	-
CD(0.05)	3.6	2.4	16.7	17.2	0.7	2.5	1.0	3.2	741.9	-
CV (%)	3.0	1.3	17.1	6.3	16.2	7.2	6.0	15.2	19.2	-

Table.2 Estimates of correlation coefficients between yield and yield components of pearl millet

Traits	X2	X3	X4	X5	X6	X7	X8	X9	X10
X1	0.263	0.835**	0.457*	0.240	0.563**	0.364*	-0.275	-0.323	0.715**
X2		0.227	0.195	0.001	0.066	0.075	0.074	0.050	0.247
X3			0.511**	0.267	0.569**	0.433*	-0.081	0.035	0.689**
X4				0.483**	0.663**	0.672**	0.218	0.380*	0.762**
X5					0.616**	0.231	-0.308	0.437*	0.535**
X6						0.516**	-0.181	0.104	0.884**
X7							0.557**	0.008	0.596**
X8								0.104	-0.064
X9									0.099

(*, ** indicate significant at 0.05 and 0.01 probability levels respectively)

X_1: Plant height X_2: Tillers /plant X_3: Panicle length X_4: Panicle diameter
X_5: Test weight X_6: Plant population X_7: Days to 50% flowering X_8: Days to maturity X_9: Harvest index X_{10}: Yield

Correlation studies

Association among growth parameters, yield attributes and yield

The effect of growth parameters and yield attributes on grain yield in pearl millet was analysed through correlation studies (Table 2). On the basis of correlation coefficients it was observed that grain yield had highly positive and significant association with plant height, panicle length, panicle diameter, and test weight and plant population. Among the yield contributing characters plant height, panicle length and plant population had high positive correlation. Similar results were also reported by Sharma *et al.,* (2014), Gupta *et al.,* (2017) and Singh *et al.,* (2018).

It is concluded that Kaveri Super Boss, NBH 4903 and NBH 5061 are the best suitable hybrid varieties of pearl millet for rainfed condition under Eastern Ghat high land zone of Odisha.

Acknowledgement

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