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Performance of Hybrid Varieties of Pearl Millet (*Pennisetum glaucum* L.) under Arid Condition of Western Rajasthan

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ABSTRACT
A field experiment was conducted during Kharif of 2019 to study the pearl millet hybrids performances under arid zone of western Rajasthan at research farm of Agricultural Research Sub Station, Samdari, Barmer. The experiment was laid out randomized block design *with 3 replications. Twenty six pearl millet hybrids viz., MH 2474, MH 2459, MH 2472, MH 2465, MH 2475, MH 2463, MH 2468, MH 2460, MH 2469, MH 2477, MH 2457, MH 2473, MH 2470, MH 2471, MH 2476, RHB 177 (C), MH 2464, MH 2458, MH 2461, HHB 272 (C), MH 2478, MH 2462, MPMH 21 (C), MH 2466, HHB 67 Imp. (C) and MH 2467, and recommended dose of fertilizers (RDF); 40 kg N + 20 kg P + 0 kg K are applied. All hybrids have statistically significant differences in respect of growth and yield characteristics. However, non-significant differences were observed regarding plant population and 1000 seed weight. The results revealed that MH 2472 gained maximum plant heights of (162. 0 cm), and number of productive tiller per plant was found maximum in HHB 67 and MH 2472 (1.9), while MH 2465 hybrids (42.3 days) showed early days to 50 percent flowering. The longest panicle was found in MH 2469 (24.9 cm) which was at par with MH 2468 (24.8 cm),while significantly higher panicle diameter was recorded in MH 2464 (3.2 cm), while days to maturity (80.3 DAS) was observed in MH 2458 and maximum grain yield (1344 in kg/ha) was observed in MH 2459 and maximum dry fodder yield (4074 kg/ha) was observed in MH 2472. While non-significant effect of hybrids on 1000 seed weight hybrids MH 2476 produced the maximum seed weight of 9.60 g, statistically the maximum plant population were observed in MH 2461 (75.7).*
Keywords: *Performances, Pearl millet, hybrids, arid zone.*

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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). Coarse cereal or millet crops are integral part of dry land agriculture due to inherent potential to adopt well under drought and high temperature conditions.

Pearl millet is important multi-purpose coarse grain crop [7] of high nutritive value [13, 2], and the significance of millets in sustainable agriculture is well recognized, in year 2017 Government of Indian has declared millet crops as 'Nutri Cereals' by gazette notification

[G.No: 4- 4/2017-NFSM (E)]. Pearl millet is grown soils mostly poor in organic matter, low in available nitrogen and phosphorus. Poor soil fertility and erratic rains are the most important constraints to crop production in arid and semi arid region.

Hence a hybrid development programme specifically targeted for poor environments like western Rajasthan would be beneficial as hybrid combinations based on parents developed under, and selected for adaptation to the harsh climatic conditions of the arid regions are likely to be more successful [8, 10, 12]. 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 [11] 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 hybrid varieties of pearl millet under arid conditions of Rajasthan.

MATERIAL AND METHODS

Experimental Materials, Design and Treatments

A field experiment was conducted at Agricultural Research Sub Station (Agriculture University, Jodhpur), Samdari, Barmer during *Kharif* season of 2019. *Randomized block design* was used with three replications and net plot size was 4.0 m × 1.8 m. The experiment was comprised of twenty six millet hybrids viz., MH 2474, MH 2459, MH 2472, MH 2465, MH 2475, MH 2463, MH 2468, MH 2460, MH 2469, MH 2477, MH 2457, MH 2473, MH 2470, MH 2471, MH 2476, RHB 177 (C), MH 2464, MH 2458, MH 2461, HHB 272 (C), MH 2478, MH 2462, MPMH 21 (C), MH 2466, HHB 67 Imp. (C) and MH 2467 was tested for their performance. The recommended dose of fertilizers (RDF); 40 kg N + 20 kg P + 0 kg K are applied. The crop was sown on 29-07-2019 with 60 cm row spacing and 15 cm plant spacing. Full does of P and half dose of N were applied as basal at sowing while remaining dose of N was applied as broadcasting at 29 days after sowing after getting sufficient rain. All other agronomic practices were kept normal and constant. Five randomly selected plants from each plot were taken for recording growth and yield parameters. The observations recorded on growth, yield and its attributes are presented in Table 1 and 2.

Data Collection

The crop was harvested 90 DAS data on yield and yield components(Days to 50 % flowering, Plant height (cm.), Productive tillers (No./Plant), Panicle Length (cm.), Panicle diameter (cm.), Days to maturity, Population at harvest/no., net plot Dry Fodder Yield (kg/net plot), Grain yield (kg/net plot) and 1000- seed wt. (g)) both were recorded by standard procedure.

RESULTS AND DISCUSSION

Effect on growth parameters of pearl millet hybrids

Plant Height at Maturity(cm)

The plant height is a significant growth attribute directly linked with the productive prospective of plant in terms of yield. In this study the statistically analyzed data presented in Table 1 revealed that pearl millet hybrids differ significantly regarding plant height. Pearl millet hybrids MH 2472 gained maximum plant heights of (162. 0 cm) its followed by MH 2465 (158.7cm) and MH 2478 (156.3 cm). The lowest plant height (123.3 cm) was observed in MH 2466 followed by (124.7 cm) in MH 2461 as shown in (Table 1). The variation in plant height in different pearl millet hybrids may be due to disparity in genetic makeup of these hybrids. Significant difference in pearl millet hybrids in respect of plant height have also been reported by [5, 1] and Ayub *et al.*, [3] also perceived significant dissimilarities among different hybrids regarding plant height.

Productive tillers (No./Plant)

Hybrids showed a significant effect on no. of productive tillers/plant under favorable environment and soil conditions. Number of productive tiller per plant was found maximum in HHB 67 and MH 2472 (1.9) followed by HHB 272 and MH 2475 (1.6) and minimum in MH 2466 , MH 2470, MH 2471, MH 2473, MH 2458, MH 2461, MH 2464 (1.0) (Table 1). These results are in conformity with the findings of [6].

Plant Population

The number of plants at harvesting time is one of key yield contributing features in crops. The statistical analysis pointed out in Table 2 that number of plants was significantly different in all pearl millet hybrids. Statistically the maximum number of plants were observed in MH 2461 (75.7) followed by MH 2474 with (67). The minimum plant populations was observed in HHB 67(41), MH 2472 (51.3), MH 2467 (54.7) and MH 2477 (55.3) and were statistically at par with each other and reflecting non-significant results. These differences in plant population of various pearl millet hybrids either due to difference in seed viability or variable soil fertility level. These results are in line with [1] who described significant difference in plant density per square meter among pearl millet hybrids.

Effect on yield attributing parameter of pearl millet hybrids

Days to 50 % flowering

The data presented (Table 1) shows that the days to 50 percent flowering. Hybrids MH 2465 (42.3) showed early flowering, it was followed by MH 2460 (42.7) and MH 2475 (43.0) while hybrids MH 2474 and MH 2471 (51.0) produced late flowering. 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).

Panicle length and panicle diameter (cm)

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. Data in Table 1 showed that longest panicle was found in MH 2469 (24.9 cm) which was at par with MH 2468 (24.8 cm) and MH 2457 (22.5 cm) and shortest panicle in MH 2466 (17.9cm). Significantly higher panicle diameter was recorded in MH 2464 (3.2 cm) statistically higher than MH 2471 (3.1 cm), MH 2476 (3.0 cm) and MH 2473 (3.0 cm) and MH 2458 (3.0 cm). Lowest panicle diameter was observed in MH 2462 (2.2 cm). The results are in agreement with the findings of [6, 4].

1000 seed weight (g)

Data showed in (Table 2) indicated that there was non-significant effect of hybrids on 1000 seed weight. Hybrids MH 2476 recorded the maximum seed weight of 9.60 g followed by MH 2474, MH 2465 and MH 2463 (9.4 g), and minimum in MH 2468 with seed weight 7.5 g. The results are in agreement with the findings of [16, 6].

Days to maturity

The data presented in(Table2) shows that days to maturity(80.3 DAS) was observed in MH 2458 followed by MH 2474 (79.9 DAS). Minimum days to maturity (73.3 DAS) was observed in MH 2470 followed by MH 2467 (74.0 DAS).

Grain yield (kg /ha**)**

The data presented in (Table 2) shows that maximum and earliness in hybrids is the prime requirement for developing cultivars suitable for hot arid regions as they can escape terminal drought due to problem of scantly and erratic rainfall patterns. Dual purpose objective of getting more fodder and grain is important as fodder requirement is met significantly by pearl millet harvest in arid parts. Statistically analyzed data indicated that grain yield was significantly differing in all pearl millet hybrids. The data presented in table shows that maximum grain yield (1344 kg /ha) was observed in MH 2459 followed by MH 2472 (1281 kg /ha). Minimum grain yield (564 kg /ha) was observed in MH 2466, it's followed by MH 2470 (592 kg /ha). More grain yield may be due to more panicle diameter, number of panicle per plant and test weight in these hybrids. It might be due to potential difference of varieties, plant population, number of effective tillers, panicle diameter, panicle length and 1000 grain weight. These findings were in concurrence with the results of [16, 6, 4].

Dry Fodder Yield (kg)

Fodder yield is the depended upon the genomic as well as environmental factors. Statistically analyzed data (Table 2) indicated that fodder yield was significantly differing in all pearl millet hybrids. The data presented in table shows that maximum dry fodder yield (4074 kg /ha) was observed in MH 2472 followed by MH 2478 (3842 kg /ha). Minimum fodder yield (1667 kg /ha) was observed in MH 2462 followed by MH 2463 (1668 kg /ha). More forage yield may be due to more stem diameter, more number of leaves per plant and more leaf area per plant and more fresh weight per plant in these hybrids. These results were matched with the findings of (Sharma et al., 2003) that exhibited increase in the fodder yield

ability due to tillers per plant, plant height and leaf to stem ratio. Yusuf *et al.*, [17]; Saifullah *et al.*, [9] reported significant differences in term of forage yield in pearl millet cultivar. [8, 18] also observed significant differences among the pearl millet genotypes for green fodder yield. High fodder yield is closely associated with high values for plant height, number of leaves and leaf area.

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

Hybrids	Days to 50 % flowering	Plant height (cm)	Productive tillers (No./Plant)	Panicle Length (cm)	Panicle diameter (cm)	Days to maturity	Population at harvest/no. net plot	1000 seed wt. (g)
MH 2474	51.0	136.0	1.2	20.1	2.8	79.7	67.0	9.4
MH 2459	47.3	137.7	1.2	20.5	2.9	78.3	66.7	9.3
MH 2472	44.7	162.0	1.9	21.7	2.3	76.3	51.3	9.0
MH 2465	42.3	158.3	1.3	21.3	2.7	74.3	66.7	9.4
MH 2475	43.0	145.3	1.6	20.6	2.5	76.0	65.0	8.5
MH 2463	44.7	149.0	1.1	19.1	2.6	75.7	55.7	9.4
MH 2468	45.0	150.7	1.1	24.8	2.6	75.0	61.0	7.5
MH 2460	42.7	147.7	1.2	21.0	2.7	73.7	63.3	9.2
MH 2469	47.3	141.7	1.3	24.9	2.4	78.0	59.3	8.9
MH 2477	45.7	132.3	1.1	19.6	2.8	77.3	55.3	8.6
MH 2457	45.7	151.3	1.3	22.6	2.5	75.7	65.3	9.3
MH 2473	48.0	125.3	1.0	20.0	3.0	76.3	61.7	8.4
MH 2470	44.3	124.0	1.0	18.3	2.6	73.3	60.0	8.5
MH 2471	51.0	130.7	1.0	18.8	3.1	78.7	62.0	8.3
MH 2476	50.3	144.0	1.1	19.9	3.0	79.3	56.3	9.6
RHB 177	44.7	141.7	1.1	19.1	2.7	76.0	58.7	7.9
MH 2464	46.3	127.3	1.0	19.8	3.2	75.0	56.3	8.4
MH 2458	48.0	134.0	1.0	18.5	3.0	80.3	65.3	9.0
MH 2461	48.3	124.7	1.0	19.4	2.9	78.3	75.7	8.0
HHB 272	43.0	139.3	1.6	21.2	2.3	74.0	60.7	7.9
MH 2478	43.0	156.3	1.3	21.6	2.5	75.3	65.3	8.2
MH 2462	43.7	139.3	1.2	19.2	2.2	74.3	63.0	8.3
MPMH 21	46.3	137.7	1.3	19.7	2.6	76.7	61.0	8.3
MH 2466	47.7	123.3	1.0	17.9	2.9	77.7	56.3	8.4
HHB 67	45.3	144.0	1.9	20.8	2.6	74.7	41.0	8.7
MH 2467	43.7	144.0	1.4	21.8	2.7	74.0	54.7	8.3
SEm±	0.9	5.8	0.1	0.8	0.1	1.0	5.7	0.6
CD5%	2.5	16.5	0.4	2.4	0.2	2.7	N/A	N/A
C.V.	3.3	7.2	18.5	7.2	4.5	2.2	16.4	12.2

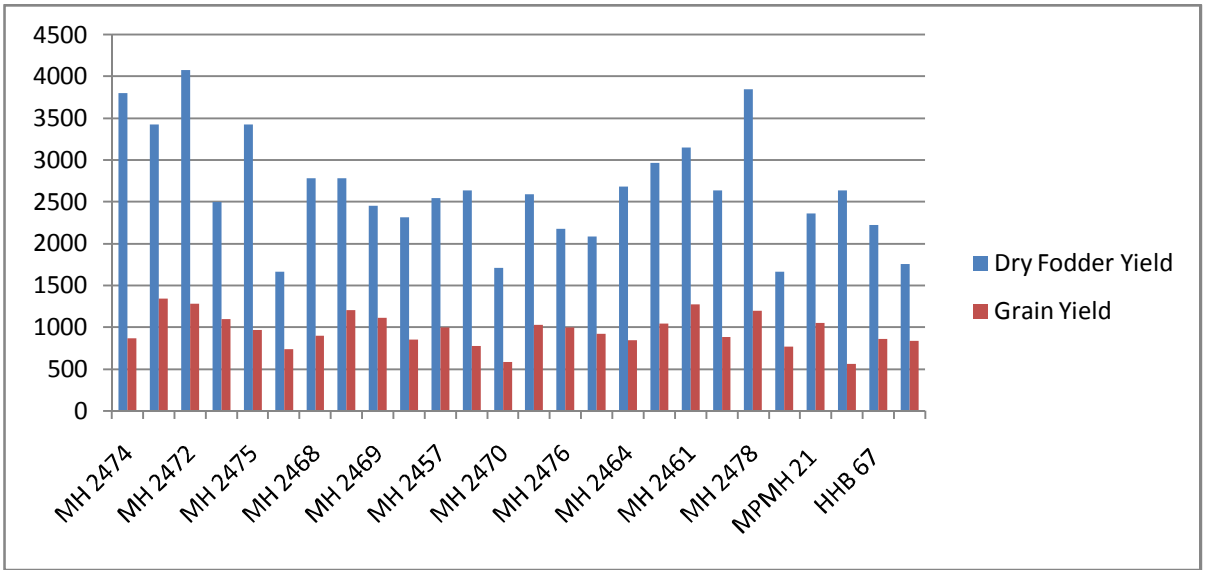

Fig:1 Dry fodder and Grain yield Performance Of Hybrid Varieties Of Pearl Millet Under Arid Condition Of Western Rajasthan

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REFERENCES

1. Amodu, J.T., Adeyinka, I.A., Kallah, M.S. and Alawa, J.P. (2007) Evaluation of Pearl Millet Accession for Yield and Nutrient Composition. Journal of Biological Sciences, 7, 379-383.
2. Are, A.K., Srivastava, R.K., Mahalingam, G., Gorthy, S., Gaddameddi, A., Kunapareddy, A., Kotla, A. and Jaganathan, J. 2018. Application of plant breeding and genomics for improved sorghum and pearl millet grain nutritional quality: In Sorghum and Millets, 2nd Ed. Elsevier International. Pp 51-68.
3. Ayub, M., Khalid, M., Tariq, M., Elahi, M. and Nadeem, M.A. (2012) Comparison of Sorghum Genotypes for Forage Production and Quality. Journal of Animal and Plant Sciences, 22, 733-737.
4. Chaudhari,R.P., Patel, P.M., Patel, B.M., Upesh, K., Darji, S.S., and Patel, S.J.2018.Performance of summer pearl millet (*Pennisetum glaucum* L.) hybrids under North Gujarat conditions.International Journal of Current Microbiology and Applied Sciences. 7(1): 637-644.
5. Chohan, M.S.M., Naeem, M., Khan, A.H. and Kainth, R.A. (2006) Performance of Pearl Millet (*Pennisetum americanum* L.)Varieties for Forage Yield. Journal of Agricultural Research, 44, 23-27.
6. Detroja, A. C., Bhuva, H. M., Chaudhari, N. N., Patel, P. R., and Kikani, V. L.2018. Production potential of improved pearl millet (*Pennisetum glaucum* L) cultivars under staggered sowing in rainfed areas of western India. International Journal of Environmental Sciences & Natural Resources. 12(4): 119-122.
7. Jalaja, N., Maheshwari, P., Naidu, K.R., and Kavi Kishor, P.B. 2016. In vitro regeneration and optimization of conditions for transformation methods in Pearl millet, *Pennisetum glaucum* (L.). International Journal of Clinical & Biological Sciences. 1: 34–52.
8. Muhammad, D., Hussain, A., Khan, S. and Bhatti, M.B. (1994) Forage Yield and Quality Potential of Pearl Millet Cultivars under Rainfed Conditions. Journal of Agricultural Research, 32, 383-388.
9. Saifullah, A., Jan, F., Munsif, M., Arif, H., Khan, K., Waqas, M.A. and Ali, A. (2011) Performance of Millet Varieties under Different Irrigation Levels. Sarhad Journal of Agriculture, 27, 1-7.
10. Shah, A. H., Rahman, H., Shah, S. M. A., Rahman, S., and Noor, M.2012. Characterization of pearl millet germplasm for various morphological and fodder yield parameters. Pakistan Journal of Botany. 44: 273-279.
11. Sharma, K.C., Sharma, R.K., Singhania, D.L.and Singh, D. (2003) Variation and Character Association in Forage Yield and Related Traits inPearl Millet [*Pennisetum glaucum*(L.)R. Sr.].Journal of Agricultural Research, 30, 53-58.
12. Sharma, N. K.(2014). Evaluation of released varieties and hybrids of pearl millet for seed and stover yields in hot arid climate of Rajasthan. Indian J. Plant Genet. Resour. 27(1): 63-65.
13. Singh, N., Singh, S.P., Kumar, M., Kanhiya, K. and Kumar, A. (2018). Nutri Cereal Pearl millet: Way Forward. International Journal of Current Microbiology and Applied Sciences. 7 (6): 578-581.

14. Solanki, R.K., R.K. Kakani, A.K. Jukanti, S.K. Singh and Bhatt, R.K. (2019). Performance of Pearl Millet Hybrids for Earliness and Grain Yield in Indian Hot Arid Region. International Journal of Current Microbiology and Applied Sciences. 8(03): 1956-1962.
15. V.K. Manga, and Arun Kumar. (2011). Performance of pearl millet hybrids under arid conditions . Electronic Journal of Plant Breeding, 2(3):320-325.
16. Yadav, A. K., Kumar, A., Singh, J., Jat, R. D., Jat, H. S., Datta, A., Singh, K., and Chaudhary, R. (2014). Performance of pearl millet genotypes under irrigated and rainfed conditions at Hisar, India. Journal of Applied and Natural Science. 6(2): 377-382.
17. Yusuf, M.J., Nabi, G., Basit, A., Husnain, S.K.andAkhtar, L.H. (2012) Development of High Yielding Millet Variety "Sargodha Bajra-2011" Released for General Cultivation in Punjab Province of Pakistan. Pakistan Journal of Agricultural Sciences, 49, 275-282.
18. Zaman, Q., Malik, N.H. and Hayat, K. (2004) Performance of Millet Varieties for Green Fodder Production under D.I.Kshan Condition. Sarhad Journal of Agriculture, 20, 47-49.