

Short Communication

Evaluation of Released Varieties and Hybrids of Pearl Millet for Seed and Stover Yields in Hot Arid Climate of Rajasthan

NK Sharma

Directorate of Research, Swami Keshwanand Rajasthan Agricultural University, Bikaner-3340006, Rajasthan

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Nine open pollinated varieties (OPVs) during *kharif* 2007, 2008 and 2010 and nine hybrids during *kharif* 2011 and 2012 were evaluated for seed yield and stover yield in hot arid climate of Rajasthan at Agricultural Research Station, Keshwana, Jalore. The significant differences among experimental varieties and hybrids for seed as well as stover yields were observed. In case of OPVs, higher seed yield per hectare was recorded for Raj-171 (2,606 kg), JBV-2 (2,565 kg) and Pusa-266 (2,565 kg). However, higher stover yield per hectare was observed for JBV-3 (14,930 kg), JBV-2 (13,009 kg) and Pusa-266 (12,894 kg). Similarly, hybrids GHB-744 (3,938 kg), RHB-173 (3,779 kg) and GHB-732 (3,465 kg) out yielded other hybrids in terms of seed yield per hectare. The higher stover yield per hectare was exhibited by RHB-173 (7,765 kg), GHB-744 (5,942 kg) and HHB-197 (5,912 kg). Though in different years but under similar agronomic practices in the arid and hot climatic conditions OPVs out yielded hybrids by 93.38% for stover yield whereas, hybrids out yielded OPVs by 31.74% for seed yield. The hybrid HHB-67 improved was early and took 34 days for exhibiting 50% flowering.

Key Words: Hybrids, Open pollinated varieties, Pearl millet, Seed yield, Stover yield

Pearl millet [*Pennisetum glaucum* (L.) R. Br.] is one of the most important *kharif* cereals of arid and semi-arid environment. It is primarily used as food grain for human consumption and fodder for animals. In Rajasthan, pearl millet occupied an area of 4.96 million hectares (average of 2006-07 to 2010-11) with grain production of 4.03 million tonnes. Barmer, Jodhpur, Nagaur, Churu, Jalore, Sikar, Jaipur, Jhunjhunu, Alwar and Bikaner are major pearl millet growing districts of the state. The average productivity of pearl millet in Rajasthan is 776 kg/ha (Anonymous, 2011-12). Pearl millet is largely grown as rainfed in Rajasthan, therefore, its production and productivity is highly erratic and varies year after year with the amount and distribution of rainfall. Under such adverse growing conditions, selection of high yielding cultivars with appropriate maturity duration attains paramount importance.

In pearl millet improvement programme there is successful development of high yielding hybrids and open pollinated varieties with good adaptation to diverse environments. Despite the availability of newly developed cultivars, many of the obsolete varieties and traditional landraces are still occupying large area under cultivation and contributing to poor productivity of pearl millet. Hence, there is an urgent need to replace them with newly developed high potential cultivars

for better production and profitability. Present studies were conducted to evaluate released hybrids and open pollinated varieties (OPVs) of pearl millet for seed and stover yields in arid Rajasthan.

Materials and Methods

Two separate experiments on released pearl millet varieties and hybrids were conducted at experimental farm of Agricultural Research Station, Keshwana, Jalore (latitude of 25° 22'N and longitude of 72° 58'E, elevation 162 msl). The experimental site has tropical arid climate with mean annual rainfall of 421 mm. Soil at the site was clay loam, slightly saline (pH 8.7) and low in organic carbon (0.23%). In first experiment, nine early to medium maturity OPVs were tested for three years and planting was done on 03.07.2007, 07.07.2008 and 11.07.2010, respectively. In second experiment, nine hybrids were tested for two years and planting was done on 15.07.2011 and 20.07.2012, respectively. Experiments were conducted during rainy season but under moisture stress situation irrigation was also applied as per requirement of the crop.

Both experiments were laid out in randomized block design with 3 replications. Plot size was kept 2.5 m x 4.0 m accommodating 8 rows at 30 cm distance with seed rate of 4 kg/ha. A fertilizer dose of N 40 kg/ha

* Author for Correspondence: Email: nksharmaars@yahoo.co.in

and P 20 kg/ha was applied to the crop. A half dose of N and full dose of P were applied at the time of sowing in the form of urea and DAP. The remaining half dose of the N was top dressed in the form of urea at 20 days after sowing. Additional spray of 1% soluble NPK (19:19:19) at flowering and grain development stage was also applied to the crop for harvesting the higher yield. Two hand weedings were carried out 15 and 30 days after sowing, to have the crop free from weeds. Data recorded for grain and stover yield was analyzed using standard analysis of variance (ANOVA) through Excel software of Microsoft Office.

Performance of OPVs: Differences among open pollinated varieties for seed yield were found statistically significant during all three years. Year-wise average seed yield ranged between 2,178 and 2,674 kg/ha (Table 1). The experiment was conducted during rainy season, therefore, fluctuation in the productivity is largely affected by the amount and distribution of rainfall along with the change in temperature and relative humidity in different years. Variety-wise seed yield ranged between 1,832 and 3,012 with the average of 2,429 kg/ha. Average number of days to 50% flowering among varieties varied between 34 and 47 and earliest flowering was observed in CZP-9802. On the basis of three years' yield data, varieties such as Raj-171, JBV-2, Pusa-266, and JBV-3 performed above average and provided grain yield of 2,606; 2,565; 2,565 and 2,453 kg/ha, respectively (Table 1). The lowest seed yield was recorded in ICTP-8203. Air dried average stover yield ranged between 7,281 and 14,930 kg/ha with the average of 11,106 kg/ha, and maximum has been produced by JBV-3 followed

by JBV-2, Pusa-266 and Raj-171 with 13,009, 12,894 and 12,828 kg/ha, respectively. The lowest stover yield was recorded in CZP-9802.

Among OPVs, Raj-171, JBV-2, Pusa-266, and JBV-3 appears to be promising and appropriate for dual purpose cultivation in arid Rajasthan. Pusa Composite-443 tested for one year also seems to be a promising dual purpose variety but it needs further testing for validation.

Performance of Hybrids: Differences among hybrids for seed and stover yield were found statistically significant in both the years (Table 2). Year-wise average seed yield ranged between 2,603 and 3,797 kg/ha; however, variety-wise it varied between 2,302 and 3,938 with the average of 3,200 kg/ha. Days to 50% flowering among different hybrids varied between 34 and 42 and earliest flowering was observed in HHB-67 Imp. On the basis of two years' yield data, hybrids *viz.*, GHB-744, RHB-173, GHB-732, RHB-121 and GHB-719 performed above average and provided seed yield of 3,938; 3,779; 3,465; 3,384 and 3,317 kg/ha, respectively (Table 2). The lowest seed yield was recorded in HHB-67 Imp. Air dried stover yield ranged between 4,952 and 7,765 kg/ha with the average of 5,743 kg/ha, and maximum has been produced by RHB-173. Therefore, based on the seed and stover productivity, GHB-744 and RHB-173 appears to be higher productive and appropriate hybrids for arid Rajasthan. Akmal *et al.* (2002), Bidinger *et al.* (2008), Kaushik and Gautam (1987) and Choi *et al.* (1988) studied the varietal performance in pearl millet and reported similar results.

Table 1. Seed and stover yield of open pollinated varieties of pearl millet

Open pollinated varieties	Seed yield (kg/ha)				Mean stover yield (kg/ha)	Days to 50% flowering
	2010	2008	2007	Mean		
CZP-9802	2,253	2,273	2,273	2,266	7,281	34
ICMV-221	2,363	2,047	2,100	2,170	10,594	37
ICTP-8203	1,889	1,947	1,660	1,832	8,878	42
JBV-2	2,747	2,740	2,207	2,565	13,009	46
JBV-3	3,383	1,743	2,233	2,453	14,930	47
Pusa-266	2,892	2,537	2,267	2,565	12,894	45
Pusa-383	2,625	2,033	2,520	2,393	10,472	43
Pusa Comp.443	3,012	—	—	3,012	9,067	43
Raj-171	2,904	2,107	2,807	2,606	12,828	46
Mean	2,674	2,178	2,258	2,429	11,106	—
CD (p=0.05)	515	375	377	—	—	—

Table 2. Seed and stover yield of different hybrids of pearl millet

Hybrids	Seed yield (kg/ha)			Stover yield (kg/ha)			Days to 50% flowering
	2011	2012	Mean	2011	2012	Mean	
GHB 538	3,852	2,377	3,115	5,648	5,223	5,436	37
GHB 719	3,956	2,677	3,317	6,933	4,257	5,595	40
GHB 732	3,830	3,100	3,465	5,933	4,833	5,383	41
GHB 744	4,968	2,907	3,938	7,657	4,227	5,942	42
HHB 67 Imp	2,893	1,710	2,302	4,833	6,490	5,662	34
HHB 197	3,902	2,367	3,135	5,990	5,833	5,912	37
RHB 121	3,925	2,843	3,384	6,117	3,957	5,037	39
RHB 173	4,455	3,103	3,779	8,367	7,163	7,765	39
RHB 177	2,400	2,343	2,372	2,847	7,057	4,952	37
Mean	3,797	2,603	3,200	6,036	5,449	5,743	—
CD (p=0.05)	448	431	—	900	1,393	—	—

Table 3. Comparative performance of pearl millet hybrids and open pollinated varieties

Particulars	Seed yield (kg/ha)	Stover yield (kg/ha)	Cost of seed (₹/ha)	Total returns (₹/ha)	Additional benefit (₹/ha)
Open pollinated varieties	2,429	11,106	88.00	50,665.00	—
Hybrids	3,200	5,743	540.00	53,414.50	2,297.50

Market rate of pearl millet grain: ₹ 14/kg; and stover: ₹ 1.50/kg

Market rate of pearl millet hybrid seed: ₹ 135/kg; and OPVs seed: ₹ 22/kg

Comparative Performance of Hybrids and OPVs: The experiments on OPVs and hybrids were conducted in different years but under similar agronomic practices at same location. The average performance of both groups of cultivars revealed that OPVs out yielded hybrids by 93.38% for stover yield whereas, hybrids out yielded OPVs by 31.74% for seed yield. Economic analysis indicates that in general, hybrid cultivation is more profitable than OPVs in arid Rajasthan. An additional income of ₹ 2,297.50 per hectare may be earned merely by the use of hybrid seed (Table 3). OPVs appear to be more suitable for dual purpose cultivation.

Pearl millet hybrids and OPVs exhibited a wide range of variability in flowering, seed yield and stover yield. OPVs *viz.*, Raj-171, JBV-2, Pusa-266, and JBV-3; and hybrids GHB-744, RHB-173, GHB-732, RHB-121 and GHB-719 were found to be high yielding and appropriate for cultivation in arid Rajasthan.

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