

A HIGH YIELDING PEARL MILLET VARIETY “YBS- 98”

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ABSTRACT

YBS-98 is a high yielding pearl millet variety. It was developed at Maize and Millets Research Institute, Yusafwala through selection from ICRISAT germplasm. The experimental variety YBS-98 was evaluated against standard variety 18- BY in different yield trials during the years 2004- 2013. On an average basis of station, farmer field trials, it exhibited 17 percent higher grain yield than standard variety 18- BY with a potential of 4045 kg /ha. Its plant is medium height (245-282 cm) having 10-12 semi erect leaves. It takes 90-95 days to maturity and stay green character at maturity. Its grey coloured grain is bold as compared to check variety. The recommended seed rate for this variety is 1.5 to 2.0 and 2.0 kg / ha in the irrigated and rain fed areas, respectively. Its optimum time of sowing is from the start of moon-soon up to third week of July under rain fed conditions whereas in irrigated areas, sowing time ranges from 21th June to 10th August. The recommended fertilizer dose is 100:50:50 and 80:50:50 NPK kg/ha to produce better grain yield of good quality. High grain /stalk yield, tolerance against diseases and suitability for both irrigated and rain fed conditions are major attributes of this new pearl millet variety.

Key words: Pearl millet, Bajra, Germplasm, Variety, High yield, Drought tolerance.

INTRODUCTION

Pearl millet is one of the most suitable and efficient crop for arid and semi arid conditions because of its efficient use of soil moisture and high level of heat tolerance (Harinarayana *et al.*, 1999). It has high yield potential and response well to moisture and soil fertility (Poehlman, 1994). It is grown in about 40 countries of the world, predominantly in Africa and Asia as staple food but also used as forage, fodder, biofuel and building materials (Sumathi *et al.*, 2010). Pearl millet contributes to both rural food security and livelihood system as it provides good nutritional supplies and income source to small farmers (Rai *et. al.*, 2012). In Pakistan, there is a little use of pearl millet grain as food because of the sufficient availability of other staple food like wheat and rice. Its grain is mainly used as feed for poultry and pet birds while the stalk is used as fodder for livestock, especially in rain fed areas. There is no industrial use of its produce.

Pearl millet is the fourth major cereal crop after wheat, rice and maize in terms of area and production in Pakistan. Pearl millet is grown on an area of 486 thousand hectares with annual production of 299 thousand tones. The production of bajra crop during 2015-16 witnessed positive growth of 1.4% due to increase in area cultivated (Anonymous, 2016). Little attention has been paid to exploit the genetic potential of pearl millet crop for the development of high yielding varieties.

Though Pakistan is not food insecure country but is still far from ensuring sustainable food production (Haq *et al.*, 2009). With shrinking land resources and alarming increase in population, Pakistan is left with no option but to strive continuously for progressive yield growth in all the crops especially food grains (Hussain *et al.*, 2006). In Pakistan, low yield of bajra crop is mainly associated with the lack of improved cultivars adapted to wide range of environment (Munawwar *et al.*, 2007). The existing approved open pollinated variety 18-BY is a long duration and low yielding variety. It was planned to evolve high yielding medium duration pearl millet variety that could be well adapted to agro climatic condition of Punjab and sustain high grain /stalk yield. The efforts made by breeders of Maize and Millet Research Institute Yusafwala and Millets Research Station, Rawalpindi become successful in the evolution of high grain /stalk yielding variety for general cultivation in Punjab. This variety was approved by Punjab seed council during the year 2016.

MATERIALS AND METHODS

Pearl millet variety YBS-98 was developed through selection from germplasm received from ICRISAT- India and planted at Maize and Millet Research Institute Yusafwala during kharif 1994. The introduced germplasm was

space planted and five entries were selected on the basis of their performance. Four to five selected panicles of each entry were covered and pollinated by hand with the bulked pollen of the same entry. These panicles were harvested and seed of all five entries was bulked. During kharif1995, bulked seed was planted on an area of one kanal keeping row to row and plant to plant distance of 75 and 30 cm respectively. At flowering 250 plants were selected on the basis of plant height, stem thickness and number of tillers per plant. At maturity heads of selected plants were harvested. Selection of 80 panicles was accomplished for grain size, head size and head shape. In kharif-1996, sowing was done following panicle to row fashion and poor performing rows and plants were rouged out before flowering. The uniform material was allowed to open pollinate. At maturity panicles were harvested and seed was bulked. Continuous selection remained in progress to attain uniformity in different traits. After attaining maturity the line was named as YBS- 98. The candidate entry was included nursery evaluation in 2003. The entry showed its worth regarding grain yield, tolerance to diseases and lodging. The entry was then evaluated in Micro Yield Trial and Macro yield trial from 2004 to 2009 and 2010 to 2013, respectively. Similarly the entry was submitted to Coordinator (MSM), NARC (Islamabad) for National Uniform Yield Trials and remained under trials from 2006 to 2010.

RESULTS

MICRO PLOT EXPERIMENTS

The results presented in Table1 revealed that grain yield of YBS-98 ranged from 1949 to 2529 kg/ha in preliminary / micro plot trial during the years 2004 to 2009 with 16.01 to 24.30 % increase over check variety (1496 to 2013kg/ha). On an average new variety produced 2263 kg/ha grain yield which is 21.76% higher than the check variety18-BY (1772kg/ha).

Table 1. Yield performance of YBS-98 in preliminary/micro plot trials.

Season	No. of location	Grain yield (Kg/ha)		% Increase over check
		YBS-98	18-BY	
2004	3	2529	2013	20.40
2005	3	2159	1670	22.60
2006	3	2634	2003	23.95
2007	3	2261	1899	16.01
2008	3	1949	1496	23.24
2009	3	2045	1548	24.30
Average		2263	1722	21.76

MACRO YIELD TRIALS (Grain yield kg/ha)

The results of macro yield trials are presented in Table 2 which revealed that new variety YBS-98 performed better than check variety 18- BY at different locations during the years 2010-2013

It is evident from the Table2 that YBS-98 gave 25.78 to 35.60% higher average grain yield than check variety 18-BY. On overall average basis, grain yield of new variety i.e.YBS-98 was 28.82% higher (2347kg/ha) as compared to check variety 18-BY (1660kg/ha).

Table 2. Yield performance of YBS-98 in macro yield trials.

Season	No. of locations	Grain yield (Kg/ha)		% Increase over check
		YBS-98	18-BY	
Kharif 2010	2	3011	2178	27.67
Kharif 2011	2	1822	1344	26.23
Kharif 2012	3	1881	1396	25.78
Kharif 2013	3	2674	1722	35.60
Average		2347	1660	28.82

MACRO YIELD TRIALS (Stalk yield kg/ha)

The results of macro yield trials conducted at varied locations for the years 2010 to 2013 pertaining to stalk yield kg/ha are given in Table 3. The data showed that new variety YBS-98 produced 5.85 to 23.40% low stalk yield

as compared to check variety 18-BY. On an average basis, the stalk yield of new variety was 16.40% low (29472 kg/ha) as compared to check variety (35264 kg/ha).

Table 3. Stalk yield performance of YBS-98 in macro yield trials.

Season	No. of locations	Stalk yield (Kg/ha)		% Decrease over check
		YBS-98	18-BY	
Kharif 2010	2	30389	32278	-5.85
Kharif 2011	2	23166	25944	-10.70
Kharif 2012	2	31167	40667	-23.40
Kharif 2013	2	33167	42167	-21.30
Average		29472	35264	-16.40

NATIONAL UNIFORM YIELD TRIALS

Trials were conducted for four years i.e. 2006, 2008, 2009 and 2010 across the country. The data indicated that new variety YBS-98 gave 3.37 to 19.17% higher average grain yield (2428 kg/ha) than the check variety 18-BY (2210 kg/ha). On overall average basis, YBS-98 out yielded the check variety by 10.6 % (Table 4).

Table 4. Yield performance of YBS-98 in national uniform yield trials.

Year	No. of location	Grain yield (Kg/ha)		% Increase over check
		YBS-98	18-BY	
2006	6	2584	2168	19.17
2008	7	2462	2178	13.46
2009	7	2163	2034	6.34
2010	4	2545	2462	3.37
Average		2428	2210	10.60

ON FARM YIELD TRIALS

The results of on farm trials conducted at different locations during the years 2007 to 2013 showed that new variety performed better than standard variety at farmer's field. The new variety YBS-98 produced 3.7 to 35.90% higher average grain yields than check variety 18-BY (Table 5).

Table 5. Yield performance of YBS-98 in on farm yield trials.

Year	No. of location	Grain yield (Kg/ha)		% Increase over check
		YBS-98	18-BY	
2007	10	1825	1465	24.60
2008	10	1489	1436	3.7
2010	5	1969	1455	35.33
2011	10	1825	1389	31.40
2012	10	1678	1235	35.90
2013	5	1913	1565	22.24
Average		1734	1424	25.3

On overall average basis grain yield of new variety was 25.3% higher (1783kg/ha) in comparison with the check variety (1424 kg/ha).

DISCUSSION

In Pakistan, millet yield (kg/ha) is low as compared to other millet producing countries of the world. Increased production could only be achieved with a proper combination of agronomic practices and cultivation of high yielding varieties under specific climatic conditions (Shah, 1994). Therefore, success of any breeding programme depends upon the development of high yielding varieties under particular environment.

YBS-98 is high yielding pearl millet variety. Its plant is medium statured with semi erect leaves and compact type panicle. It takes 90-95 days to mature and remain stay green after maturity. Number of leaves varies from 10-12 and thousand grain weight is 11-13gm. The grain yield potential of YBS-98 is 4045kg/ha. YBS -98 newly developed pearl millet variety is recommended for both under irrigated as well as rain fed conditions of the Punjab province.

Increased emphasis on development of dual purpose (grain cum fodder) of pearl millet, is necessary to ensure high grain yield as well as high dry fodder yield under rain fed cultivation (Dangaria and Atara, 2004). Being a dual purpose variety, it will not only provide better grain yield to the farmers of the Barani areas but also give reasonable amount of dry stalk to feed the livestock especially in the winter season when no other fodder is available. This pearl millet variety will help to change the socio-economic condition of the poor farmers.

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