

MMRI-YELLOW: A HIGH YIELDING AND FULL SEASON YELLOW MAIZE VARIETY

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ABSTRACT

MMRI-Yellow is a high yielding, full season and yellow grain variety of maize (*Zea mays* L). It was developed at Maize and Millets Research Institute, Yusafwala, Pakistan by crossing Yusafwala Pool-50 base population and five CIMMYT collections viz. Nanning-8528, Pozarica-8624, Jardinoplis-8624, Across-8627 and Across 8328 in half diallel fashion during spring 1991. For this purpose seven half sib improvement cycles through recurrent selection method were followed. The experimental variety EV-5098, developed in 1998 was evaluated against the standard variety Sahiwal-2002 in different yield trials during the year 2002-2009. On an average basis of 10 stations, 22 national and 75 farmer's field trials, it exhibited 11.5 percent higher grain yield (6600 kg/ha) than standard with a potential of 8500 kg per hectare. Its plant is medium in height (190-210 cm) having 14-16 semi-erect leaves and mid cob bearing (95-105 cm). It takes 60 (autumn) to 75 (spring) days to flower and 100 (autumn) to 115 (spring) days to mature. Its seed is bold with 240-260g 1000-grain weight. It performed better at seed rate of 30 kg per hectare with 75 cm row to row and 20 cm plant to plant spacings. Its optimum sowing time is last week of January in spring season and first week of August in autumn season in central Punjab. It needs 11-12 irrigations and 250-125-60(spring) and 200-100-60 (autumn) kg NPK per hectare. Higher grain yield, tolerance against diseases (stalk rot and leaf blight) and suitability for Punjab, Khyber Pakhtunkhwa and Azad Jammu & Kashmir are major attributes of this new maize variety.

KEYWORDS: *Zea mays*; higher yielding varieties; agronomic characters; Pakistan.

INTRODUCTION

Maize is the 3rd important cereal after wheat and rice. However, it ranks 1st as far as production per unit area and duration is concerned. So it has great potential to meet the challenge of food security and demand of growing

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industry. In Pakistan, maize yield per unit area is very low (3.5 t/ha) due to non-availability of high yielding varieties (2). Extremely expensive hybrid seed of maize is un-affordable for majority of the farmers. During autumn, more than 50 percent area under maize is sown by varieties seed. The significance of open pollinated maize varieties cannot be denied even in the era of hybrid maize as these can better withstand the extreme temperatures giving stable yields (3), with comparatively very low seed rate and inputs cost. So, it warrants to evolve high yielding maize varieties which can ensure comparative and stable yields in succeeding generations as suggested by Olakojo and Iken (9) and Russel (12). These broad base varieties ensure stable yields under varied environments (1).

Certain combinations between genetically divergent varieties are capable of high heterotic response for yield comparable to the best double cross hybrids (13). Half-sib and full-sib families have been used and proved effective in the improvement of maize populations as stated by Hallauer and Filho (6), Coors (4), Daros *et al.* (5) and Rodriguez and Hallauer (11). Paternianni (10) obtained 13.6 percent yield increase per half-sib improvement cycle compared to the original population.

The existing approved variety Sahiwal 2002 showed susceptibility against stalk rot and leaf blight. Hence, it was planned to evolve a maize variety with half-sib improvement that could sustain better grain yield and disease resistance. The efforts made by the breeders of Maize and Millets Research Institute, Yusafwala-Sahiwal have culminated in the evolution of a high yielding, stalk rot and leaf blight resistant, full season, yellow grain maize variety MMRI-Yellow for general cultivation in Punjab, Khyber Pakhtunkhwa and Azad Jammu & Kashmir. This variety was approved by Punjab Seed Council during the year 2011.

MATERIALS AND METHODS

The maize variety MMRI-Yellow was developed by crossing Yusafwala Pool-50 base population and five CIMMYT collections viz. Nanning -8528, Pozarica-8624, Jardinoplis-8624, Across-8627 and Across-8328 in half dialleled fashion. The hybridization work was started at Maize and Millets Research Institute, Yusafwala, Pakistan during the year 1991. The resultant enriched base population was planted on an area of 30 x 45 m² in isolation and allowed to undergo open pollination for four seasons to attain maximum genetic variability. Half-sib improvement method through recurrent selection was used to evolve this variety as suggested by Lamkey and Kendall (7). Seven improvement cycles were run by selecting 250 cobs per cycle. The

selected cobs were planted during each improvement cycle in ear-to-row fashion as female lines alongwith their bulk seed as male in 3:1 ratio of 6 meter rows with 20 cm plant to plant and 75 cm row to row spacings. The female rows were allowed to undergo half-sib pollination with the male pollen ensured by de-tasseling of female rows as devised by Mulamba *et.al.* (8).

Selection was done on the best desirable plants of best rows basis. At harvesting 100-150 families (rows) with 700-750 plants (cobs) were selected. Finally, at table selection (shelling), the number of cobs was restricted to 250. After the completion of seven improvement cycles of recurrent selection, 90 best families were selected during 1997 and evaluated subsequently in progeny testing trials. On the basis of yield performance, 10 top ranking families were selected in 1998. Half-diallel mating was opted to constitute new experimental variety EV-5098 from their remnant seed which was sown in isolation during 1999 and allowed to undergo open pollination for homogenization accompanied by light rouging. EV-5098 was tested in station, national and on-farm yield trials against check variety Sahiwal-2002 during the year 2002-2009. The agronomic requirements were also determined. Data regarding stalk rot reaction were also recorded.

RESULTS AND DISCUSSION

Station (micro plot) yield trials

The results (Table 1) showed that grain yield of variety MMRI-Yellow (EV-5098) ranged from 5131 to 11020 in station yield trials during the years 2005-2009 with 1.16 to 28.83 percent increase over check variety Sahiwal-2002 (4948 to 8554 kg/ha). On an average, new variety produced 7232 kg per hectare grain yield which is 13.71 percent higher than standard (6360 kg/ha).

Table 1. Yield performance of MMRI-Yellow in station (micro plot) yield trials.

Year/season	Grain yield (kg/ha)		LSD 5%	Increase over check (%)
	MMRI-Yellow	Sahiwal-2002		
2005-Spring	7520	6314	1182	19.10
Autumn	5973	5099	1193	17.14
2006-Spring	8258	6836	669	20.80
Autumn	5131	4948	1155	4.33
2007-Spring	7553	7161	730	5.47
Autumn	7258	7175	1029	1.16
2008-Spring	6610	5876	900	12.49
Autumn	6384	5760	1146	10.83
2009-Spring	11020	8554	878	28.83
Autumn	6610	5904	793	11.96
Average	7232	6360	-	13.71

On-farm (macro plot) yield trials

The results (Table 2) showed that new variety MMRI-Yellow performed better than standard variety at farmer's fields in macro plot yield trials conducted at different locations during the years 2002-2006.

Table 2. Yield performance of MMRI-Yellow in on farm yield trials.

Year/season	Number of locations	Grain yield (kg/ha)		Increase over check (%)
		MMRI-Yellow	Sahiwal-2002	
2002-Spring	5	5541	5276	5.02
Autumn	2	7198	7109	1.25
2003-Spring	5	5281	4611	14.53
Autumn	5	6402	6088	5.16
2004-Spring	9	5657	5300	6.73
Autumn	9	5568	4675	19.1
2005-Spring	10	6464	5975	8.18
Autumn	11	4537	4527	0.22
2006-Spring	11	6116	5966	2.51
Autumn	8	5042	4630	9.00
Average		5780	5416	6.72

The new variety MMRI-Yellow gave 1.25 to 19.1 percent higher average grain yield than check variety Sahiwal-2002. On overall average basis, grain yield of new variety was 6.72 percent higher (5780 kg/ha) as compared to check (5416 kg/ha).

National uniform yield trials

These trials were conducted consecutively for four seasons during 2008-2009 across the country. The data (Table 3) revealed that new variety MMRI-Yellow produced 6.7 to 18.1 percent higher average grain yield (6632 kg/ha) than check variety Sahiwal-2002 (5754 kg/ha). On overall average basis, new variety surpassed the check variety (5754 kg/ha) by 13.52 percent.

Table 3. Yield performance of MMRI-Yellow in national uniform yield trials.

Year/season	Number of locations	Grain yield (kg/ha)		Increase over check (%)
		MMRI-Yellow	Sahiwal-2002	
2008-Spring	6	7895	6684	18.12
Autumn	5	6112	5728	6.7
2009-Spring	5	6325	5196	21.73
Autumn	6	5794	5407	7.6
Average		6632	5754	13.52

The data (Table 4) further showed that on pooled average basis new variety exhibited 11.5 percent more grain yield (6515 kg/ha) over check (5843 kg/ha). These results are in close agreement to the findings of Russel (12).

Table 4. Yield performance of MMRI-Yellow (summarized data).

Name of trial	Number of trials	Grain yield (kg/ha)		Increase over check (%)
		MMRI-Yellow	Sahiwal-2002	
Station (Microplot)	10	7232	6360	13.71
Farmers (Macroplot)	75	5780	5416	6.72
National (Adaptation)	22	6532	5754	13.52
Pooled average		6515	5843	11.5

Reaction towards stalk rot

In pathological studies conducted during 2005-06 variety MMRI-Yellow was ranked as fairly resistant group.

Table 5. Evaluation of MMRI-Yellow for stalk rot resistance.

Year	Stalk rot(%)	Reaction
2005	2.04	Fairly resistant
2006	1.49	Resistant
Average	1.76	Fairly resistant

CONCLUSION

MMRI-Yellow is full season, yellow grain, high yielding and stalk rot resistant maize variety. Its plant is mid cob bearing, medium statured with semi-erect leaves and spreading type medium tassel. It takes 60 (autumn) to 75 (spring) days to flower and 100 (autumn) to 115 (spring) days to mature. Plant and cob height ranges from 190-210 cm and 95-105 cm, respectively. Number of leaves per plant varies from 14 to 16 and 1000-grain weight from 240 to 260g. Its average grain yield is 6600 kg per hectare against its potential of 8500 kg per hectare.

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