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Phule Maharshi-A Single Cross Maize Hybrid for Maharashtra

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Abstract

Phule Maharshi (QMH-1025), a single cross maize hybrid from public sector in Maharashtra is developed from the cross between QMI-1403 x QMI-1401 by hybridization technique. It is high yielding, orange yellow, semi-flint type, midlate maturing, resistant to Maydis leaf blight, Fusarium stalk rot, and moderately resistant to Turcicum leaf blight, Banded leaf & sheath blight and Charcoal rot. It is also resistant to Stem borer (*Chilo partellus* Sw.) in field condition. It is superior for crude protein and fibre, starch, Mn and Ca over the check Rajarshi and suitable for *Kharif* and *Rabi* season. In various states and varietal trials, the maize hybrid QMH-1025 consistently recorded best performance. During *Kharif* season, QMH-1025 recorded 7605 Kg ha^{-1} grain yield, which was 37.27 percent higher than Rajarshi (5540 Kg ha^{-1}) and 24.20 percent higher than the national check Bio.9637(6123 Kg ha^{-1}). In *Rabi* season, it recorded 8761 Kg ha^{-1} grain yield which was 19.60 percent and 29.45 percent higher than the checks Rajarshi (7326 Kg ha^{-1}) and Bio.9637 (6768 Kg ha^{-1}), respectively. Overall QMH-1025 recorded 27.20 percent higher yield (8183 Kg ha^{-1}) over the check Rajarshi (6433 Kg ha^{-1}) and 26.95 percent over the national check Bio.9637 (6446 Kg ha^{-1}) in *Kharif* and *Rabi* season. The maize hybrid is released under the name 'Phule Maharshi' for *Kharif* and *Rabi* season for Maharashtra State in 2016.

Key words : Maize hybrid, Phule Maharshi (QMH-1025), resistance, high yield, quality characters.

Maize is the third most important cereal crop in India after rice and wheat due to its multifarious uses in industrial, food, feed, fodder and seed crop. It occupies about 9.43 million hectares area having production of 24.35 million tones with an average productivity of more than 2.5 tonnes ha^{-1}, whereas in Maharashtra, the area, production and productivity was 9.47 lakh hectares, 31.24 lakh tones and 2.47 tonnes ha^{-1} respectively, during the year 2013-14.

To develop hybrid maize and to make the seed available in cheaper rate to the farmers, formal maize improvement programme has been concentrated almost exclusively in development of single cross hybrid maize.

Material and Methods

Single cross maize hybrid Phule Maharshi (QMH-1025) has been evolved from a cross of QMI-14.03 x QMI-1401 at All India Coordinated Maize Improvement Project, Kolhapur during the year 2010. Among the several crosses made amongst different inbred, a single cross QMH-1025 appeared to be most promising. It was therefore tested in station trial along with the local check Rajarshi and national check Bio.9637, at Kolhapur during *Kharif*-2011 as well as in *Rabi*-2011-2012. Looking into the promising performance, this hybrid was promoted to multilocation trials and tested at 5 locations under *Kharif* during the year 2012-2015. It was tested in inter university trial at Kolhapur, Parbhani, Aurangabad, Nagpur and Buldhana during 2012-2015. This hybrid was also tested in coordinated trial (Table 1) over 7

1. Ex-Maize Breeder, 2. Ex-Maize Breeder, 3. and 4. Sr. Res. Asstt., 5. Ex-Sr. Res. Asstt.

Table 1. Summary table showing grain yield potentiality of maize hybrid Phule Maharshi (QMH-1025)

Name of the experiment	Year	No. of locations	Grain yield q ha^{-1}				% Increase over checks		
			QMH-1025	Rajarshi (C)	Bio. 9637 (C)	Uday (C)	Rajarshi (C)	Bio. 9637 (C)	Uday (C)
***Kharif* season**									
Station trial	2011	01	58.95	44.43	43.92	-	31.50	34.22	-
MLT	2012-15	16	73.46	61.14	61.08	57.93	20.15	20.27	26.81
Inter University Trial(IUT)	2012-15	12	72.22	60.62	62.86	-	19.14	14.89	-
Coordinated trial	2014	7	99.58	-	77.04	-	-	29.26	-
Kharif Total /Average		36	76.05	55.40	61.23	57.93	37.27	24.20	31.28
***Rabi* season**									
Station trial	2011-12	01	82.30	78.01	65.70	-	5.50	25.27	-
Station trial	2012-13	01	92.92	68.50	69.65	-	35.65	33.41	-
Rabi Total /Average		02	87.61	73.26	67.68	-	19.60	29.45	-
Adaptive Trials (Mean of 30 Farmers field)		-	36.27	28.85	-	-	25.72	-	-

locations in zone IV (comprising of Arbhavi, Coimbatore, Hyderabad, Karimnagar, Kolhapur, Mandya and Vagarai) during 2014. The performance of this hybrid was consistently superior over the check Rajarshi for yield as well as resistance to Turcicum leaf blight and stem borer. It was therefore released for commercial cultivation under *Kharif* and *Rabi* season in Maharashtra in 2016 under the name 'Phule Maharshi'. The statistical analysis was carried out according to Panse and Sukhatme (1967).

Results and Discussion

Performance of QMH-1025 in different trials: In station trial during *Kharif*-2011 maize hybrid yield differences due to genotypes were significant. Maize hybrid QMH-1025 gave grain yield of 5895 Kg ha^{-1} (Table 1) which was 31.50 percent higher than the local check Rajarshi (4443 Kg ha^{-1}) and 34.22 percent higher than the national check Bio.9637(4392 Kg ha^{-1}). In multilocation trials, QMH-1025 recorded 20.15 percent and 20.27 percent higher grain yield (7346 Kg ha^{-1}) than the checks Rajarshi (6114 Kg ha^{-1}) and Bio.9637 (6108 Kg ha^{-1}), respectively. Whereas under inter university trial it gave 7222 Kg ha^{-1} grain yield which was 19.14 and

Table 2. Mean grain yield and stover yield of maize hybrid QMH-1025 as influenced by different nitrogen levels and spacing during 2015-16, Kolhapur

Treatments	Grain yield (q ha^{-1})	Stover yield (q ha^{-1})
Genotypes (4)		
QMH-1025	76.68	84.48
Rajarshi	60.91	68.83
Bio-9637	60.75	71.08
Uday	57.50	65.55
S.E.±	2.01	2.45
C.D. at 5%	7.90	9.62
C.V. %	13.35	14.34
Fertilizer levels (3)		
F_1 : 120:60:40 kg NPK ha^{-1}	59.46	67.17
F_2 : 150:75:50 kg NPK ha^{-1}	64.89	73.68
F_3 : 180:0:60 kg NPK ha^{-1}	67.52	76.60
S.E.±	0.92	1.09
C.D. at 5%	2.75	3.26
C.V. %	7.02	7.34
Spacing (2)		
S1 : 60 x 20 cm.	66.11	75.10
S2 : 75 x 20 cm.	61.81	69.86
S.E.±	0.67	0.84
C.D. at 5%	1.97	2.46
C.V. %	6.32	6.97
Interaction effect		

	S.E.±	C.D. at 5%	S.E.±	C.D. at 5%
Genotypes x Fertilizers	1.83	NS	2.17	NS
Genotypes x Spacings	1.35	NS	1.68	NS
Fertilizers x Spacings	1.17	NS	1.46	NS

14.89 percent higher than the checks Rajarshi(6062 Kg ha^{-1}) and Bio.9637 (6286 Kg ha^{-1}). Under coordinated trials QMH-1025 gave grain yield of 9958 Kg ha^{-1} which was 29.26 percent higher than the national check Bio.9637 (7704 Kg ha^{-1}). Under 30 adaptive trials conducted on farmers field QMH-1025 recorded 25.72 percent higher yield (3627 Kg ha^{-1}) than the check Rajarshi (2885 Kg ha^{-1}).

Under *Rabi* season, it gave grain yield of 8761 Kg ha^{-1} which was 19.60 and 29.45 percent higher than the checks Rajarshi (7326 Kg ha^{-1}) and Bio.9637 (6768 Kg ha^{-1}), respectively.

Pests and Diseases : Maize hybrid QMH-1025 was moderately resistant to stem borer under artificial infestation during *Kharif*-2013-

Table 3. Reaction of maize hybrid QMH-1025 against various diseases in Initial Varietal Trial (IVT), Trial No. -62 (medium maturity) during *Kharif* 2014

Entries	Maydis leaf blight (Score 1-5)		Turcium leaf blight score (1-5)		Banded leaf and sheath blight score (1-5)		C. Rot (1-9)		FSR (1-9)	
	Av. score	Reaction	Av. score	Reaction	Av. score	Reaction	Av. score	Reaction	Av. score	Reaction
QMH-1025	1.9	R	2.1	MR	2.8	MR	3.4	MR	1.9	R
PMH 4©	2.6	MR	2.9	MR	3.8	MS	3.7	MR	3.3	MR
HM 9©	3.1	MS	2.5	MR	4.1	S	5.2	MS	2.8	R
HM 10©	2.3	MR	2.5	MR	3.1	MS	3	R	1.9	R
BIO-9637©	1.9	R	2.3	MR	3.1	MS	3.3	MR	-	-
RES. ©	1.1	R	2.4	MR	1.7	R	2.4	R	-	-
SUS ©	4.2	S	4.4	S	4.3	S	6.3	MS	8.8	S

Rating scale :

MLB, TLB and BLSB

1. 0-2.0 : Resistant (R)
2. 1-3.0 : Moderately Resistant (MR)
3. 1-4.0 : Moderately Susceptible (MS)
4. 1-5.0 : Susceptible (S)

C. Rot and FSR

1. 0-3.0 : Resistant (R)
3. 1-5.0 : Moderately Resistant (MR)
5. 1-7.0 : Moderately Susceptible (MS)
7. 1-9.0 : Susceptible (S)

Table 4. Screening of maize hybrid QMH-1025 against stem borer (*Chilo partellus* Sw.) under Natural and Artificial infestation during Kharif 2013-15

Entry	Natural infestation						Artificial infestation					
	Kharif-2013		*Kharif*-2014		*Kharif*-2015		*Kharif*-2013		*Kharif*-2014		*Kharif*-2015	
	Mean LIR	Reaction	Mean LIR	Reaction	Mean LIR	Reaction	Mean LIR	Reaction	Mean LIR	Reaction	Mean LIR	Reaction
QMH-1025	1.60	R	2.7	R	2.10	R	3.10	MR	3.40	MR	4.20	MR
Rajarshi-(C)	1.80	R	2.8	R	2.30	R	4.05	MR	3.70	MR	3.60	MR
BIO -9637 (C)	1.50	R	3.0	R	1.90	R	4.40	MR	5.40	MR	5.60	MR

Scale :

i) 1.0-3.0 : Resistant (R)
ii) 3.1-6.0 : Moderately Resistant (MR)
iii) 6.1-9.0 : Susceptible (S

Rating :

1 = Apparently healthy plant
2 to 8 = Intermediate foliar injury
9 = Dead-heart (Complete failure of plant)

Table 5. Performance of maize hybrid QMH-1025 for quality parameters (Dry grain)

Content	QMH-1025	Rajarshi
Crude protein (g 100-1 gm)	12.21	8.50
Crude fibre (g 100-1 gm)	1.82	1.35
Starch (g 100-1 gm)	59.24	58.51
Iron ppm	51.33	60.50
Zn ppm	25.00	33.57
Mn ppm	38.16	36.50
Ca ppm	105.00	72.00

(Method used for analysis : AOAC, 2009)
The values are mean of three independent observations.
Source: Drpartment of Biochemistry, MPKV, Rahuri, Dist. Ahmednagar

2015; whereas it was found resistant under natural infestation (Table 4) This hybrid was found resistant to moderately resistant for diseases *viz*.; Maydis leaf blight, Fusarium stalk rot, Turcicum leaf blight, Banded leaf and sheath blight, and Charcoal rot during *Kharif* season (Table 3).

Quality Characters : In quality studies (dry grain basis) QMH-1025 was superior for Crude protein (12.21%), Crude fibre (1.82%), Starch (59.24 %), Mn (38.16 ppm), Ca (105.0 ppm) over the check Rajarshi (Crude protein-8.50%, Crude fibre-1.35%, Starch-58.51%, Mn-36.50 ppm, Ca-72.0 ppm) (Table 5).

This hybrid is of mid-late maturity duration (95-100 days), semi spreading in growth, medium bold size (25-30 g 100 seeds^{-1}, responsive to high fertilizer dose (180:90:60 N;P;K, Kg ha^{-1}) performing high yield (Table 2). Being a high yield potential and consistent resistance to Turcicum leaf blight and stem borer(Chilo partellus Sw.), the maize hybrid QMH-1025 was identified for release during 2016 for *Kharif* and *Rabi* season of Maharashtra for commercial cultivation to the farmers. (Anonymous,2016).

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