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PRI MUNG-2018 : A NEW MUNGBEAN VARIETY RELEASED IN PAKISTAN FOUND RESISTANT TO VIRAL DISEASES

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A B S T R A C T

A cross was made between Line No.1 and E-321 in 2002. The material was handled in filial generations following pedigree method from 2002-2018. It was tested in yield trials 2009-14 and was found high yielding as compared to check variety AZRI Mung-2006. In disease screening nurseries it had shown good disease resistance against Mung bean yellow mosaic virus, Urdbean Leaf Crinkle virus and Cercospora disease. It also exhibited tolerance to insect pests. In addition to this, proposed variety needs no special production technology package and fit in a better way in Rice-Wheat cropping system or between wheat and succeeding crop as catch crop due to short duration. The new variety PRI Mung-2018 is suitable for all areas of Punjab province.

Keywords: new variety, mung bean, PRI Mung-2018, Pakistan, yield.

INTRODUCTION

Mungbean (*Vigna radiata* (L.) R. Wilczek) is a legume cultivated for its edible seeds and sprouts across Asia. It is a major edible legume seed in Asia (India, South East-Asia and East Asia) and is also eaten in Southern Europe and in the Southern USA. Legumes like beans, peas, lentils and groundnut belongs to the family leguminosae/fabaceae and play important role in human nutrition because these are rich source of protein, calories, certain minerals and vitamins (Deshpande *et al,* 1992). Many recent studies have been conducted on the nutritional quality of *V. radiata* and *V. Mungo* (Blessing *et al*, 2010) and (Hussain *et al*, 2010). These studies suggested that these beans are good source of protein, carbohydrate and minerals (Suneja *et al*. 2011). Mung beans are cooked fresh or dry. They can be eaten whole or made into flour, soups, porridge, snacks, bread, noodles and ice-cream. Split seeds can be transformed into dhaal in the same way as black gram or lentils. Mung beans can be processed to make starch noodles (vermicelli, bean thread noodles, cellophane noodles) or soap.

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Mung bean is the major kharif pulse crop grown in Punjab on an area of 116.78 thousand hectare with a production of 78.46 thousand tons (Anonymous 2016-17). In Pakistan, the area under Mung bean cultivation over the last five years has been recorded to be between 130 to 140 thousand hectares with a production of 90 to 98 thousand tons. On National level, Punjab leads the Mung bean production with 87% share, Balochistan 6%, KPK 5% and Sindh 4%. Seed yield of Mung bean per acre is very low which is due to low varietal potential along with poor management practices.

Research activities on mungbean breeding carried out in this project resulted in the significant achievement regarding release of the variety SML 668 which is the first early-maturing and high-yielding variety found most suitable for cultivation in the present rice-wheat system of Indo-Gangetic plains (Brar *et al*. 2004).

Any disturbance in the metabolic processes caused by various biotic and abiotic stresses faced by the plant may reduce the actual yield. The severity of various stresses is

largely due to varying weather conditions that prevail year after year, thus lowering pulses yield at farmer's field and potential yield. The susceptibility to diseases is the major constraint causing low seed yield. Among the viral diseases, Mung bean yellow mosaic virus is very devastating in Pakistan especially in summer season. The disease is characterized by the appearance of yellow specks or spots on young leaves and the emerging trifoliate leaves manifest irregular yellow and green patches causing reduction in leaf size. In severe cases there is complete yellowing of leaves followed by stunted growth, few flowers and pods with shriveled seeds. Disease incidence ranges between 30-100% causing yield losses that range between 60-80%, depending upon the disease severity and the crop stage at which plants get infected. However, in naturally infected susceptible cultivars it varies with the time of infection and yield losses may reach up to 100% (complete crop failure).

MATERIALS AND METHODS

A cross between two parents Line No. 1 and E-321 was made at Pulses Research Institute, AARI, Faisalabad in kharif 2001. By following pedigree method material was handled in filial generations. This strain was tested in a series of trial on research stations and throughout the Mung bean growing areas of Punjab and it out yielded check variety AZRI-2006. In national uniform yield trial it surpassed the check variety NM-2011 and stood eighth position during kharif 2013, whereas in kharif 2014 it stood second position in NUYT. Its maximum yield potential of 2119kg/ha was achieved in NIAB in national uniform yield trial kharif 2014. The new strain possesses in-built moderate resistance against Mung bean yellow mosaic virus, Urdbean Leaf Crinkle virus and Cercospora disease. It also exhibited tolerance to insect pests. In addition to this, proposed variety needs no special production technology package and fit in a better way in Rice-Wheat cropping system or between wheat and succeeding crop as catch crop due to short duration. The new strain is suitable for all areas of Punjab province.

Detail of Hybridization and Selection

Year	Filial generation/trial	Operation
2002	Cross was attempted	F_0 seed was harvested
2003	F_1	Seed of F_1 cross harvested
2004	F_2	Single plant selection
2005	F_3	Single plant selection
2006	F_4	Single plant selection
2007	F_5	Single plant selection
2008	F_6	Superior Progeny line selected
2009	Preliminary Yield Trial	Yield Data
2010	Advanced Yield Trial	-
2011	Advanced Yield Trial	-
2012	Micro Yield Trial	-
2013	National Uniform Yield Trial	-
2014	National Uniform Yield Trial	-

RESULTS

Agronomic Studies: Planting date studies and fertilizer trials were conducted at Pulses Research Institute, Faisalabad during 2015-2016 to fix specific agronomic requirements of the candidate variety V-08009. It was observed that the new strain adheres to the existing production technology and needed no special treatments. The detail is as under:

Diseases and Insect Pests Reaction

Insect Pests: Insect Pest's infestation studies for whitefly, Jassid, Espanola bug and Pod borer were carried out during 2015-2016 at Pulses Research Institute, AARI, Faisalabad

Mungbean Yellow Mosaic Virus: The screening studies were carried out at Pulses Research Institute AARI, Faisalabad during 2015-2016. The candidate line V-08009 and check variety AZRI-06 was placed in moderate resistant (R) group.

Urdbean Leaf Crinkle Virus and Cercospora Leaf Spot Disease: The screening against ULCV and Cercospora was conducted at Pulses Research Institute AARI, Faisalabad during 2015-2016. . The candidate line V-08009 and check variety AZRI-06 was placed in moderate resistant (R) group.

The new strain V-08009 is also very much responsive to Rhizobial Inoculation. Number of nodules and yield increased significantly by inoculation of Rhizobial as compared to check AZRI-06.

Quality Characteristics: This new candidate line is suitable for table purpose both as whole as well as split (Dhaal).

Detail of Parental Material

Parent	Characteristics
Line No.1	Bold Seeded, Resistant to MYMD, High yielding
E-321	Short duration, Short stature

Parentage/Pedigree: Line No. 1 X E-321 MC1008-05-11-08-06-03-09

Species *Vigna radiata* L.

Planting Date 2015 (Yield kg/ha)

Sowing Date	V-08009	NM-11	AZRI-06
15 March	1018	1025	915
1st April	1130	1149	1042
15 April	1210	1135	978
1st May	1280	1025	894
15 May	1235	933	864
Average	1175	1053	939

Planting Date 2016 (Yield kg/ha)

Sowing date	V-08009	AZRI-06	NM-11
15 March	988	928	1164
1st April	1067	1026	1095
15 April	1124	960	1014
1st May	1320	928	996
15 May	1310	906	970
Average	1162	950	1048

Fertilizer Trial 2016

Fertilizer level N-P-K(kg/ha)	V-08009	AZRI-06 Yield (kg/ha)	NM-11 Yield (kg/ha)
T_1 0-0-0	994	854	992
T_2 12-30-0	1088	926	1006
T_3 24-60-0	1236	1178	1278
T_4 36-90-0	1240	1250	1217
Average	1140	1052	1124

Insect Pests: Insect Pest's infestation studies for whitefly, Jassid, Espanola bug and Pod borer were carried out during 2015-2016 at Pulses Research Institute, AARI, Faisalabad. The data collected is as under:

Sr. No.	Line/ Variety	Whitefly Avg. pop./ leaf	Jassid Avg. pop./ leaf	Pod Borer Avg. infes. % age	Espanola Bug Avg. Pop./ plant	Avg. grain yield kg/ha
1	V-08009	2.40	1.20	2.60	4.80	865
2	AZRI-06	2.00	0.80	2.20	4.20	850

Diseases

Sr. No.	Variety	Mung bean yellow mosaic virus	Urdbean leaf crinkle virus	Cercospora disease
1	PRI Mung-2018	Moderately resistant	Moderately resistant	Moderately resistant

Bacteriological Studies

Rhizobial Inoculation	No. of Nodules			
	2015		2016	
	V-08009	AZRI-06	V-08009	AZRI-06
Un-inoculation	15	16	14	14
Inoculation	24	22	26	23
	Yield kg/ha			
Uninoculation	987	870	1011	843
Inoculation	1134	954	1195	958
% +/- Increase	14.89	9.65	18.19	13.6

Characteristics	PRI MUNG-2018	AZRI Mung-2006
Plant traits		
Growth habit	Semi Erect	Erect
Plant height (cm)	45-55	40-50
Canopy spread	Narrow	Medium
Stem color	Light green	Light green
Primary branches	1-2	1-2
Secondary branches	3-5	4-6
Maturity duration	Short	Medium
Leaf characteristics		
Leaf color	Green	Green
No. of leaflets	3	3
Leaflet size	Medium	Medium
Leaf hairiness	Present	Present
Flower characteristics		
Days to flowering (50%)	35-40	40-45
Flower color	Greenish yellow	Greenish yellow
Flower size	Medium	Medium
Days to maturity	60-70	70-80
Pod characteristics		
Pod size	Medium to large	Medium
Pods / plant	13-20	12-16
Seeds / pod	7-12	7-11
Seed characteristics		
Seed color	Light green	Light green
Seed shape	Oval	Oval
Seed size	Medium to Bold	Medium
100 seed weight (g)	5.60	5.20
Distinguishing characteristics	Short duration variety fit in Rice-Wheat cropping system or between wheat and succeeding kharif crop as a catch crop	

DISCUSSION

Advance line V-08009 is a high yielding, early maturing and moderately resistant strain for MYMD and ULCD. Its yield performance remained very good throughout the evaluation studies. It produced an overall 19.3 % higher grain yield over check variety AZRI-M-2006. The new strain V-08009 Produced 14.6 % and 50.4 higher grain yield than the check variety in Preliminary & Advanced yield trials, respectively conducted in two different environments. It consistently surpassed the check with 37.2 % higher grain in Micro yield trial conducted at two locations. The purposed variety PRI-2018 out yielded check varieties in National uniform yield trials by 9.2 % and 1.47 % increase in grain yield in 2013 and 2014 respectively. It ranked 8th in 2013 and 2nd in 2014 in National uniform yield trial. Its potential yield of 2119 kg/ha achieved in 2014 at NIAB Faisalabad. On over all bases, in all the trials, it produced 19.3 % higher yield than check varieties. The advance line V-08009 was tested by FSC & RD in DUS trials for two years during 2014-2015.

Detail of yield performance is given in the below in Table 1.

An advance line with a yield potential of 2119 kg/ha and average yield of 962 kg/ha , One of its character is it is short duration as compared to existing varieties, fit for Mungbean catch crop in Rice-Wheat cropping system or between Wheat and succeeding kharif crop. It produced an overall 19.25% yield higher than the check variety AZRI-06 .An advance line with medium seed size and attractive shape and color. It is also suitable for mechanical harvesting as pod bears at the top of plant.

Table 1. Yield performance of Advance Line V-08009 in different yield trials

Trial	Year	V-08009 Yield kg/ha	AZRI-06	% +/- Increase
Preliminary Yield Trial	2009	955	833	14.6
Advance Yield Trial	2010	833	810	2.83
Advance Yield Trial	2011	1207	802	50.4
Micro Yield Trial	2012	956	696	37.2
National Uniform Yield Trial	2013	887	812 (NM-11)	9.20
National Uniform Yield Trial	2014	962	948	1.47
	Average	967	816	19.3

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REFERENCES

GOP. 2016-17. Economic Survey of Pakistan, Finance Division, Economic Advisor's Wing, Islamabad.

Brar, J., T. Bains, S. Shanmugasundaram and S. Singh. 2004. Developing short duration mungbean genotypes suitable for rice-wheat cropping system. Improving Income and Nutrition by Incorporating Mungbean in Cereal Fallows in the Indo-Gangetic Plains of South Asia DFID Mungbean Project for 2002–2004: 61.

Deshpande, S. S. 1992. Food legumes in human nutrition: A personal perspective. Critical Reviews in Food Science and Nutrition, 32: 333-363.

Hussain, I., M. Burhanuddin and, M. K. J. Bhuiyan. 2010. Evaluation of physiochemical Level of nutritional constituents and anti-nutritional factors in black gram *Vigna mungo* L. Food Res. Int, 44: 621-628.

Suneja, Y., S. Kaur, A. K. Gupta and N. Kaur. 2011. Levels of nutritional constituents and anti-nutritional factors in black gram *Vigna mungo* L. Hepper. Food Research International, 44: 621-628.