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GAM 8: A New High yielding MYMV Virus Resistant Variety for Middle Gujarat

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ABSTRACT: In middle Gujarat, Mungbam Yellow Mosaic Virus (MYMV) disease was a major destructive disease observed in summer season and it serious and open spread ultimately heavy loss in yield. A new high yielding MYMV resistant Mungbean variety GAM 8 is developed through pedigree method of cross between Meha × GM 4 at RRS, AAU, Anand and tested as ANDGG 1301 in trial and was tested 20 times in different trials. ANDGG 1301 recorded average yield over seasons and locations is 1106 kg/ha which is 46.4, 6.5, 18.9 and 14.3 per cent yield increase over the check varieties *viz.*, GM 4, Meha, GAM 5 & GM 6, respectively in state trials. It was recorded 1171 kg/ha seed yield which was 46.4, 6.5, 18.9 and 14.3 per cent higher over GM 4, Meha, GAM 5 & GM 6, respectively under middle Gujarat trials. The proposed genotype ANDGG 1301 has semi erect plant type, medium maturity, more branches and pod, dark green leaf with purple vein, medium-sized, shining green seeds. It has high protein content and resistant to MYMV, LCV (%), anthracnose and powdery mildew disease. This variety is notified for Gujarat with notification number SO.4065E dated 31-8-2012.

Keywords: GAM 8, Mungbean, MYMV, Summer, Yield.

INTRODUCTION

Mungbean (*Vigna radiata* L. wilczek) is an important short duration pulse crop of Gujarat. It is mainly grown during the summer and *kharif* seasons. It is grown over an area of around 1.34 lakh hectares, producing 1.04 lakh tonnes at a productivity of 771 kg/ha (State Production Data, DAG, 2019-20). Due to summer mungbean's higher productivity than during the kharif season its area increased. Due of guaranteed irrigation and a high market price that produced more profit in short time, farmers chose to raise summer mungbean. A specific class of consumer preference is small seeded variety as it looks like *Desi*.

Sustainable mungbean production is continuously challenged by biotic and abiotic stresses that take a heavy toll of the crop and mainly diseases could cause an estimated yield loss of 21.93 to 68.77%. Globally, Mungbean Yellow Vain Mosaic Virus (MYMV) disease remains a major constraint of mungbean production, and management of this deadly disease is still the biggest challenge (Mishra *et al*., 2020; Rao *et al*., 2021). This disease is spread by whiteflies, and as the population of white flies in middle Gujarat exceeds the threshold level during the summer, so MYMV disease was a major destructive disease observed. This disease is critical, serious and open spread which leads to a heavy yield loss. Seeds become discoloration and size is reduced. In nutshell this variety is best suited for such conditions.

At the Regional Research Station AAU, Anand, an effort was made in response to the need for a medium bold seeded, medium mature group with MYMV resistance and high yield potential, and a cross between Meha and GM 4 was attempted. This genotype was developed through pedigree method. ANDGG 1301, a medium-maturing, compact, branching, bunchy pod-bearing entry that is MYMV resistant, was examined over the course of seven summers seasons in seven distinct experiments at 20 different locations.

Looking to its high yield potential with MYMV resistant and good quality, ANDGG 1301 (GAM 8) will be liked by farmers and consumers.

MATERIALS AND METHODS

ANDGG 1301 was derived through pedigree selection method. It is progeny of cross made between Meha × GM 4. Meha has a high yield, more branches and pods, and is resistant to MYMV but small seed, whereas GM4 has a high yield, bold seed, fewer branches, and is vulnerable to MYMV. Although GM 4 is a very good variety, farmers of middle Gujarat did not grow in the summer because of its susceptibility to MYMV. Therefore, in order to create a high yielding, MYMV resistant variety, these parents were used in a crossing programme. The F_1 was selfed and selection were made from segregating population i.e. F_2 to F_5. High yielding, more number of branches and pods, MYMV resistant are main selection criteria. In F_5 generation it was observed phynotypically similar than it was bulked as ANDGG 1301. This line was maintained by progeny row approach at Regional Research Station, AAU, Anand, Gujarat. This entry was tested in a replicated preliminary evaluation trial with one check Meha, in

the summer of 2014 at Anand with a plot size of 0.9 × 4.0 m. (2 rows). The same trial also carried out in Vadodara during summer 2015 with two checks GM 4 and GAM 5. Based upon yield superiority and MYMV resistant this entry was promoted in multi-location state varietal trial *i.e* SSVT during summer 2015 and 2016 along with check varieties GM 4, Meha, and GAM 5. Due to its good performance, it was advanced to a multi-location LSVT during summer of 2017 with the same checks. The plot size in SSVT and LSVT was 3.6 × 4.0 m (8 rows) and 3.6 × 4.0 m (8 rows), respectively. This genotype was also tested in replicated Zonal Varietal Trial I and II in middle Gujarat locations during summer 2018 and 2019 with plot size of 1.8 × 4.0 m (4 rows) and 3.6 × 4.0 m (8 rows), respectively. All the trials were conducted under irrigated conditions. To grow a high-quality crop, recommended agronomical procedures were used. Yield potential and ancillary observations with respect to yield traits of ANDGG 1301 and the checks were recorded as per standard guidelines. Observations were recorded on quantitative characters *viz*., plant height (cm), days to 50% flowering, days to maturity, number of branches, number of pods per plant, number of seeds per pod, pod length, seed yield and 100-seed weight (g). The data were analysed as per the RBD analysis given by Panse and Sukhatme (1985). Biochemical analysis *viz.*, Moisture (%), Protein (%), Total soluble sugar (%), Chlorophyll (mg/g fresh weight), Phenol (%), Flavanoids (%), Total antioxidant activity (%) and Oil (%) were carried our as per standard protocol at Department of Biochemistry , B.A. College of Agriculture, AAU, Anand.

From 2014 to 2019 the culture undergone station and state trials for MYMV screening. According to IIPR, Kanpur standard operating procedure, this genotype was additionally screened in AICRP trials throughout summer 2021 for yield, MYMV, anthracnose, cercospora leaf spot, web blight, ULCV, LCV as well as pest such aphid, jassid, thrips, and whiteflies.

Based on MYMV, anthracnose, cercospora leaf spot, web blight score, the genotype disease reaction score ≤3 classified as resistant, for ULCV, LCV and root rot, resistant reaction with disease incidence ≤ 10%, For powdery mildew score ≤ 2 indicate resistant reaction. Observations on incidence of sucking pests (aphid, jassid, thrips, and whitefly) were recorded from five randomly selected plants. The data on sucking pest were recorded on three leaves, representing top, middle and lower canopy of each entry. Pod borer damage % were recorded from five randomly selected plants and then per cent capsule damage was computed. The DNA fingerprinting of variety ANDGG 1301 along with check varieties *i.e*. GM 4, GAM 5, GM 6, GM 7 and Meha were done using SRAP primers. An interesting modified marker technology termed as Sequence-Related Amplified Polymorphism (SRAP) (Li and Quiros 2001) was used for DNA fingerprinting which is similar to RAPD, but it was a preferential random amplification of coding regions in genome are being applied extensively in genetic diversity analysis (Lin *et al*., 2004) and comparative genetics (Li *et al*., 2003) of different species.

RESULTS AND DISCUSSION

In middle Gujarat, summer season is suitable for famers to cultivate mungbean. Looking to the requirements, In Gujarat, ANDGG 1301 was tested 20 times and the average performance over seasons and locations is 1106 kg/ha which is 46.4, 6.5, 18.9 and 14.3 per cent higher than checks *viz.*, GM 4, Meha, GAM 5 & GM 6, respectively (Table 1), whereas in middle Gujarat, the culture ANDGG 1301 gave 1171 kg/ha with 86.6, 18.2, 18.9 and 14.3 per cent yield increase over the check varieties *viz.*, GM 4, Meha, GAM 5 & GM 6, respectively (Table 2). Out of 13 trials in middle Gujarat, this entry 8 times ranked first. In central zone, AICRP IVT trial, this genotype gave 1398 kg/ha. Yield which was 27.90 and 22.20 per cent higher than check IPM-02-3 and Virat, respectively in AICRP coordinated trial (Table 3). Its yield performance remained very good throughout the evaluation studies indicating it will produced better performance in farmers field.

Compared to the checks *viz*., GM 4, Meha, GAM 5, GM 6, and GM 7, ANDGG 1301 was taller (49.64 cm), had more branches per plant (3.63) which produced more pods per plant (32.27). Other yield attributing characters of this entry involves seeds per pod (8-10), pod length (6.7-8.8 cm), 100-seed weight (3.3-4.2 g) (Table 4). Important physio-morphological characteristics that set this variety apart from others include the presence of anthocyanin coloration at the hypocotyls, a semi-erect growth habit, green petioles with purple splashes, dark green leaves with purple vein colour, straight black colour pods, and medium, shiny, drum-shaped seeds (Table 5 and Annexure I). Unique morphological identity will be considered as a varietal marker in the seed production chain to maintain the genetic purity of the variety (Tasphiya *et al*., 2022).

The newly developed mungbean culture ANDGG 1301 (GAM 8) has highest protein (25.86%) and total soluble sugar content (7.06%) than the check varieties, and other parameter are comparable with checks (Table 6). The increase in protein content of seed was might be due to efficient and effective working of N fixing bacteria, ultimately it results into more nitrogen absorption by plant. It led to more protein synthesis in plant and its accumulated in seed (Patel *et al.,* 2020). Other crucial quality indicators for this variety are phenol (%), flavanoids (%) and overall antioxidant activity (%). The size of the seed is medium, allowing it to be consumed whole, and it has excellent cooking qualities, including greater water absorption and fewer hard seeds. This new variety is suitable for table purpose as whole.

Screening mungbean germplasm against MYMV disease under natural condition is the first step in identifying the resistant donors for evolving the mungbean varieties with MYMV resistance and Yield (Mohan *et al*., 2014). Middle Gujarat consider as hot spot for MYMV disease and this disease appear more in summer as compared to *kharif* season. This variety was tested for MYMV disease under natural field condition.

When compared to GM 4, which had up to 100% MYMV disease from summer 2016 to summer 2019, ANDGG 1301 culture had a maximum of 5.00 percent (grade 2), indicating a resistance reaction to MYMV disease (Table 7). This entry and checks were moderately resistant to powdery mildew in state level trial. In AICRP trial, this entry noted resistant reaction against Leaf curl virus (LCV) (%), anthracnose and powdery mildew diseases whereas for MYMY disease, it showed the resistant reaction on all the location except Lam and Berhampur (Table 8). This might be due to different races prevailing in that respective location. Similar results were observed for ULCV (%) and Cercospora leaf spot as it indicates resistant reaction in all the locations except Berhampur. In general, the infestation of whitefly, thrips, aphid, jassid and pod borer damage comparable with check varieties in state trials (Table 9). The thrips, whitefly infestation was found lower or comparable with check entries at all the locations of AICRP trial. Similar trends were also observed for pod damage (%) (Table 10).

DNA fingerprinting carried out for ANDGG 1301 along with varieties *i.e*., GM 4, Meha, GAM 5, GM 6 and GM 7 using SRAP markers. The variety differentiated by using two polymorphic markers *i.e*., SRAP 53 (SRAP PM18+ SRAP SA18), SRAP 10 (SRAP Me2 + SRAP eM4). The results indicate ANDGG 1301 is genetically distinct from check varieties (Fig. 1).

Table 1: Yield performance of Mungbean entry ANDGG 1301 (GAM 8) in comparison to check varieties in the Gujarat.

Sr. No.	Season/ Year	Name of Trials	Number of trials / location	Seed Yield (kg/ha)					
				ANDGG 1301	GM 4	Meha	GAM 5	GM 6	GM 7
1.	S-2014	PET	1	1512	-	1029	-	-	-
2.	S-2015	PET	1	1267	935	-	1128	-	-
3.	S-2015	SSVT	1	790	632	1285	-	-	-
4.	S-2016	SSVT	5	1052	861	1086	827	-	-
5.	S-2017	LSVT	5	1106	763	1081	804	-	-
6.	S-2018	ZVT	4	988	549	795	871	-	-
7.	S-2019	ZVT	3	1270	734	1089	1096	1111	1293
Overall Mean			**(20)**	1106	-	-	-	-	-
Overall Mean			**(19)**	1085	741	-	-	-	-
Overall Mean			**(19)**	1098		1031	-	-	-
Overall Mean			**(11)**	1120	-	-	942	-	-
Overall Mean			**(3)**	1270	-	-	-	1111	1293
Per cent yield increase					**46.4**	**6.5**	**18.9**	**14.3**	-
No. of top ranking				**10/20**	**0/19**	**0/19**	**0/11**	**0/3**	**1/3**

Table 2: Yield performance of Mungbean entry ANDGG 1301 (GAM 8) in comparison with checks in the middle Gujarat.

Sr. No.	Season/ Year	Name of Trials	Number of trials / location	Seed Yield (kg/ha)					
				ANDGG 1301	GM 4	Meha	GAM 5	GM 6	GM 7
1.	S-2014	PET	1	1512	-	1029	-	-	-
2.	S-2015	PET	1	1267	935	-	1128	-	-
3.	S-2016	SSVT	2	1126	584	1084	827	-	-
4.	S-2017	LSVT	2	1213	427	1084	804	-	-
5.	S-2018	ZVT	4	988	549	795	871	-	-
6.	S-2019	ZVT	3	1270	734	1089	1096	1111	1293
Overall Mean			(13)	**1171**	-	-	-	-	-
Overall Mean			(12)	**1142**	**613**	-	-	-	-
Overall Mean			(12)	**1163**	-	**984**	-	-	-
Overall Mean			(11)	**1120**	-	-	**942**	-	-
Overall Mean			(3)	**1270**	-	-	-	**1111**	**1293**
Overall % increase over the checks					**86.6**	**18.2**	**18.9**	**14.3**	-
Freq. in top non-significant groups				**11/13**	**0/12**	**3/12**	**1/11**	**0/3**	**3/3**
No. of top ranking				**8/13**	**0/12**	**0/12**	**0/11**	**0/3**	**1/3**

Table 3: Yield performance of Mungbean entry ANDGG 1301 (GAM 8) in comparison with checks in IVT trial in Central zone.

Sr. No.	Number location	Seed Yield (kg/ha)				
	Central Zone	ANDGG 1301	IPM 02-3 (C)	Virat (C)	Pusa 9531 (C)	IPM 410-3(C)
1	3	1398	1093	1144	1493	1577
	% increase over	-	27.90	22.20	-	-

Table 4: Ancillary observations of economic attributes of Mungbean entry ANDGG 1301 along with checks.

Sr. No.	Characters	ANDGG 1301	GM 4	Meha	GAM 5	GM 6	GM 7
1.	Days to 50 % flowering	43.61	41.58	43.51	41.72	42.70	40.80
		(37-48)	(33-48)	(37-49)	(34-54)	(42-45)	(38-43)
2.	Days to maturity	69.87	67.59	70.44	63.52	64.77	67.67
		(65-75)	(62-70)	(64-77)	(58-67)	(62-70)	(64-70)
3.	Plant height (cm)	49.64	41.20	42.89	41.06	40.77	41.83
		(39-58)	(27-55)	(31-49)	(28-55)	(36-45)	(34-46)
4.	Number of branches per plant	3.63	2.90	3.57	2.60	2.55	2.65
		(2.9-4.6)	(2.0-3.55)	(2.1-5.0)	(2.3-3.0)	(2.1-3.0)	(2.3-3.0)
5.	Number of pods per plant	32.27	24.54	29.18	26.81	22.03	27.67
		(18-47)	(17-40)	(19-40)	(15-44)	(18-25)	(25-33)
6.	Number of seeds per pod	9.68	9.60	9.83	10.18	8.83	9.40
		(8.9-10.7)	(8.6-10.2)	(9.4-10.0)	(9.0-11.1)	(9.2-10.9)	(10.5-10.7)
7.	Pod length (cm)	7.25	7.36	6.77	7.67	8.80	8.63
		(6.7-8.8)	(6.6-8.4)	(6.1-7.5)	(6.9-8.5)	(8.2-9.5)	(8.0-9.5)
8.	Seed size (100 seed weight gm)	3.66	4.64	3.57	5.16	5.60	5.00
		(3.3-4.2)	(4.1-5.3)	(3.4-3.8)	(4.2-5.3)	(5.5-5.7)	(4.7-5.3)

Table 5: Morphological characters of ANDGG 1301 (GAM 8) (As per DUS Guidelines).

Sr. No.	Character		ANDGG 1301
1.	Hypocotyl: Anthocyanin colouration	:	**Present**
2.	Time of flowering	:	Medium
3.	Plant: Growth habit	:	Semi-erect
4.	Plant: habit	:	Determinate
5.	Stem: Colour	:	Green
6.	Stem: Pubescence	:	Present
7.	Leaf: Colour	:	**Dark Green**
8.	Leaf: Vein colour	:	**Purple**
9.	Petiole: Colour	:	**Green with purple splashes**
10.	Leaf: size (at 5th node from the base)	:	Small
11.	Flower: Colour of petal (standard)	:	Yellow
12.	Pod: Colour of premature pod	:	Green
13.	Pod: Pubescence	:	Present
14.	Pod: Position	:	Above canopy
15.	Pod: Colour	:	**Black**
16.	Pod: Curvature of mature pod	:	**Straight (slightly curved at pod end)**
17.	Pod: Length (mature pod)	:	Short
18.	Seed: Colour	:	Green
19.	Seed: Lusture	:	**Shiny**
20.	Seed: Shape	:	**Drum**
21.	Seed: Size (weight of 100 seeds)	:	**Medium**

Table 6: Bio-chemical parameters of ANDGG 1301(GAM 8) along with checks.

Sr. No.	Character	ANDGG 1301	GM 4	Meha	GAM 5	GM 6	GM 7
1.	Protein (%)	25.86	23.87	24.94	24.09	23.65	24.12
2.	Total soluble sugar (%)	7.06	6.49	6.97	6.62	6.12	6.43
3.	Phenol (%)	0.231	0.237	0.270	0.235	0.211	0.226
4.	Flavanoids (%)	0.207	0.185	0.156	0.210	0.193	0.148
5.	Total antioxidant activity (%)	0.257	0.185	0.267	0.254	0.238	0.244
6.	Oil (%)	1.35	1.34	1.41	1.15	1.36	0.98

Table 7: Reaction of mungbean GAM 8 (ANDGG 1301) against Mungbean Yellow Mosaic Virus disease in state trial.

Season/ Year	Number of trials	ANDGG 1301	GM 4	Meha	GAM 5	GM 6	GM 7
Summer 2016	2	2.55-3.68	8.56-98.46	3.60-6.55	1.11-4.56	-	-
Summer 2017	2	2.30-2.33	5.67-93.83	1.61-1.67	0.00-0.62	-	-
Summer 2018	6	0.25-5.00	12.08-100	0.00-8.80	0.00-3.30	0.00-1.96	0.53-3.28
Mean Range		**0.25-5.00**	**5.67-100**	**0.00-8.80**	**0.00-4.56**	**0.00-1.96**	**0.53-3.28**
Reaction Grade		**2**	**9**	**3**	**2**	**2**	**2**

Table 8: Reaction of mungbean ANDGG 1301 (GAM 8) against major diseases in IVT during Summer 2021.

Entry	Ldh	Lam	Adu	Ber	Ayo	Kot	Vam	Shil	HiS	Skn
MYMV(1-9)	3	9	0	4	1	0	3	1	2	1
ULCV(%)	-	3	1	11.5	-	-	5	-	2	1
LCV (%)	-	7	-	-	-	-	-	-	-	-
Anthracnose (1-9)	-	-	-	-	-	-	-	3	-	1
Cercospora leaf spot (1-9)	-	0	-	6	-	-	-	3	-	-
Powdery Mildew (0-5)	-	0	-	-	-	-	-	-	-	-

Lam, Berhampur(Ber), SK Nagar(SKN), Kota(Kot), Aduthurai(Adu), Vamban(Vam), Ayodhya(Ayo), Dholi(Dho), Ludhiana (Ldh) and Shilangoni (Shil)

Table 9: Incidence of insect-pests of ANDGG 1301 (GAM 8) along with the checks at Anand & Vadodara during 2017 to 2019.

Insect-Pest	Genotypes/Varieties			
	ANDGG 1301	GM 4	Meha	GAM 5
Aphid/ plant	1.02-2.53	1.34-2.93	1.27-2.07	1.15-2.00
Whitefly/ plant	1.57-5.73	2.05-8.07	1.75-4.33	1.62-4.00
Jassid / Plant	0.21-1.95	0.04-2.34	0.21-2.33	0.15-2.08
Thrips/ 5 flower	1.35-2.85	1.34-3.94	1.40-3.79	1.15-2.65
Pod Borer damage (%)	6.67-14.33	9.50-18.67	9.50-12.00	10.00-12.67

*Range is given for three years data 2017, 2018 & 2019

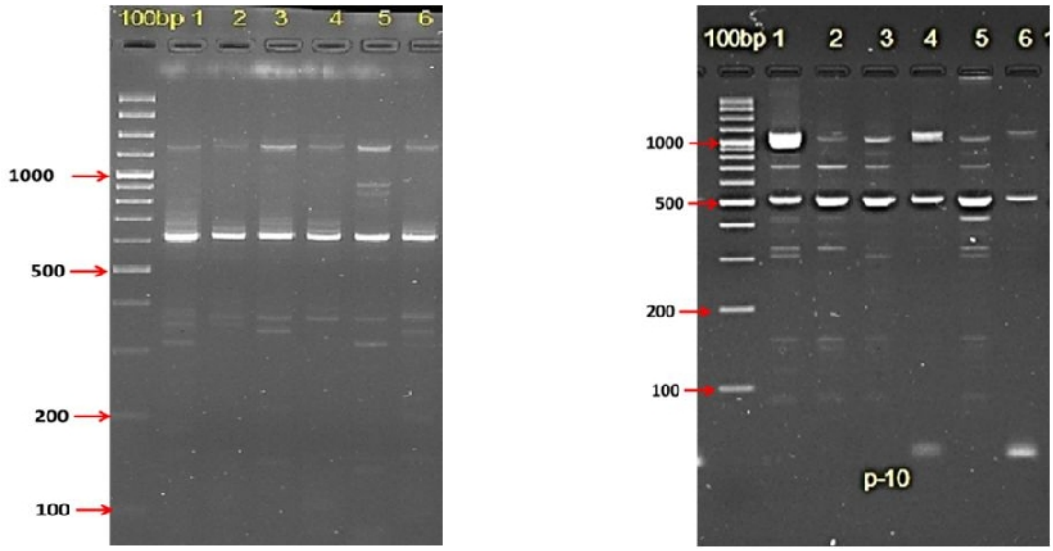
Table 10: Screening of ANDGG 1301 and check entries against thrips, whitefly, pod damage (%) due to pod borer, pod bug and mruca infesting mungbean in AICRP trial.

Entries		Mean number of thrips/10flower					
	Var	Moh	Dho	Ran	Pnr	Ldh	Lam
ANDGG1301	1.80	8.5	2.45	5.4(2.52)	2.33 (1.68)	7.00 (2.82)	5.33
PantMung2	2.75	4.5	3.02	4.53 (2.34)	2.67 (1.74)	5.50 (2.55)	6.33
HUM16 (c)	2.24	-	-	-	-	-	-
IPM99-125(c)		1.5	-	-	-	-	-
SML 668(c)			7.45	9.56 (17.97)	-	-	-
PantM 2(c)				5.3(2.51)	2.53 (1.74	-	-
SML1827(c)						4.50 (2.34)	

Entries	Mean number of whitefly/trifoliate							
	Ran	Var	Dho	Pnr	Lam	Vam	Ber	Skn
ANDGG 1301	18.0 (4.35)	1.50	3.67	1.23 (1.30)	9.33	3.1	1.84	4.00
Pant Mung 2 (c)	18.6 (4.37)	1.17	4.12	1.90 (1.51)	8.33	3.6	2.67	3.00
SML 668 (c)	14.6 (3.94)	-	8.90	-	-	-	-	-
HUM 16 (c)	0.89	-	-	-	-	-	-	-
VBN(Gg)-2(c)	-	-	-	-	-	5.4	-	-
ML-613 (c)	-	-	-	-	-	5.8	-	-
LGG-460 (c)	-	-	-	-	-	-	2.21	-
OBGG-52 (c)	-	-	-	-	-	-	2.38	-

Entries	Podborer (Poddamage%)							Podbug			Maruca
	Moh	Ran	Var	Shil	Dho	Skn	Ber	Pnr (Bug/ plant)	Vam	Shil	Vam
									(Poddamage %)		
ANDGG1301	21.45	10.93 (19.29)	3.33	19.08 (26.53)	8.05	10.13	0.0	0.64 (1.02)	19.6	8.52 (15.73)	21.60
PantMung2 (C)	18.97	10.16 (18.57)	3.33	3.30 (11.08)	17.26	9.63	11.11	0.47 (0.97)	15.6	2.74 (9.78)	23.00
IPM99-125 (C)	4.37	-	-	-	-	-	-	-	-	-	-
SML668 (C)	-	9.56 (17.97)	-	16.81 (23.68)	26.26	-	-	-	-	21.69 (27.36)	-
HUM16 (C)	-	-	16.67	-	-	-	-	-	-	-	-
MH-721 (C)	-	-	-	6.15 (14.58)	-	-	-	-	-	4.79 (12.37)	-
LGG-460 (C)	-	-	-	-	-	-	29.49	-	-	-	-
OBGG52 (C)	-	-	-	-	-	-	14.58	-	-	-	-
VBN(Gg)- 2C)	-	-	-	-	-	-	-	-	25.0	-	24.6
ML-613 (C)	-	-	-	-	-	-	-	-	26.6	-	26.0

Var: Varanasi, Moh: Mohanpur, Dho: Dholi, Ran: Ranchi, Pnr: Pantnagar, Lud: Ludhiana, Vam: Vamban, Ber: Berhampur, Skn: SK Nagar, Shil: Shilangoni,



M(Marker): 100 bp plus ladder
SRAP 53 (SRAP PM18+ SRAP SA18)

M(Marker): 100 bp plus ladder
Primer SRAP 10 (SRAP Me2 + SRAP eM4)

Lane No. 1: GM 4 Lane No. 2: GAM 5 Lane No. 3: GM 6
Lane No. 4: GM 7 Lane No. 5: Meha Lane No. 6: ANDGG 1301

Fig. 1. DNA fingerprinting report of mungbean variety ANDGG 1301 (GAM 8) using SRAP marker.

ANNEXURE-I

Photograph of Mungbean genotype ANDGG 1301 (GAM 8)

Field view of ANDGG 1301

Green pod view

Matured pod view

Seeds

Mature plant

CONCLUSION

High yielding ANDGG 1301 has a determinate growth habit, matures in 65–75 days (medium group), and has medium-sized, shining green seeds. It has high protein content and resistant to MYMV disease. Looking at the above characters, Gujarat Anand Mungbean 8 (GAM8: Haramoti) has been released by the Central Sub-Committee on Crop Standards for farmers in middle Gujarat during the summer season. Notification and Release of Variety vide notification number SO.4065E dated 31-8-2012.

FUTURE SCOPE

Mungbean is a best suitable crop for summer cultivation under irrigated conditions. MYMV is major constrains in summer cultivation which effect on low crop yield. To increase pulse production with productivity of pulses research work focused on virus resistance variety. In this context the present variety will help the framers to grow this variety in MYMV affected areas and breeder can utilize this variety as parent in crop improvement programme.

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