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Research Article

High yielding multiple blooming and leaf crinckle virus resistant greengram variety : VBN 4

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Abstract
Greengram variety VBN 4 is derived from PDM 139 x BB 2664. The average yield of VBN 4 is 1024kg/ha . It is 16.8 and 21.3 per cent yield increase over VBN (Gg) 3 and CO 8, respectively. It matures in 65 – 70 days. It recorded seed yield of 1251kg/ha under irrigated condition. It is 27.5 and 31.2 per cent increase over VBN (Gg)3 and CO 8, respectively. In rainfed condition, this variety recorded seed yield of 936kg/ha. It is 12.0 and 15.7 per cent increase over VBN (Gg) 3 and CO 8, respectively. Special traits of this variety are multi bloom, non-shattering type, moderate resistance to Mung bean Yellow Mosaic Virus and powdery mildew diseases and resistance to urd bean leaf crinkle virus disease. It is suitable for cultivation in Adi, Puratasi, Markazhi/Thai and chithirai pattam in Tamil Nadu.

Key words
Greengram, VBN 4, seed yield, multi bloom.

INTRODUCTION

Greengram [*Vigna radiata* L. Wilczek] is an important short duration grain legume. It is widely grown in South and Southeast Asia. Over 80 per cent of greengram is produced in South Asia. It is grown in crop rotation and relay cropping with cereals using residual moisture in the soil. In Tamil Nadu, it is cultivated in an area of 1.66lha with a production of 0.56 l tand productivity of 338kg/ha (MULLaRP, 2016-17). Mung bean Yellow Mosaic Virus (MYMV) disease is a serious disease in greengram. It is one of the main factors for decreased yield and production in greengram. Hence, VBN 4 was released due to the attempts made to evolve a high yielding variety and resistant to MYMV disease.

MATERIALS AND METHODS

PDM 139 and BB 2664 were used as parents in hybridisation programme during the year 2007. Generations *viz*., F_1 to F_6 were evaluated at National Pulses Research Centre (NPRC), Vamban. A homozygous F_6 progeny was identified as a high yielding with MYMV resistance and named as VGG 10-008 during 2010. Preliminary and Advanced Yield Trials (PYT & AYT) were conducted along with the local check varieties from 2010 to 2014. Based on its superiority at station trials, it was nominated to MultiLocation Trials (MLT). It was tested under MLT at the different research station of the Tamil Nadu Agricultural University from 2015 to 2017. It was also nominated for evaluation under All India Coordinated Trials on MULLaRP during *Kharif* and *Rabi* 2015-16. Based on yield advantage, VGG 10-008 was promoted and evaluated under Adaptive Research Trial (ART) and On-Farm Trial (OFT) during *Kharif* and *Rabi* 2017-18 season. VGG 10-008 was screened for major diseases and pests resistance.

RESULTS AND DISCUSSION

Greengram culture VGG 10-008 is derived from PDM 139 x BB 2664 cross combination. It matures in 65-70

days. It is suitable for cultivation in *Adi pattam, Purattasi Pattam, Markazhi / Thai pattam and Chitirai pattam* both under irrigated and rainfed conditions of Tamil Nadu. The average yield is 1024kg/ha. It is 16.8 and 21.3 *per cent* increased yield over VBN (Gg)3 and CO 8 respectively **(Table 1.).** Under the irrigated condition, it recorded an average yield of 1251 kg/ha. It is 27.5 and 31.2 *per cent* increases over VBN (Gg)3 and CO 8, respectively **(Table 2).** Under the rainfed condition, VGG 10-008 recorded a seed yield of 936 kg/ha. It is 12.0 and 15.7 *per cent* increase over the above check varieties **(Table 3).**

Table 1. Overall performance of greengram culture VGG 10-008 in various trials (Seed yield kg/ha)

S. No	Trial	Number of trials / Locations	VGG 10-008		VBN(Gg)3		CO8	
1	Station trial	8	912	(67)	731	(69)	-	
2	MLT	30	934	(67)	859	(66)	775	(64)
3	ART	128	940	(70)	840	(71)	813	(69)
4	OFT	15	1970	(65)	1300	(65)	1243	(60)
Weighted Mean (181)			1024	(69)	876	(70)	844	(67)
Per cent increase over VBN (Gg) 3			16.8					
Per cent increase over CO 8			21.3					

*Figures in parenthesis indicates days to maturity

Table 2. Performance of greengram culture VGG 10-008 under irrigated condition (Seed yield kg/ha)

S. No	Trial	Number of trials / Locations	VGG 10-008		VBN(Gg)3		CO 8	
1	Station trial (kharif)	4	773	(68)	665	(69)	-	-
2	MLT (kharif)	9	959	(68)	918	(68)	824	(65)
3	Station trial (rabi)	4	1051	(66)	797	(68)	-	-
4	MLT (rabi)	8	946	(65)	903	(65)	728	(62)
5	MLT (summer Irrigated)	7	904	(66)	660	(67)	832	(64)
6	MLT (rice fallow)	3	1057	(68)	1199	(68)	775	(65)
7	OFT (summer irrigated)	15	1970	(65)	1300	(65)	1243	(60)
Weighted Mean (50)			1251	(66)	981	(67)	953	(62)
Per cent increase over VBN (Gg) 3			27.5					
Per cent increase over CO 8			31.2					

*Figures in parenthesis indicates days to maturity

Table 3. Performance of greengram culture VGG 10-008 under rainfed condition (Seed yield kg/ha)

S. No	Trial	Number of trials / Locations	VGG 10-008		VBN (Gg) 3		CO 8	
1	MLT (kharif)	2	812	(68)	845	(70)	630	(67)
2	ART (kharif)	70	874	(70)	785	(72)	763	(69)
3	MLT (rabi)	1	710	(65)	362	(64)	593	(60)
4	ART (rabi)	58	1019	(69)	905	(70)	874	(68)
Weighted Mean (131)			936	(69)	836	(71)	809	(68)
Per cent increase over VBN (Gg) 3			12.0					
Per cent increase over CO 8			15.7					

*Figures in parenthesis indicates days to maturity

Table 4. Performance of greengram culture VGG 10-008 at station trials during *Kharif* season (yield kg/ha)

S. No	Trial	Season	VGG 10-008		VBN (Gg) 3	
1	PYT	Kharif 2011	582	(68)	520	(69)
2	PYT	Kharif 2012	231	(67)	481	(69)
3	AYT	Kharif 2013	1115	(68)	860	(68)
4	AYT	Kharif 2014	1162	(69)	799	(71)
Mean			773	(68)	665	(69)
Per cent increase over VBN (Gg) 3			16.2			

*Figures in parenthesis indicates days to maturity

Table 5. Performance of greengram culture VGG 10-008 at station trials during *Rabi* season (Seed yield kg/ha)

S. No	Trial	Season	VGG 10-008		VBN (Gg) 3	
1	PYT	Rabi 2011	729	(65)	589	(69)
2	PYT	Rabi 2012	870	(65)	855	(69)
3	AYT	Rabi 2013	1290	(66)	930	(68)
4	AYT	Rabi 2014	1314	(68)	815	(71)
Mean			1051	(66)	797	(69)
Per cent increase over VBN (Gg) 3			31.9			

*Figures in parenthesis indicates days to maturity

In station trials of PYT and AYT, VGG 10-008 registered seed yield of 773kg/ha and 1051 kg/ha during *Kharif* and *Rabi* seasons, which is 16.2 and 31.9 *per cent* increase over VBN (Gg) 3, respectively **(Table 4 and 5)**. Based on the performance at station trials, the culture was promoted to Multi Location Trial. VGG 10-008 was evaluated in MLT for two years over four seasons (*Kharif*, *Rabi*, rice fallow and the summer 2015-16 and 2016-17) (**Table 2 and 3**). VGG 10-008 recorded a seed yield of 932, 920 and 904kg/ha during *Kharif*, *Rabi* and the summer seasons, respectively. It is 3.0, 9.1 and 37.0 *per cent* increase over the best check VBN (Gg)3 during *Kharif*, *Rabi* and the summer irrigated seasons, respectively. In *rice fallow* MLT, VGG 10-008 recorded a yield of 1057kg/ha. It is 25.53 *per cent* increase over ADT 3.

Based on MLT results, VGG 10-008 was promoted to Adaptive Research Trial (ART) *Kharif* 2017 and *Rabi* 2017-18 seasons. In ART, the culture VGG 10-008 recorded an average yield of 874kg/ha during *Kharif* season. It is 11.3 and 14.6 *per cent* increase over VBN (Gg)3 and CO 8 respectively. In *Rabi* season, VGG 10-008 recorded an average yield of 1019kg/ha. It is 12.6 and 16.6 *per cent* increase over VBN (Gg)3 and CO 8, respectively **(Table 3).** On-Farm Trials (15 locations) were conducted at Thiruvarur district during the summer irrigated 2018

Table 6. Reaction of green gram culture VGG 10-008 against Yellow Mosaic Virus Disease at NPRC, Vamban and TNAU, Coimbatore under MLT

S. No	Season and Year	Mungbean Yellow Mosaic virus (1-9 scale)							
		VGG 10-008		VBN (Gg) 3		CO 8		SML 1082 (Susceptible check)	
		VBN	CBE	VBN	CBE	VBN	CBE	VBN	CBE
1.	Kharif 2016	3	1	5	1	5	2	5	3
2.	Rabi 2016 – 17	3	3	5	3	3	4	6	8

VBN: Vamban, CBE: Coimbatore

Yellow Mosaic Virus (Grade):

1 – Free from disease; 2-Highly Resistant; 3- Resistant; 4- Moderately resistant; 5 - Moderately susceptible; 6 & 7 - Susceptible; 8 & 9 - Highly susceptible

season **(Table 2).** Culture VGG 10-008 recorded a mean seed yield of 1970 kg/ha. It is 69.39, 51.54 and 58.49 *per cent* increase over VBN (Gg) 2, VBN (Gg) 3 and CO 8, respectively.

Culture VGG 10-008 was screened against major diseases *viz.,* MYMV, Powdery mildew and Leaf crinkle virus diseases from 2015 to 2016 and was found to be moderately resistant to MYMV and powdery mildew diseases and resistant to urd bean leaf crinkle virus disease **(Tables 6, 7 and 8).** It was also screened against major pests and was found to have less pod borer damage compared to checks **(Table 9).**

Culture VGG 10-008 has the protein content of 23.35 per cent (**Table 10).** It has the superior cooked weight (206 g /100g) than VBN (Gg)3 (198 g) and CO8 (180 g). The organoleptic parameters *viz*., colour and appearance, flavour, texture and taste and overall acceptability are better than VBN (Gg)3 and CO8 **(Table 11).**

The key morphological characters to distinguish other varieties during seed production are, large ovate leaves, dark green leaves and pods positioned above the canopy. The descriptions as per the DUS characters are presented in **Table 12**.

Table 7. Reaction of green gram culture VGG 10-008 against Urd bean Leaf Crinckle Virus Disease at NPRC, Vamban and TNAU, Coimbatore under MLT

S. No	Season and Year	Leaf crinkle (%)							
		VGG 10-008		VBN (Gg) 3		CO 8		SML 1082 (Susceptible check)	
		VBN	CBE	VBN	CBE	VBN	CBE	VBN	CBE
1.	Kharif 2016	0.0	2.4	1.92	2.7	2.22	3.7	1.51	6.4
2.	Rabi 2016- 17	3.12	1.3	1.49	2.8	3.84	3.5	15.67	6.4

VBN: Vamban, CBE: Coimbatore
Leaf crinkle: 0-Highly Resistant; 1 to 5%- Resistant; 5.1 to 10% -Moderately resistant; 10.1 to 20%- Moderately susceptible; 20.1 to 40%-Susceptible and > 40% - Highly susceptible

Table 8. Reaction of green gram culture VGG 10-008 against Powdery mildew Disease at NPRC, Vamban and TNAU, Coimbatore under MLT

S.No	Season and Year	Powdery mildew (0-5 scale)							
		VGG 10-008		VBN (Gg) 3		CO 8		SML 1082 (Susceptible check)	
		VBN	CBE	VBN	CBE	VBN	CBE	VBN	CBE
1.	Rabi 2016 – 17	2	3	2	3	3	2	2	4

VBN: Vamban, CBE: Coimbatore
Powdery mildew: 0-Free from disease; 1-Resistant; 2- Moderately resistant; 3- Moderately susceptible; 4-Susceptible and 5- Highly susceptible

Table 9. Performance of green gram culture VGG 10-008 against pod borer (%) in MLT at NPRC, Vamban

S.No.	Season and year	VGG 10-008					VBN (Gg) 2		
		Whitefly / Plant	Web larva/ Plant	CPD (%)	PSI	Category of Resistance	Whitefly / Plant	Web larva/ Plant	CPD (%)
1.	Kharif 2016	5.4	0.7	4.2	4	MR	4.6	0.6	6.0
2	Rabi 2016 – 17	2.4	1.1	4.0	4	MR	2.5	1.0	3.3

CPD- Cumulative pod damage; PSI- Pest susceptibility index.

Table 10. Performance of VGG 10-008 for cooking quality traits

S. No	Variety	Protein (%)	Water uptake (%)	Cooking time (Minutes)	Initial weight (g)	Cooked weight (g)
1	VGG 10-008	23.35	71.50	20	100	206
2	VBN (Gg)3 (Ch)	23.96	99.00	25	100	198
3	CO 8 (Ch)	22.96	98.37	23	100	180

Table 11. Organoleptic evaluation of VGG 10-008 on nine point hedonic rating scale

S. No	Variety	Colour and appearance	Flavour	Texture	Taste	Over all acceptability (Out of 10)
1	VGG 10-008	8.50	8.00	8.00	8.00	8.00
2	VBN (Gg)3 (Ch)	7.50	7.50	7.00	7.25	5.25
3	CO 8 (Ch)	8.00	7.50	7.50	7.75	5.75

Table 12. Descriptor of green gram culture VGG 10-008 as VBN 4

Plant growth habit	:	Semi erect
Plant habit	:	Determinate
Stem colour	:	Green with light purple wash
Stem pubescence	:	Present
Shape of trifoliate leaf	:	Ovate
Size of trifoliate leaf		Large
Colour of the leaf	:	Dark Green
Leaf pubescence	:	Present
Petiole colour	:	Green with light purple wash
Intensity of colour of premature pods	:	Green
Pod position	:	Above canopy
Pod pubescence	:	Present
Pod colour at maturity	:	Black
Seed colour	:	Green
Seed lusture	:	Dull
Seed shape	:	Drum
Days to 50% flowering	:	35-40 days
Days to maturity (days)	:	65-70 days
Plant height (cm)	:	45-55 cm
Seeds per pod	:	11-13
100 seed weight (g)	:	3.5 – 4.0
Single Plant Yield (g)	:	10-15

Based on the yield superiority in various trials, VGG 10-008 was released as VBN 4 by the 49th State Variety Release Committee during 2018. It is suitable for cultivation in Adi, Puratasi, Markazhi / Thai and Chithirai pattam in Tamil Nadu. The national identity of this variety is IC 629207.

REFERENCES

MULLaRP 2016-17. Annual Report 2016-17 of All India Coordinated Research Project on MULLaRP, Indian Institute of Pulses Research, Kanpur.