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Research Article

VBN 3: A new high yielding multiple disease resistant cowpea variety

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Abstract
Cowpea variety VBN 3 (VCP 09-013) is derived from TLS 38 x VCP 16-1. The average yield of VBN 3 is 1013 kg / ha. It is a 17.0 and 17.2 per cent yield increase over VBN 1 (866 kg/ha) and CO (CP) 7 (864 kg/ha), respectively. Duration is 75 – 80 days. It recorded the grain yield of 1148 kg/ha under the irrigated condition which is a 13.8 and 18.0 per cent yield increase over the check varieties VBN 1 (1009 kg/ha) and CO (CP) 7 (973 kg/ ha), respectively. In rainfed conditions, this variety recorded the seed yield of 1013 kg/ha. It is a 17.0 and 17.2 per cent yield increase over the check varieties VBN 1 (866 kg/ha) and CO (CP) 7 (864 kg/ha, respectively. It is having the special features of determinate plant type, synchronized maturity, multiple resistance to bean common mosaic virus, rust and anthracnose diseases. It is resistant to pod borer and pod bug. The cowpea VBN3 is having a protein content of 25.22 per cent. It recorded 100 grain weight of 13.0 g with preferable brown seed colour. It is suitable for cultivation during *Rabi* season (Purattasi pattam) in Tamil Nadu.

Key words: Cowpea, VBN 3, seed yield, rust resistance

INTRODUCTION

Cowpea (*Vigna unguiculata* L.Walp) is an important legume crop which is tolerant to drought and water logging conditions. Cowpea is nutritionally rich with a protein content of 22 to 27 per cent which is an inexpensive source of protein for both rural poor and urban consumers. Like other legume crops, it also has the unique ability to fix atmospheric nitrogen, which in turn improves the fertility status of soils (Kumar *et al*., 2015). Cowpea varieties are indeterminate and not amenable for mechanical harvest. Hence, VBN 3 was developed with short duration and synchronous maturity which is highly needed by the farmers of Tamil Nadu.

MATERIALS AND METHODS

TLS 38 and VCP 16-1 were used as parental lines in the hybridization programme during the year 2006-07. Generations *viz*., F_1 to F_6 were evaluated at National Pulses Research Centre (NPRC), Vamban. High yielding, multiple disease resistant homozygous F_6 progeny (VCP 19-013) was identified during 2009-10. Preliminary Yield Trial (PYT) and Advanced Yield Trial (AYT) were conducted along with the check varieties VBN 1 and CO(CP 7) from 2010 to 2012. Based on its yield superiority at the station trials, VCP 09-013 was nominated and evaluated under Multilocation Trials (MLT) at different research stations of Tamil Nadu Agricultural University during *Kharif* 2012 and

Rabi 2012-13. Based on yield advantage, VCP 09-013 was promoted and evaluated under Adaptive Research Trial (ART) and On-Farm Trial (OFT) for three years during *Rabi* 2013-14, 2014-15 and 2015-16 seasons. It was also nominated for evaluation under All India Coordinated trials on Arid Legumes during *Summer 2017*. VCP 09-013 was screened against major diseases *viz.,* Rust, Bean common mosaic virus and Anthracnose diseases from 2015-16 to 2016-17. Cowpea seeds of VCP 09-013 and VBN 1 were artificially screened for resistance against Bean Common Mosaic Virus. Sap transmission was done at two leaf stage using 0.1 M phosphate buffer. The plants were maintained in insect proof glass house condition and observed for symptom appearance.

RESULTS AND DISCUSSION

Cowpea variety VBN 3 (VCP 09-013) is a cross derivative between TLS 38 and VCP 16-1. It matures in 75-80 days. This variety is suitable for cultivation in *Purattasi Pattam* of Tamil Nadu both under irrigated and rainfed conditions. Under the irrigated condition, VBN 3 has performed well by recording 1148 kg/ha. The yield advantage was 13.8 and 18.0 per cent over the check varieties VBN 1 (1009 kg / ha) and CO (CP) 7 (973 kg / ha), respectively (**Table 1**). Under the rainfed condition, the culture VCP 09-013 has recorded a grain yield of 1013 kg/ha which is a 17.0 and 17.2 per cent increase over VBN 1 (866 kg/ha) and CO (CP) 7 (864 kg/ha), respectively (**Table 2**).

Under station trials (PYT and AYT), VCP 09-013 registered seed yield of 1397 kg/ha and 1931 kg/ha during *Kharif* and *Rabi* seasons, respectively. It is a 45.5 and 24.4 per cent increase over best check variety CO (CP) 7 **(Table 3 and 4)**. Based on the grain yield advantage at station trials, the culture was promoted to Multi Location Trial and being evaluated under MLT for two years during *Kharif,* 2012 and *Rabi,* 2012-13.

In multilocation trials, the culture VCP 09-013 registered 1012 kg/ha with 6.9 per cent increased grain yield over the check variety CO (CP) 7 (947 kg/ha) during *Kharif* season and recorded 844 kg/ha with a 9.9 per cent increased seed yield over the check CO (CP) 7 (768 kg/ha) in *rabi* season (**Table 1**).

Under Adaptive Research Trials (121 locations), VCP 09-013 recorded a grain yield of 963 kg/ha with 15.1 (836 kg/ha) and 15.0 (837 kg/ha) per cent increase over the check varieties Vamban 1 and CO (CP) 7, respectively during *rabi* season (*Rabi* 2013-14 and *Rabi* 2014-15). Among the 121 locations, VCP 09-013 recorded more than 1000 kg in 46 locations and the maximum yield of 1680 kg/ha was recorded in Sathyamangalam of Erode district (**Table 2**).

On Farm Trials were conducted at Pudukottai district during 2013-14, 2014-15 and 2015-16 r*abi* seasons. This culture VCP 09-013 recorded an average grain yield of 1392 kg/ha which is a 27.2 and 29.9 per cent increase over check varieties Vamban 1 (1094 kg/ha) and CO (CP) 7 (1072 kg/ha), respectively (**Table 2**).

Based on the screening of the cowpea culture VCP 09-013 during *Rabi* 2015-16 and 2016-17, it was found to be resistant to bean common mosaic virus, rust and anthracnose diseases (**Tables 5 & 6**). Cowpea seeds of VCP 09-013 and VBN 1 were artificially screened for resistance against bean common mosaic virus through sap transmission method at two leaf stage using 0.1 M phosphate buffer. The plants were maintained in insect proof glass house condition and observed for symptom appearance. The symptom expression was not found in the cowpea culture VCP 09-013, whereas the mosaic symptom appeared in inoculated plants of VBN 1 at the trifoliate leaves. The results revealed that the cowpea culture VCP 09-013 was found to be resistant to bean common mosaic virus (**Table 6).** It was also screened against major pests and found to be resistant to pod borers *viz*., *Maruca vitrata*, *Helicoverpa armigera* and Pod bug (**Table 7**).This culture VCP 09-013 recorded a protein content of 25.22 per cent (**Table 8).**

Table 1. Performance of cowpea culture VCP 09-013 under irrigated condition

Trials	Number of locations	Seed yield (kg/ha)					
		VCP 09-013		Vamban 1		CO (CP) 7	
Station Trials (*kharif* 2010 and *kharif* 2011)	2	1397	(79)	879	(70)	960	(79)
MLT (*kharif* 2012)	4	1012	(82)	-		947	(82)
Station Trials (*Rabi* 2010-11 and *Rabi* 2011-12)	2	1931	(80)	1139	(70)	1552	(80)
MLT (*Rabi 2012-13*)	5	844	(80)	-	-	768	(80)
AICRP (Summer 2017)	8	863*	-	-	-	-	-
Weighted Mean		**1148**	**(80)**	**1009**	**(70)**	**973**	**(80)**
Per cent increase				**13.8**		**18.0**	

Figures in parenthesis indicates days to maturity; *Not included for mean

Table 2. Performance of cowpea culture VCP 09-013 under rainfed condition

Trials	Number of locations	Seed yield (kg/ha)					
		VCP 09-013		Vamban 1		CO (CP) 7	
ART (*Rabi* 2013-14, 2014-15 and 2015-16)	121	963	(78)	836	(76)	837	(78)
OFT(*Rabi* 2013-14, 2014-15 and 2015-16)	16	1392	(77)	1094	(70)	1072	(77)
Mean		**1013**	**(77)**	**866**	**(75)**	**864**	**(77)**
Per cent increase				**17.0**		**17.2**	

Figures in parenthesis indicates days to maturity

Table 3. Performance of cowpea culture VCP 09-013 at station trials during *kharif* season

S. No	Trial	Season / trial	Seed yield (kg/ha)					
			VCP 09-013		Vamban 1		CO(CP) 7	
1	PYT	*Kharif* 2010	1380	(78)	1101	(70)	1086	(78)
2	PYT	*Kharif* 2011	1413	(80)	657	(70)	834	(80)
Mean			**1397**	**(79)**	**879**	**(70)**	**960**	**(79)**
Per cent increase					**58.9**		**45.5**	

Figures in parenthesis indicates days to maturity

Table 4. Performance of cowpea culture VCP 09-013 at station trials during *rabi* season

S. No	Trial	Season / trial	Seed yield (kg/ha)					
			VCP 09-013		Vamban 1		CO (CP) 7	
1	PYT	*Rabi* 2010-11	1170	(80)	556	(70)	692	(80)
2	AYT	*Rabi* 2011-12	2692	(80)	1721	(70)	2412	(80)
Mean			**1931**	**(80)**	**1139**	**(70)**	**1552**	**(80)**
Per cent increase					**69.6**		**24.4**	

Figures in parenthesis indicates days to maturity

Table 5. Performance of cowpea culture VCP 09-013 against rust disease during *rabi* seasons

Season and Year	VCP 09-013	Vamban 1	CO (CP) 7
Rabi 2015-16	**1**	3	3
Rabi 2016-17	**1**	3	3

Rust: 0-Free from disease; 1-Resistant; 3- Moderately resistant; 5- Moderately susceptible; 7-Susceptible ; 9- Highly susceptible

Table 6. Reaction of cowpea culture VCP 09-013 against bean common mosaic virus (Artificial screening) and Anthracnose diseases at NPRC, Vamban

Season and Year	Bean Common Mosaic virus (%)			Anthracnose (0 -9 grade)		
	VCP 09-013	Vamban 1	CO (CP) 7	VCP 09-013	Vamban 1	CO (CP) 7
Rabi 2015-16	**0**	3.03	1.53	**1**	5	3
Rabi 2016-17	**0**	5.00	1.00	**1**	5	3

Anthracnose: 0-Free from disease; 1-Resistant; 3- Moderately resistant; 5- Moderately susceptible; 7- Susceptible; 9- Highly susceptible

Table 7. Reaction of Cowpea culture VCP 09-013 against major pests at NPRC, Vamban

Season	*Maruca vitrata*		*Helicoverpa armigera*		Pod bug complex	
	VCP 09-013	Vamban 1	VCP 09-013	Vamban 1	VCP 09-013	Vamban 1
Rabi 2013-14	**18**	7	**2**	0	**9**	6
Rabi 2014-15	**7**	13	**0**	10	**22.5**	13

Scale & Category of resistance: 0-10 % - Resistant, 11-30% – Moderately Resistant, 31-50% – Susceptible, 51-70% - Highly Susceptible, > 70 % - Highly Susceptible

Table 8. Protein content of cowpea culture VCP 09-013

Culture/ Checks	VCP 09-013	Vamban 1 (check)	CO (CP)7 (check)
Protein content (%)	25.22	28.02	28.72

Table 9. Descriptor of cowpea culture VCP 09-013 as VBN 3

1.	**General**		
1.1	Name of the variety	:	VCP 09-013
1.2	Pedigree	:	TLS 38 x VCP 16-1
1.3	Year of development	:	2006
1.4	Year of identification	:	2016
1.5	Origin (Name of the Institute)	:	National Pulses Research Centre Vamban – 622 303
2.	**Habit**		
2.1	Plant growth habit	:	Semi erect
2.2	Plant growth pattern	:	Determinate
3.	**Stem characters**		
3.1	Stem colour	:	Green
3.2	Stem pubescence	:	Absent
4.	**Leaf characters**		
4.1	Terminal leaflet shape	:	Sub globose
4.2	Colour of the leaf	:	Green
4.3	Leaf pubescence	:	Absent
5.	Petiole colour	:	Green
6.	**Pod characters**		
6.1	Pod colour: intensity of colour of premature pods	:	Green
6.2	Pod pubescence	:	Absent
6.3	Pod colour at maturity	:	Creamy yellow
7.	**Seed characters**		
7.1	Seed colour	:	Light brown
7.2	Seed lusture	:	Dull
7.3	Seed shape	:	Kidney
8.	**Agronomic traits**		
8.1	Days to 50 per cent flowering	:	50 - 55 days
8.2	Days to maturity (days)	:	75 - 80 days
8.3	Plant height (cm)	:	65 - 70 cm
8.4	Seeds per pod	:	15 – 17
8.5	100 seed weight (g)	:	12.5 – 13.5 g
8.6	Single plant yield (g)	:	25 – 30 g
9.	**Disease reaction**	:	Resistant to Bean common mosaic virus, rust and anthracnose.

Key morphological characters to differentiate other cowpea varieties during seed production are, a) sub globose shape terminal leaves and b) kidney shape seeds. The DUS traits of the culture are presented in **Table 9**.

Based on the grain yield superiority in various trials, VCP 09-013 was approved and released as VBN 3 by the 48th State Variety Release Committee during 2017. The national identity of this variety is IC 625669. The cowpea variety VBN 3 has been notified in the gazette on 26.12.2018 (S.O.6318 (E)).

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