

Gujarat Dantiwada Vegetable Cowpea 2 (GDVC 2): A high yielding variety of cowpea

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ABSTRACT

At present, two varieties viz., Pusa phalguni and AVC-1 are under cultivation in Gujarat State. Both the varieties are non determinant and non synchronous types. Also, they are more prone to important diseases and pest. Hence, in order to provide suitable variety, attempts were made to develop high yielding, early maturing and synchronous vegetable cowpea variety with better nutritive quality at Centre for Research on Seed Spices, SDAU, Jagudan. More than 500 germplasm lines collected from Main Pulses Research Station, SDAU, S.K.Nagar were thoroughly screened for various yield contributing characters and desirable traits including pest and diseases at Centre for Research on Seed Spices, SDAU, Jagudan during *kharif* 2007 & 2008 seasons. Among them, most promising germplasms were further screened at two different locations viz., Jagudan and Ladol during the *kharif* 2009 and five different locations viz., Jagudan, Ladol, Anand, Navasari and Junagadh during the *kharif* 2010 to 2012 in large scale trial. On an average, variety JDNVC-74 produced 103.5 q/ha green pod against 72.9 and 83.4 q/ha of Pusa phalguni and AVC-1 check variety, respectively and out yielded both the check varieties in 17/17 tests. It also significantly out yielded the check varieties viz., Pusa phalguni and AVC-1 in 12/17 and 10/17 tests with 42.0 and 24.1 per cent higher pod yield, respectively, indicating superiority in yield over the year and locations. The yield potential of this variety is 151.5 q/ha which will enhance the productivity under varying environmental conditions. The analysis of nutritional and bio-chemical properties revealed that JDNVC-74 (GDVC-2) has high soluble protein (10.3 %), total soluble sugar (4.5 %) and less crude fiber (15.1 %) makes this variety more nutritive and palatable. This genotype is less prone to cowpea mosaic virus, root rot and leaf spot diseases and also exhibited the least pod borer damage as well

Key words : Cowpea, disease/pests reaction, pod quality, yield potentiality.

Cowpea [*Vigna unguiculata* (L.) Walp.], belongs to family "*Fabaceae*" locally known as lobiya, chowla (chowli) is an annual legume. It is diploid and has $2n = 22$ chromosomes. In India, the crop is grown on a small scale especially for the immature pods as vegetable, grains, fodder and green manure. Fresh green pods are rich in protein, vitamins & minerals. In Gujarat, Vegetable Cowpea is cultivated in about

27.6 thousand hectares with a total production of 290 thousand tones resulting in an average productivity is 10.49 MTha⁻¹. (Anon., 2012). It is grown almost in all the districts of Gujarat State but the major districts are Banaskantha, Kheda, Baroda, Junagadh, Amreli, Surat, Anand and Gandhinagar.

At present, two varieties viz., Pusa phalguni and AVC-1 are under cultivation. Both the presently cultivated varieties are semi spreading and none

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synchronous types. Also they are prone to important diseases and pest. The green pods colour of varieties viz., Pusa phalguni and AVC-1 are dark and light green, respectively. However, many consumers prefer pale green pods. In order to provide suitable variety to satisfy the consumer's preference, attempts were made to develop high yielding, early maturing, synchronous vegetable cowpea variety having pale green pod with more nutritive quality at CRSS, SDAU, Jagudan for identification of promising genotypes which are high yielding as well as better quality to the farmers. JDNVC-74 (GDVC-2) has been emerged as a high yielder variety after testing in field trials since 2007.

MATERIALS AND METHODS

Large number of germplasm accessions collected from Main Pulses Research Station, SDAU, S.K.Nagar were evaluated to develop high yielding, early maturing and synchronous vegetable cowpea variety with higher nutritive value in PET during *kharif* 2008 at Jagudan. Out of them, seven high yielding entries viz., JDNVC-39, JDNVC-41, JDNVC-58, JDNVC-62, JDNVC-74, JDNVC-75 and JDNVC-76 were further evaluated at Jagudan and Ladol during the *kharif* 2009 and at Jagudan, Ladol, Anand, Navasari and Junagadh during the *kharif* 2010 to 2012 in large scale varietal trial in a randomized block design with three replications. The data pertaining to various characters were analyzed as per the procedure of Randomized Block Design given by Panse and Sukhatme (1978) for individual environments. Soluble Protein was estimated by Folin-Lowry method as described by Lowry *et al.* (1951). Total Soluble Sugar was estimated by phenol-sulphuric acid method as described by Dubois *et al.* (1956). The water content (WC) of cowpea was determined using the equation:

$$WC = 100 \times (M_1 - M_2) / M_1$$

Where: WC = Water content, %;

M_1 = Mass of sample before drying, g

M_2 = Mass of sample after drying, g

RESULTS AND DISCUSSION

GDVC-2 (JDNVC-74) is one of the promising cultures selected during the evaluation of 500

germplasm lines collected from Main Pulses Research Station, SDAU, S.K.Nagar. Initially, it was named as CGD-335 (JDNVC-335) and renamed as JDNVC-74 during multilocal testing. During 2008 to 2012, it was tested in 17 trials at five different locations viz., Jagudan, Ladol, Anand, Navasari and Junagadh. On an average, variety JDNVC-74 produced 103.5 q/ha green pod against 72.9 and 83.4 q/ha of Pusa phalguni and AVC-1 check variety, respectively and out yielded both the check varieties in 17/17 tests. It also significantly out yielded the check varieties in 12/17 and 10/17 tests by producing 42.0 and 24.1 *per cent* higher pod yield, respectively, indicating superiority in yield over the year and locations. The yield potential of this variety is 151.5 q/ha (Table 1).

The green pods are tender and fleshy, having smooth surface, medium in size, straight and round shape and pale green in colour. It possesses more pod weight and number of pods per plant. High soluble protein (10.3 %), total soluble sugar (4.5 %) and less crude fiber (15.1 %) makes this variety more nutritive and palatable (Table 4).

The genotype JDNVC-74 has an erect plant growth habit with an average plant height of 54.0 (42.5 to 72.5) cm. The pods are pale green, fleshy, 14.8 (13.2 to 17.8) cm in length with 11 to 16 seeded. First picking of green pods may start on 43 day and continue up to 90 days after sowing. This genotype is less prone to cowpea mosaic virus, root rot and leaf spot diseases and also exhibited the least pod borer damage as well as sucking pests (Table 5).

CONCLUSION

Variety GDVC-2 (JDNVC-74), with high stable green pod yield as well as better green pod quality with erect growth habit, less prone to pest and diseases will provide very good replacement for Pusa phalguni and alternative to AVC-1 under varying environmental conditions in Gujarat state. The variety GDVC-2 (JDNVC-74) has been assigned national identity number (IC.No.596962) by Division of Germplasm Conservation, National Bureau of Plant Genetic Resources, ICAR, Pusa Campus, New Delhi.

Table 1 Comparative green pod yield performance of JDNVC-74 at individual location and mean over the locations.

Location	Name of experiment and year	Green pod yield (q/ha)			% increase over		C. D. (5 %)	C. V. %
		JDNVC -74	Pusa Phalguni	AVC -1	Pusa Phalguni	AVC -1		
Jagudan	PET -2008 (5)	77.7	48.7	56.4	59.5	37.8	NS	23.1
	LSVT -2009 (11)	151.2	129.7	143.0	16.6	5.7	27.2	10.0
	LSVT -2010 (12)	98.4	78.7	83.6	25.0	17.7	20.5	12.0
	LSVT -2011 (10)	135.5 ⁺⁺	90.8	95.7	49.2	41.6	18.5	8.7
	LSVT -2012 (10)	116.3 ⁺⁺	95.0	104.4	22.4	11.4	11.7	7.0
	Mean	115.8	88.6	96.6	30.7	19.9		
Ladol	LSVT -2009 (10)	151.5 ⁺⁺	78.4	115.5	93.2	31.2	20.7	9.9
	LSVT -2010 (10)	121.7 [*]	72.7	105.2	67.4	15.7	21.2	11.0
	LSVT -2011 (9)	124.7 ⁺⁺	90.0	104.0	38.6	19.9	16.4	8.5
	LSVT -2012 (9)	135.2 ⁺⁺	75.0	104.0	80.3	30.0	11.4	6.1
	Mean	133.3	79.0	107.2	68.7	24.3		
North Gujarat Region		122.8	84.8	84.8	100.8	44.8		
Anand	LSVT -2011 (4)	87.7 ⁺⁺	67.3	61.1	30.3	43.5	10.4	7.8
	LSVT -2012 (5)	72.9 ⁺⁺	51.5	60.5	41.4	20.5	11.3	10.4
	Mean	80.3	59.4	60.8	35.2	32.1		
Junagadh	LSVT -2010 (8)	73.7 ⁺⁺	44.7	54.4	64.9	35.5	12.4	13.8
	LSVT -2011 (10)	58.3 ⁺	52.3	47.6	11.5	22.5	9.4	10.0
	LSVT -2012 (4)	56.2 [*]	48.5	51.2	15.9	9.8	6.2	7.1
	Mean	62.7	48.5	51.1	29.3	22.7		
Navasari	LSVT -2010 (9)	73.7	64.8	47.0	13.7	56.8	NS	23.7
	LSVT -2011 (9)	140.6 [*]	109.8	128.1	28.1	9.8	21.3	9.4
	LSVT -2012 (5)	83.5 ⁺⁺	41.8	55.7	99.8	49.9	17.6	19.7
	Mean	99.3	72.1	76.9	37.7	29.1		
Over all Mean (17 trials)		103.5	72.9	72.9	83.4	42.0		
Superiority over check			17/17	17/17				

Note: ^{*} and ⁺ indicate that the proposed variety JDNVC-74 (GDVC-2) is significantly superior to the respective check Pusa phalguni and AVC-1 in green pod yield.

() indicates number of pickings in their respective trials.

Table 2 Green pod yield attributing characters

Sr.No	Character	JDNVC-74	Pusa Phalguni	AVC-1
1	Days to 50% flowering	42.0 (35.0 to 44.3)	40.6 (35.0 to 43.0)	45.1 (37.3 to 50.0)
2	Days to first picking	47.0 (43 to 50)	46.5 (45 to 48)	50.0 (48 to 52)
3	Days to last picking	83.0 (77 to 90)	81.5 (74 to 85)	86.0 (79 to 90)
4	Plant height (cm)	54.0 (42.5 to 72.5)	54.3 (47.3 to 57.3)	58.8 (50.3 to 78.5)
5	Primary branches /pl.	4.1 (3.1 to 5.7)	4.1 (2.7 to 5.7)	4.6 (3.5 to 5.2)
6	Leaf length,cm	9.1	9.7	10.2
7	Leaf width, cm	6.2	6.9	6.4
8	Pods per plant	53.0	56.0	49.0
9	Pod length (cm)	14.8 (13.2 to 17.8)	12.3 (12.2 to 14.5)	14.9 (14.2 to 17.5)
10	Seeds per pod	15 (10.8 to 16.1)	14 (12.0 to 16.4)	15 (11.7 to 16.5)
11	Cluster per plant	11.0	12.0	11.0
12	Length of peduncle	18.7	30.9	30.0
13	Pods per cluster	5.0	4.1	4.6
14	Green pod weight (g)	4.1 (3.0 to 4.9)	2.6 (2.4 to 4.0)	3.0 (2.4 to 3.2)
15	Green Pod yield(q/ha)	103.5 (56.2 to 154.2)	72.8 (41.8 to 129.7)	83.2 (47.0 to 143.0)

Table 3 Morphological descriptors of cowpea variety GDVC-2

Descriptors details	Name of Variety		
	JDNVC-74	Pusa Phalguni	AVC-1
Trifoliate Leaf			
Leaf Color	Light green	Dark green	Green
Leaf Surface	Rough	More rough	Semi rough
Pigmented spot at base of two leaf attachment	Absent	Absent	Absent
Plant Characters			
Plant growth habit	Erect	Dwarf with bushy	Bushy & compact
Branching habit	Erect	Semi spreading	Semi spreading
Stem & Peduncle (stout)	Strong	Weak	Strong
Flower colour			
Outer surface of corolla	Light Cream	Light Cream	Light Yellow
Inner surface of corolla	Bluish	Light Bluish	Light Cream
Calyx colour	Creamy	Brownish green	Green
Pods Characters			
Pod colour	Pale green	Dark green	Light green
Pod surface	Very Smooth	Slight Rough	Smooth
Pod constriction	No	Prominent	Slightly prominent
Pod Shape	Straight & round	Round flat	Slightly Flat
Green Seeds colour	Light green	Green	Light green
Pod colour at maturity	White	Light brown	White
Seed colour	White	Light cream	Light cream

Table 4 Quality characters of green pod

Sr. no.	Genotypes	Moisture (%)	Per cent content (on dry basis)		
			Soluble protein	Crude fiber	Total sugar
1	JDNVC-74	88.9	10.3	15.1	4.5
2	Pusa phalguni(c)	88.1	10.0	18.3	5.3
3	AVC-1(c)	88.4	11.1	13.8	3.5

Table 5 Reaction to diseases and pest

Disease/pest infection		JDNVC-74	Pusa phalguni	AVC-1
Disease	Mosaic Virus (%)	2.0	5.0	4.0
	Root Rot (%)	3.0	8.0	9.0
	Leaf spot (%)	4.0	8.0	7.0
Pests	Pod borer damage (%)	4.1	9.9	11.2
	Leaf Hopper/leaf	1.0	2.3	3.0
	Whitefly/leaf	0.8	2.0	2.2

Table 6 Agronomic packages of practices carried out

Sr. No	Details	Vegetable Cowpea
1	Period of sowing	Kharif season, July-August
2	Spacing distance (cm)	45 x 30 cm
3	Seed rate required (kg/ha)	12-15 kg/ha
4	Irrigation	As and when required
5	Fertilizer (N.P.K) kg/ha	20-40-00

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