



## Greengram Co 8 : A High Yielding, Short duration Variety with Synchronized Maturity

P. Jayamani\*, AR. Muthiah, C. Durairaj, S. Pazhanivelan,  
A. Kamalakanan and K. Thiyagarajan

Department of Pulses  
Centre for Plant Breeding and Genetics,  
Tamil Nadu Agricultural University, Coimbatore - 641 003

The high yielding greengram culture COGG 973 is a cross derivative of COGG 923 x VC 6040A and matures in 55 - 60 days. This culture recorded an average yield of 845 kg/ha with a yield increase of 20 per cent over the check variety Co (Gg) 7. It has medium bold seed with a mean 100 seeds weight ranging from 3.5 to 4.0 g. It is determinate with synchronized maturity and suitable for single / mechanical harvest. The variety is suitable for closer planting and recorded a grain yield of 948 kg/ha with 25 x 10 cm spacing, which is 8.5 per cent yield increase over 30 x 10 cm spacing (874 kg/ha). It is also suitable for intercropping with maize and with drip fertigation system in redgram. Protein content of this variety is recorded as 20.21 per cent and has good organoleptic values. Co 8 greengram variety is resistant to yellow mosaic and moderately resistant to stem necrosis, root rot, aphids and stemfly. The variety is well suited for cultivation during *kharif* and *rabi* seasons in Tamil Nadu.

**Key words:** Greengram Co 8, New variety, Short duration and Synchronized maturity

Greengram (*Vigna radiata* (L.) Wilczek) commonly known as mungbean is one of the most important grain legumes in many Asian countries including India, China and Pakistan and belongs to the family Leguminosae. This is mainly because greengram can be grown in a wide range of environments. It is a major source of high quality protein. The grain of greengram contains 58 per cent carbohydrate and 20-26 per cent protein. It contains aminoacids such as arginine, histidine, lysine, tryptophan, etc. It has high digestibility and palatability. In human food, its pods are used as green vegetable. Its whole grains and split grains are used as dhal. Its green plants, chopped and mixed with other fodders are palatable feed for animals. It is also used as green manure crop, which adds nitrogen in addition to humus to the soil. It is a soil protecting crop in rainy season (Reddy, 2004). Greengram is the third important pulse crop of India, in terms of area and production next to chickpea and pigeonpea. The area under greengram in India was around 3.8 million ha. with a total production of 1.0 million tonnes. In Tamil Nadu, greengram is normally cultivated in an area of 1.34 lakh ha. with an annual production of 0.458 lakh tons. The productivity of the crop is low, 336 kg/ha (AICRP Report, 2012). Major constraints in achieving higher yield of this crop are lack of genetic variability, absence of suitable ideotypes for different cropping systems, poor harvest index and susceptibility to pests and diseases (Pawar and Bhatia, 1980).

Previously released commercial varieties of greengram in Tamil Nadu possess indeterminate growth habit, which require two or more harvest and increase labour cost (Jayamani *et al.*, 2006). Also due to labour scarcity, in order to promote mechanical harvest, development of variety with synchronized maturity is of crucial importance. Hence, breeding work was initiated to develop high yielding, short duration variety with synchronized maturity suitable for single mechanical harvest.

### Materials and Methods

The greengram culture COGG 973 was evolved at Department of Pulses, Centre for Plant Breeding and Genetics, Tamil Nadu Agricultural University, Coimbatore. It is a cross derivative, selected from COGG 923 X VC 6040A. Elite plants with desirable traits, which contribute towards high grain yield were selected from F<sub>2</sub> generation. They were evaluated for their sustained performance and homozygosity. Among them, the culture COGG 973 was identified as the best one. It was evaluated with check varieties in Multi Location Trial (MLT), Adaptive Research Trial (ART), AICRP trials *viz.*, Initial Varietal Trial (IVT), Advanced Varietal Trial (AVT), On Farm Trial (OFT) and in Large Scale Demonstration (LSD). Thus, a total of 131 trials were conducted. Besides, the reaction of the culture against important pests and diseases were also studied (Mayee and Datar 1986; Singh *et al.*, 2000). Based on the standard procedure the grain quality and its consumer acceptability were analyzed.

\*Corresponding author email : jayamani1108@gmail.com

## Results and Discussion

COGG 973 is a cross derivative of COGG 923 x VC 6040A and matures in 55 - 60 days. In AICRP trial, the performance of the culture was tested in

central and south zones during 2009 and 2010 *khari* season, respectively. It recorded an average grain yield of 1038 kg/ha in IVT conducted in central zone and surpassed the check varieties BM4 and ML131.

**Table 1. Yield performance of greengram culture COGG 973 in various trials**

Season	No. of locations	Mean grain yield (kg/ha)								
		COGG 973	COGG 912 /Co(Gg)7*	VBN (Gg) 2*	VBN (Gg) 3*	OUM 11-5*	HUM 1*	Pusa 9072*	BM4*	ML131*
Station	6	970	797	-	-	-	-	-	-	-
MLT 2009 (K)	6	952	905	932	859	-	-	-	-	-
MLT 2009-10 (R)	5	672	573	689	712	-	-	-	-	-
ART 2010 (K)	18	614	610	-	-	-	-	-	-	-
KVK ART 2010 (K)	21	781	806	-	-	-	-	-	-	-
OFT 2011 (K)	28	797	622	-	-	-	-	-	-	-
IVT CZ 2009 (K)	9	1038	-	-	-	-	-	-	979	782
AVT1 CZ 2010 (K)	10	908	-	-	-	-	-	-	813	908
IVT SZ 2010 (K)	4	855	814	-	-	784	-	-	-	-
AVT1 SZ 2011 (K)	7	712	696	-	-	692	677	-	-	-
IVT CZ 2009-10 (R)	2	1131	-	-	-	-	-	1087	-	-
IVT SZ 2009-10 (R)	5	1129	-	-	-	-	-	1012	-	-
IVT 2009-10(R) Rice fallow	2	610	-	-	-	-	-	636	-	-
LSD during K 2011	8	664	514	-	-	-	-	-	-	-
Mean	131	845	704	811	786	738	677	912	896	845
% increase over checks		-	20.2	4.2	7.5	14.5	24.8	-	-	-

\*The varieties are indeterminate and the duration is 10 and more days higher than COGG973

Hence, it was promoted to AVT 1 where, it recorded a mean grain yield of 908 kg/ha. Similarly, in south zone it recorded an average grain yield of 855 kg/ha

in IVT . It recorded a yield increase of 5.0 and 9.0 per cent over the check varieties COGG 912 and OUM 11 -5, respectively and promoted to AVT 1. During

**Table 2. Performance of COGG 973 in 25 X 10 cm spacing**

Treatment	Plant stand at harvest (lakh /ha)	Plant height (cm)	Number of pods/plant	Number of seeds / pod	Test weight (g/100seeds)	Grain yield (kg/ha)
CoGG972 (30 x 10 cm)	3.15	40.8	30.75	11.39	3.7	848
COGG973(30 x 10 cm)	3.21	45.6	33.51	12.45	3.9	874
COGG978(30 x 10 cm)	3.08	33.7	31.10	11.86	5.2	889
COGG979(30 x 10 cm)	3.17	41.5	24.38	12.11	5.7	831
COGG980(30 x 10 cm)	3.19	42.6	21.17	11.67	3.6	806
CoGG972 (25 x 10 cm)	3.89	41.2	28.20	11.41	3.7	863
COGG973(25 x 10 cm)	3.94	48.3	32.80	12.38	3.9	948
COGG978(25 x 10 cm)	3.85	34.9	28.70	11.59	4.9	837
COGG979(25 x 10 cm)	3.79	42.4	22.61	11.93	5.5	815
COGG980(25 x 10 cm)	3.91	43.1	20.50	6.03	3.4	785
SEd	0.20	3.88	2.56	0.78	0.32	27.91
CD (5%)	0.42	8.34	5.48	1.67	0.68	60.01
CV (%)	8.59	12.15	11.10	14.36	9.80	11.21

2009 - 10 *rabi* season, it was evaluated in central zone and south zone and it recorded an average yield of 1131 kg/ha and 1129 kg/ha, respectively. In

rice fallow trial conducted during 2009-10, it recorded an average yield of 610 kg/ha (Table 1).

**Table 3. Screening of greengram entries to yellow mosaic disease (YMD) under hot spot location (Panpozhi village) during summer 2010.**

Entry / Variety	YMD incidence (0-9 grade)	Reaction
COGG 934	1	Highly Resistant
COGG 936	1	Highly Resistant
COGG 972	1	Highly Resistant
COGG 973	1	Highly Resistant
COGG 975	1	Highly Resistant
COGG 999	1	Highly Resistant
VBN (Gg)2	3	Resistant
VBN (Gg) 3	3	Resistant
Co 6	3	Resistant
SML 668	1	Highly Resistant
Samrat	1	Highly Resistant
Pusa vishal	1	Highly Resistant
SML 1082 (Susceptible Check)	9	Highly Susceptible

In the state trials, this culture recorded an average yield of 952 kg/ha (MLT), 614 kg/ha (ART),

781 kg/ha (KVK, ART), 797 kg/ha (OFT) and 664 kg/ha in LSD. The overall performance of this culture

**Table 4. Disease reaction of COGG 973 at Coimbatore (Kharif 2011)**

Entry name	Root rot (%)	Leaf spot (1-9 grade)	Powdery mildew (0-5 grade)	YMD (1-9 grade)	Leaf crinkle (%)	Stem necrosis (%)
COGG 973	13.9	1	1	1	2.0	0
PM 09-6	31.6	4	1	1	2.5	5.0
MH 709	64.3	1	1	1	1.0	16.6
IPM2K 14-9	46.1	2	1	1	1.0	0
SML 1082(Local check)	62.5	3	5	5	12.0	20.0

was good and it recorded an average grain yield of 845 kg/ha with a yield increase of 20 per cent over

the variety Co (Gg) 7, the nearest comparable check variety in terms of duration (Table 1).

**Table 5. Screening of greengram genotypes for stemfly incidence at Coimbatore (kharif 2011)**

Varieties	Damage % (30 DAS)	PSI rating
GPB PCS 265	19.6	9
GPB LM 9	20.8	9
LM 344	3.8	2
LM 275	22.7	9
LM 299	65	9
SML 1076	28.3	9
LM 82	24.6	9
PLS 334	48.7	9
ACI 196	9.8	7
AC 41	26.1	9
Annur 1	0.0	2
SML 1077	22.7	9
COGG 979	2.3	2
Berimung 5	19.7	9
SML 1076	2.1	2
LM 279	17.5	9
Pusa 0871	18.2	9
PLS 318/2	0.0	2
ML 1583	0.0	2
Pusa 953	17.2	9
ML 1124	0.0	2
GG 975	14.5	9
Pusa 0672	8.2	6
AKM 9904	2.4	2
NM 54	28.8	9
COGG 973	2.2	2
IPM 02-19	4.2	3
COGG 980	2.1	2
COGG 11-01	3.5	2
RMG 991	7.9	5
Co(Gg) 7	8.1	-

Since COGG 973 is an early maturing and short statured plant type, it was evaluated in normal spacing of 30 x 10 cm and with a closer spacing of 25 x 10 cm. It recorded 948 kg/ha in 25 x 10 cm spacing, which is 8.5 per cent yield increase over 30 x 10 cm spacing (874 kg/ha) (Table 2). Hence, 25 x 10 cm spacing is recommended to get the maximum grain yield.

#### **Reaction to diseases and pests**

The culture COGG 973 was screened for yellow mosaic disease (YMD) at hot spot location

(Panpozhi) during summer 2010. It was found to be highly resistant (grade 1) when compared to susceptible check SML 1082 (grade 9) (Table 3). During *kharif* 2011 season, this culture was evaluated for diseases like root rot, leaf spot, powdery mildew, YMD, leaf crinkle and stem necrosis at Coimbatore. It was found to be resistant to YMD and stem necrosis. It also showed less incidence of leaf crinkle and root rot diseases when compared to susceptible check (Table 4). The culture COGG 973 was evaluated for stemfly damage during *kharif* 2011 at Coimbatore. It recorded only 2.2 per cent

**Table 6. Distinguishing morphological characters of the culture COGG 973 (as per PPV & FRA)**

Characteristics	States	COGG 973	Co(Gg) 7
Hypocotyl: Anthocyanin colouration	Absent Present	Absent	Absent
Days to 50% flowering	Early (<40 days)	Early (25 -30 days ) Medium (40-45 days) Late (>50 days)	Early (30 - 35 days )
Plant growth habit	Erect Semi-erect Spreading	Erect	Erect
Plant habit	Determinate Indeterminate	Determinate	Determinate
Stem colour	Green Green with purple splashes Purple with green splashes Purple	Green	Green
Stem pubescence	Absent Present	Present	Present
Leaflet (terminal) shape	Deltoid Ovate Lanceolate Cuneate	Ovate	Ovate
Foliage colour	Green Dark green	Dark Green	Green
Leaf vein colour	Green Purple	Purple	Green
Leaf pubescence	Absent Present	Present	Present
Petiole colour	Green Green with Purple splashes Purple	Green with purple splashes	Green
Pod: Intensity of green colour of premature pods	Yellowish green Green Dark green	Dark Green	Green
Pod pubescence	Absent Present	Present	Absent
Peduncle length	Short (<5 cm) Medium (5-10 cm) Long (>10 cm)	10.0 -14.0 cm long	15.0 – 18.0 cm - long
Pod length Small (<5cm)	6.0 – 7.0 cm medium Medium (5-7 cm) Long (>7cm)	9.0 – 10.0 cm long	
Pod Colour of mature pod	Buff (off-white) Brown Black	Brown	Brown
Plant height	Short (<45 cm) Medium (45-60 cm) Long (>60 cm)	Medium 55.0 – 65.0 cm	Medium 45.0–55.0 cm
Seed colour	Green Greenish brown Brown Black Mottled	Green	Green
Seed lusture	Shiny Dull	Dull	Shiny
Seed shape	Globose Oval Drum shaped	Drum shaped	Globose
Seed size ( weight of 100 seeds)	Small (<3g) Medium (3-5 g) Large (>5 g)	Medium 3.5 to 4.0 g	Medium 4.5 to 5.0 g
<b>Biometrical traits</b>			
1 Maturity days		55 - 60	60 - 65
2 Number of branches / plant		2.0 – 3.0	1.0 – 2.0
3 Number of clusters/plant		10.0 – 18.0	10.0 – 15.0
4 Number of pods /cluster		8.0 – 10.0	6.0 – 8.0
5 Number of pods/plant		65 .0 – 91.0	48.0 – 62.0
6 Number of seeds/pod		12.0 – 13.0	11.0 – 12.0

incidence, which PLS 334 recoded 48.7 per cent (Table 5).

#### Grain quality

The culture COGG 973 has good organoleptic traits and is nutritionally rich with high protein content of 20.21 per cent (Table 7).

#### Morphological characters

The greengram culture COGG 973 matures in 55 – 60 days. It has erect growth habit with a plant height ranging from 55 – 65 cm. Immature pods are dark green, drooping and ranging from 65 to 91 per plant. The seeds are dull green, drum shaped and

**Table 7. Physical, batter, protein and organoleptic characters of greengram culture COGG 973**

Parameters	COGG 973	Co(Gg) 7
100 grain wt.(g)	3.4	4.0
Bulk density (m <sup>3</sup> /kg)	799	820
Protein content (%)	20.21	17.02
Water absorption during soaking (ml)	34	22
Weight after soaking (g)	128	115
Volume of batter (ml)	80	60
Weight of batter (g)	133	118
Sensory evaluation of greengram dhal bonda		
Appearance	8.75	8.25
Colour	8.50	8.25
Flavour	7.25	7.50
Texture	7.00	7.00
Taste 7.50	6.50	
Overall acceptability	7.00	7.00

#### Overall acceptability 9-1

9- Like extremely; 8- Like very much; 7- Like moderately; 6- Like slightly; 5- Neither like nor dislike; 4- Dislike slightly  
3- Dislike moderately; 2- Dislike very much; 1- Dislike extremely

medium bold with 100 seeds weight ranging from 3.5 to 4.0 g (Table 6).

The culture COGG 973 possess superior features viz., high yield, short duration, synchronized maturity, suitable for single / mechanical harvest, medium bold seeds, high protein content and good organoleptic traits. It is suitable for intercropping with maize and in redgram drip fertigation system. It is resistant to yellow mosaic disease and stem necrosis and moderately resistant to root rot. It is moderately resistant to aphids and stemfly. Hence, it was released as greengram Co 8 for commercial cultivation during 2012. The variety is best suited for cultivation during *khari* and *rabi* seasons in Tamil Nadu.

#### References

AICRP on MULLaRP Report. 2012. Indian Institute of Pulses Research, Kanpur.

Jayamani, P., Kumaravadeivel, N., Muthiah, A.R., Subbalakshmi, B., Kalaimagal, T., Veerabhadhiran, P., Rajarathinam, S., Raveendran, T.S., Alice, D. and Durairaj, C. 2006. Co (Gg) 7 – An early maturing, high yielding greengram variety. *Madras Agric. J.*, **93** (7-12): 253-255.

Mayee, C. D. and Datar, V.V. 1986. *Phytopathometry*. Technical Bulletin No.1. Marathwada Agricultural University, Parbhani, 145 – 146.

Pawar, S.E. and Bhatia, C.R. 1980. The basis for grain yield difference in mungbean cultures and identification of yield limiting factors. *Theor. Appl. Genetics*, 57:171 -175.

Reddy, A.A. 2004. Consumption pattern, Trade and Production potential of pulses. *Economic and Political weekly*, 4854 – 4860.

Singh, B.R., Chandra, S. and Ram, S. 2000. Evaluation of mungbean varieties against yellow mosaic virus. *Annals of plant protection sciences*, **8**(2): 233-280.