Original Research Article

Assessment of Green Gram Varieties for Better Yield in Western Tamil Nadu, India

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ABSTRACT

Pulses occupy a very important position in Indian Agriculture. Being nitrogen fixers, they help to restore the soil fertility. Their protein composition makes up for the overcoming the deficiency of essential amino acids in cereal and millets. India is the largest producer, consumer and importer of pulses in the World. Green gram (*Vigna radiata* L.) commonly known as moong, an important pulse crop in India. It produces about 1.5 to 2 million tons of moong annually from about 3-4 million ha area with an average productivity of 500 kg ha^{-1} and accounts for about 10-12 per cent of total pulse production. In Tirupur district, Tamil Nadu, pulses is the major crop, which is cultivated in nearly 10,000 ha. Very old and most disease susceptible green gram variety VBN 2 is predominantly grown by Tiruppur farmers and this variety is more susceptible to Yellow Vein Mosaic Virus (YMV), which leads to spend higher cost towards control of pest and disease and resulted in yield and income. To overcome this problem, Krishi Vigyan Kendra, Tamil Nadu Agricultural University, Tirupur has conducted On Farm Testing (OFT) in green gram during the year 2021-22. Ten farmers were selected in different locations of Tirupur district in Tamil Nadu. Critical input *viz*., seeds of greengram varieties CO 8 and DGG 1 were distributed to the farmers and the varietal performance were assessed along with the existing variety VBN 2. The yield attributing parameters such as number of pods / plants, pest and disease incidence (%), yield (q/ha) and B:C ratio were recorded. The results revealed that, between these two varieties, Green gram CO 8 was recorded the highest number of pods (42) and minimum incidence of yellow mosaic virus disease of 3.2 per cent resulting in the highest yield of 9.5 q/ha followed by DDG 1 with 34 pods/plant, disease incidence of 7.3 per cent and yield of 8.4 q/hacompared to the existing variety VBN 2, which recorded the lowest number of pods (31), yield (7.6 q/ha) with the highest pest and disease incidence (12.5%). The higher B:C ratio was recorded ingreengram variety CO 8 (2.25). It was concluded that, farmers

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of Tirupur district in Tamil Nadu were satisfied with cultivation of greengram CO 8 variety due to the lowest pest and disease incidence, higher yield and BC ratio.

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Key Words: Green gram, Varieties, On Farm Testing, Yield improvement, B: C ratio.

INTRODUCTION:

Pulses are good and cheaper source of protein, which indicate the great importance in the daily food habits. Pulse crops have the ability to fix the atmospheric nitrogen and addition of organic matter to soil, which are important factors to maintain soil fertility (Kumar and Singh, 2014). The total world acreage under pulses is about 93.18 Mha with production of 89.82 Mt and productivity of 964 kg/ha. India is the largest pulse producing country in the World in an area of 28 M ha. It ranks first in area and production with 31 per cent and 28 per cent respectively. The productivity of pulses has been increased to 885 kg/ha during the year 2020-21. India is the largest producer, consumer and importer of pulses in the world(Jeevitha et. al., 2022). It accounts for 33 per cent of world area and 22 per cent of the total World production of pulses (Sandhu and Dhaliwal, 2016). Green gram (*Vigna radiata*) commonly known as moong, an important pulse crop in India and about 1.5 to 2.0 Mt of moong annually produced from 4.0 million ha area with an average productivity of 500 kg/ ha and accounts for about 10-12 per cent of total pulse production. The total coverage under mungbean has been about 46 Lha with a production of 24 Lt. There has been phenomenal increase in area of mungbean in the country from 2015-16 onwards. In the country Rajasthanoccupies the first position with 46 per cent area and 45 per cent of production in the total mungbean contribution. More than 90 per cent of mungbean production comes from Rajasthan, Madhya Pradesh, Maharashtra, Karnataka, Bihar, Odisha, Gujarat, Andhra Pradesh and Tamil Nadu. In Tamil Nadu, it is grown on about 42.38 lakh hectares with a total production of 30.9 lakh tonnes and a productivity of 729.1 kg/ha and contributes 12% to the total pulse production in the year 2020-21.

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Mung bean (Vigna radiata (L.)is indigenous to India or Indo-Burma region and is the third most important self-pollinated, short-duration grain legume crop after chickpea and pigeonpea. The central Asian region is believed to be the primary center of genetic diversity for mungbean (Kumar and Kumar, 2014).It contains a relatively high proportion of easily digestible good quality protein (24%) with low flatulence and is also rich in iron contents (40–70 ppm), making it an ultimate choice for balanced diets (Vairam et al., 2016). Mung bean yellow mosaic disease is transmitted by the vector, the whitefly (Bemisiatabaci). It is found to spread the begomoviruses, the major hazard to the flourishing production of mungbean in India, Sri Lanka, Pakistan, Bangladesh, Papu New Guinea, Philippines and Thailand (Haq et al. 2011a). The most conspicuous symptom on the foliage starts as small yellow specks along the vein-lets and spreads over the lamina; the pods become thin and curl upwards. Extensive records from the past showed that the disease occurs with different intensities in all of the mungbean producing areas in and around Asia. Depending on the severity of the disease infection, theyield reduction may reach up to 85%. Quite a lot of disease management strategies have been developed or implemented for MYMV disease and so far, no complete resistance to this disease has been incorporated into any of the commercially available mungbean cultivars. The disease still poses a major crisis to the economic production of this crop in the Asian subcontinent. This disease is important, serious, destructive, wide spread and inflicts heavy loss annually. It was first identified in India in 1955 and is naturally transmitted by whitefly (*Bemisiatabaci Genn.*), but not by mechanical inoculation or by seed (Nariani 1960). YMV infected plants bear few flowers and pods with someimmature and deformed seeds, thus affecting the yieldboth qualitatively and quantitatively. Pods of the infectedplants are reduced in size and turn yellow in colour. Insevere cases, other plant parts become completely yellow. Disease infection decreases the photosyntheticefficiency and as a consequence the yield of the crop isaffected (Malathi & John 2008b).Yellow mosaic disease incidence has been reported as high as 100 percent in susceptible cultivars in farmers' fields. The virus poses a major threat to green gram production globally, demanding urgent attention and effective management practices. Various management approaches have been employed to mitigate the impact of YMV. To overcome this problem, Tamil Nadu

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Agricultural University has released MYMV resistant, short duration (55-60 days) greengram CO 8 variety, which is suitable for single harvest. But, most of the farmers of Tamil Nadu are using only the old variety VBN 2, which is moderately resistant to MYMV. A participatory rural appraisal study was conducted to assess the greengram varieties used by the farmers for cultivation in Thiruppur District of Tamil Nadu. The study revealed that due to non awareness of the recently released MYMV resistant greengram CO8 variety, the farmers are cultivating very old greengram variety VBN 2 which is low yielding, susceptible to Moongbean Yellow Mosaic Virus (MYMV), leaf crinkling and powdery mildew diseases. This MYMV is transmitted through the vector whitefly (*Bemisiatabaci* Genn.). For control of these vector, farmers are using pesticides indiscriminately which leads to environmental pollution and higher cost of cultivation. Besides, several biotic, abiotic and socio-economic constraints inhibit exploitation of the yield potential of green gram and these are needed to be addressed. Crop growth and yield are limited through poor plant nutrition and uncertain water availability during the growth period. Inappropriate management of the crop may further reduce the yield and fertility of soil. Therefore, it was considered to evaluate the growth and yield parameters of two selected high yielding varieties of greengram in farmer's field of Tiruppur district of Western Tamil Nadu to identify the most suitable variety for Moogbean Yellow Mosaic Virus (MYMV) resistance and obtaining higher yield and B:C ratio.

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MATERIALS AND METHODS

The present On Farm Test (OFT's) were conducted during *Kharif* 2020 at three villages in Pongalur block of Tiruppur district, Tamil Nadu. Ten farmers' were randomly selected in each village and sowing was taken up with two high yielding improved varieties of green gram *viz*., CO 8 released by Tamil Nadu Agricultural University and DDG 1 by University of Agricultural Science, Dharward in seven replications along with one check variety VBN 2, which is commonly cultivated by the farmers. For all the three varieties, existing farmer's cultivation practices and improved crop management techniques were adopted. The details of the cultural practices followed were given in Table1. The recommended weed control measures and irrigation were applied

according to requirement of crop. The plant physiological and yield parameters like average number of nodules/plants, plant height, number of branches, number of pods/plant and yield were recorded.

Table 1. Details of greengram cultivation practices in Tirupur district, Tamil Nadu **under OFT programme**

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Sl. No.	Cultural operation	Existing cultivation practice	Improved cultivation practice
1.	Variety	VBN 2	CO 8 and DDG 1
2.	Seed rate	25-30 kg/ha	20 kg/ha.
3.	Seed quality	Farm saved seeds	Certified seeds
4.	Seed treatment	No seed treatment	Seed treatment with Biofertilizers and Pseudomonas
5.	Method of sowing	Broadcasting	Line sowing
6.	Weed management	Hand weeding	Integrated weed management
7.	Fertilizer application	Indiscriminate application	Integrated Nutrient Management with recommended fertilizer dose
8.	Foliar application of nutrient	No foliar application	TNAU pulse wonder @ 5 kg/ha
9.	Plant protection	Indiscriminate application	Integrated Pest management

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The height of the plant was measured from the ground level to the tip of the main branch at maturity (60 days after sowing) from ten plants in each variety and the mean expressed in cm. Total number of pods in each variety were counted at maturity and the mean plant^{-1} was arrived. The technology gap, extension gap and technology index were assessed by using the formula given by Samui *et al* (2000).

Technology gap = Potential yield – yield obtained with improved practices

Extension gap = Improved practices yield– Farmers yield

$$\text{Technology Index} = \frac{\text{Technology Gap}}{\text{Potential Yield}} \times 100$$

The MYMV disease incidence was recorded at 45 days after sowing. In each plot, the total numbers of healthy plants, as well as virus-infected plants were counted separately and the percentage of the infection was calculated by using the following formula.

$$\text{Total number of infested plants} = \frac{\text{Percent MYMV disease incidence}}{\text{Total number of plants}} \times 100$$

RESULTS AND DISCUSSION

The result indicated that more number of nodules were found in CO 8 variety which was significantly superior (12.8 Nos.) followed by DDG 1 (10.5 Nos.). The farmers used variety VBN 2 recorded the lowest number of nodules (6.5 Nos.)(Table 2). This might be due to decrease in P-adsorption or fixation and enhanced phosphorus availability with application of organic manures resulting in better growth and consequently exploitation of greater soil volume for modulation (Choudhary *et al.,* 2011). The maximum plant height was recorded in variety CO 8 (48.3 cm) over DDG 1 (45.6 cm) and VBN 2 (43.2 cm). The variety CO 8 produced more number of branches per plant (9.6) followed by DDG 1 (8.4) and VBN 2 (7.3). The reason may be attributed to the genetic variability and varietal difference, environmental adaptability and adoption of improved cultivation practices. Similar results were reported by Samant (2014) in greengram. The variety CO 8 recorded more number of pods/plant (42.0) which was significantly higher over the variety DDG 1 (34.0) and VBN 2 (30.0). The positive effect

of phosphorus application on number of pods/plants might be due to better enzymatic activities which control flowering and pod formation (Kumar and Singh, 2014).

Table 2. Performance of greengramvarieties on growth parametersand yield attributes

Treatments	Nodules	Plant height (cm)	No. of Branches	No. of pods/ plant	No. of grain/ pod	Disease incidence (%)	Yield (q/ha.)
Famers' practice VBN 2	6.5	43.2	7.3	30	11.0	12.5	7.6
CO 8	12.8	48.3	9.6	42	11.8	3.2	9.5
DDG 1	10.5	45.6	8.4	34	11.4	7.3	8.4
CD *P*< (.05)	2.32	1.64	.61	1.72	.16	1.41	.42

** Significant at 5% level of probability*

The variety CO 8 recorded the maximum number of grain/ pod (11.8) which was significantly superior to DDG 1(11.4) whereas, the farmers' used variety had minimum grain/pods (11.0). The reason may be attributed towards the genetic variability and grain size.The disease incidence (%) ranged between 3.2 to 7.3 per cent in two varieties whereas, the farmers' practice recorded 12.5 per cent (Table 2). The maximum yield was recorded in green gram CO 8 (9.5 q/ha) which was significantly superior to DDG 1 (8.4 q/ha). However, the variety VBN 2 recorded the lowest yield of 7.6 q/ha. The similar result was observed by Kathiravan and Vanitha (2017) in paddy and they reported that the replacement of old varieties and farmers' practice by high yielding varieties with improved production technology increased the productivity in rice. Cutivation of groundnut variety CO 7 with improved production technology recorded 15 per cent more number of pods per plant and 17 per cent higher pod yield (Marimuthu and Kathiravan 2019). Similar findings have been observed by Anuratha et al (2019) in greengram.

Table 3. Yield, technology gap, extension gap and technology index of greengram varieties

Name of Variety	Yield (q/ha.)			Per cent increase	Technology gap (q/ha)	Extension gap (q/ha)	Technology index (%)
	Potential yield (q/ha)	Improved practices	Farmers' Practice(VBN 2)				
CO 8	11.0	9.5	7.6	25.0	1.5	1.9	13.63
DDG 1	12.0	8.4	7.6	15.8	3.6	0.8	30.00

The technology gap ranged between 1.50 to 3.60 q/ha (Table 3). The observed technology gap was due to various constraints such as improved varieties, soil fertility, availability of low moisture content and climatic hazards *etc*. Hence, to reduce the yield gap, location specific recommendations for varieties, soil testing and timely sowing appears to be necessary. A value of 0.8 to 1.9 q/ha of extension gap was found (Table 3). There is a need to decrease this wider extension gap through demonstration of latest techniques and imparting knowledge to farmers through training programme. These findings were similar to the findings of Jain (2016) and Kushwah*et al* (2016). The technology index showed the suitability of varieties at farmer's field and lower technology value indicated that feasibility of variety adoption among the farmers is more. The technology index ranged from 13.63 to 30.00per cent (Table 3). The finding was in accordance to finding of Sandhu and Dhaliwal (2016).

Table 4. Yield and economics of greengram varieties

Variety	Yield (q/ha)	Economics of Trials (Rs. /ha)			
		Gross cost	Gross income	Net income	B:C Ratio
Famers' practice VBN 2	7.6	24000	60800	36800	2.53
CO 8	9.5	26000	76000	50000	2.92
DDG 1	8.4	26000	67200	41200	2.58

The greengramvariety CO 8 recorded the highest net income of Rs. 50000/- and Benefit Cost Ratio (2.92) over the varieties DDG1 (Rs.41200/ and 2.58, respectively) and VBN 2 (Rs. 36800/ and 2.53, respectively) (Table 4).

CONCLUSION

The results revealed that among the varieties, greengram CO 8 recorded the highest number of pods (42) and minimum incidence of Mungbean Yellow Mosaic Virus (MYMV) disease of 3.2 per cent resulting in the highest yield of 9.5 q/ha followed by DDG 1 with 34 pods/plant, MYMV disease incidence of 7.3 per cent and yield of 8.4 q/hacompared to the existing variety VBN 2 which recorded the lowest number of pods (30), yield (7.6 q/ha) with the highest disease incidence (12.5%). The higher B:C ratio was recorded ingreengram variety CO 8 (2.25). It was concluded that, farmers of Tirupur district in Tamil Nadu were satisfied with cultivation of greengram CO 8 variety due to the lowest MYMV disease incidence, higher yield and BC ratio.

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