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Physiological analysis of pre and post harvest parameters of different green gram cultivars

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Abstract

The experiment was carried out at Department of Agricultural Botany, VNMKV Parbhani to study the “Physiological Analysis Of Pre And Post Harvest Parameters Of Different Green Gram Cultivars” during *kharif* season of 2019-2020. The soil of the experimental field was deep black, well drained, the experiment was laid out in randomized block design with three replications which comprised of Seven varieties viz; BM-4, BM-2002-1, BM-2003-2, BPMR-145, PKV AKM-4, PKV Green Gold, VAIBHAV. Sowing was done by dibbling on 03 July, 2019.

From the experimental findings, the variety BM-2003-2 recorded overall better performance over other varieties in respect of pre and post harvest parameters, yield contributing characters and yield in the given environment. This variety needs to be tested further in future.

Keywords: Green gram, pre and post harvest parameters, yield, cultivars

Introduction

The word legume is derived from the word ‘lerge’ which means ‘to gather’ because the pods have to be gathered or picked by hands, as distinct from reaping the cereal crops. Pulses, best known as “poor man’s meat”, constitute the major source of dietary protein of the large section of vegetarian population of the world. On an average, pulses contain 20 to 30 per cent protein, which is almost 2.5 to 3.0 times the value normally found in cereals. Besides their high nutritional value, they have a unique characteristic of maintaining and restoring soil fertility through biological nitrogen fixation and thus play a vital role in sustainable agriculture (Asthana, 1998) [2]. Pulses occupy 68.32 m. hectares and contribute 57.51 million tonnes to the world food basket (Chaturvedi and Ali 2002) [5].

Green gram is the third most important pulse crop in India covering an area of 3.53 million hectare with a total production of 1.49 mt. and the average productivity of 532 kg/ha (Iranra and Kajjidoni, 2008) [6]. Important green gram growing states in India are Orissa, Andhra Pradesh, Maharashtra, Karnataka and Bihar. The area under green gram in Maharashtra is 3.85 lakh ha with production of 0.72 lakh tonnes and productivity of 187 Kg/ha. During 2015-16 (Anonymous 2016) [1].

Mung bean has a tremendous potential for horizontal expansion. The crop is not only ideal for catch cropping but also serve as a excellent cover crop to protect soil erosion and also as a green manure crop to maintain the soil fertility. Apart from soil fertility improvement, mungbean serves as a source of protein (24.00%) to vegetarian people of India. Amongst the pulses, mungbean ranks second in the nutritive value.

Mung dal and Mung dal chawal is an important ingredient in the average Indian diet. The biological value improves greatly, when wheat or rice is combined with green gram because of the complementary relationship of the essential amino acids. It is particularly rich in Leucine, Phenylalanine, Lysine, Valine, Isoleucine, etc.

In addition to being an important source of human food and animal feed, green gram also plays an important role in sustaining soil fertility by improving soil physical properties and fixing atmospheric nitrogen. It is a drought resistant crop and suitable for dry land farming and predominantly used as an intercrop with other crops.

Marathwada region of Maharashtra state is known for the cultivation of *Kharif* pulses particularly red gram, green gram and black gram.

The efforts are being made to boost the yield of pulses by using the different technology like release of new varieties, fertilizer application, cultivation practices and pest management etc, even though yield level is not increased upto expectation. In analysis studies, it is observed that yield fluctuation is due to late sowing, poor management and unstable prices also.

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The crop is mainly grown under rainfed conditions, and sowing is completely depending upon onset of monsoon. The late sown crop always yields less than the early sown crop. Therefore, it is felt necessary to study growth and development performance of different varieties under rainfed conditions and find out a suitable variety which gives more yields.

Material and Method

The present experiment was conducted at Research Farm of Department of Agricultural Botany, Vasant Rao Naik Marathwada Krishi Vidyapeeth, Parbhani.

The details of the material used and methods adopted during the present investigation presented in this chapter. The investigation was carried out at Experimental Farm, Department of Agricultural Botany, Vasant Rao Naik Marathwada Krishi Vidyapeeth, Parbhani. The field selected for experiment is uniform with typical medium soil having medium fertility and fairly good drainage. Agro climatically Parbhani is situated at latitude, longitude and altitude of 19° 16' N, 76° 47' E and 409 m, respectively. Parbhani district falls under Central Maharashtra Plateau agro-climatic zone (MH-7) in Maharashtra. The district receives annual rainfall of 916.0 mm of which 790.0 mm is received soon south west monsoon and 91.0 mm in North East monsoon. The experiment was laid out in Randomized Block Design with three replications. The treatment comprised of seven different varieties viz. BM-4, BM-2002-1, BM-2003-2, BPMR-145, PKV AKM-4, PKV Green Gold, VAIBHAV. The seeds were sown with spacing row to row 45 cm and plant to plant 15 cm on dated 03-07-2019.

Result and Discussion

Physiological Analysis of Pre and Post Harvest Parameters of Different Green Gram Cultivars

Pre harvest Parameters

Days to 50% flowering

The data on mean number of days to 50% flowering as influenced by different treatments is presented in table 1.

Variety BM-2003-2 recorded significantly early flowering over rest of the varieties, however, the varieties BPMR-145 recorded late flowering. The results of investigation are in confirmation with the finding made by Ayyangouda *et al.* (2003) [3], Rajesh *et al.* (2014) [10] in green gram.

Days for physiological maturity

The mean number of days for physiological maturity was significantly influenced by different treatments is presented in table 2.

The differences amongst the varieties for physiological maturity were significant. The variety BM-2003-2 recorded early physiological maturity (58.92 Days) over rest of the varieties, However, the variety BPMR-145 recorded late maturity (64.57 Days). The results of investigation are in confirmation with the finding made by Rajesh *et al.* (2014) [10] in green gram

Germination count on field

The data on Mean Germination count on field as influenced by different treatments is presented in table 3.

The emergence count was found to be non-significant indicating that the uniform emergence in all treatments. Amongst the varieties BM-2003-2 and BM-4 recorded

maximum and minimum germination count respectively. The results of investigation are in confirmation with the findings made by Baskaran *et al.* (2009) [4] in green gram.

Plant height (cm)

The data in respect of mean plant height of Green Gram as significantly influenced by different treatments is presented in table 4.

The plant height was found to be increased continuously up to harvest. The increase in plant height was slow during initial stage up to 30 days. It was very fast during 30-60 days and again was decreased with increasing order from 60 days onwards. The gross mean maximum plant height of 44.90 cm per plant was recorded at harvest. The differences amongst the varieties were significant at all the stages. The variety BM-2003-2 was significantly higher plant height than the rest of varieties, The varietal differences in respect of plant height were also reported by Yadahalli *et al.* (2006) [12] and Nayak *et al.* (2014) [9].

Functional leaves plant⁻¹

The data in respect of mean functional leaves per plant of Green Gram as significantly influenced by different treatments is presented in table 5.

The mean number of functional leaves per plant were 32.57, 50.34, 25.48, and 13.43 at 30, 45, 60 DAS and at harvest, respectively. The mean numbers of functional leaves were increased up to 45 DAS and then it decreased due to leaf senescence. The mean numbers of functional leaves were produced by BM-2003-2 (58.00) at 45 DAS were maximum and also at other stages. The results of investigation are in confirmation with the finding made by Nayak *et al.* (2014) [9], Rathore *et al.* (2010) [1].

Leaf area plant⁻¹ (cm²)

The data in respect of mean of Leaf area Green Gram as significantly influenced by different treatments is presented in table 6.

The leaf area per plant increased up to 60 DAS and later on it decreased slowly due to leaf senescence. The mean leaf area was 163.70 cm², 375.48 cm², 672.75 cm² and 564.68 cm² at 30, 45, 60 DAS and at harvest. Data recorded amongst the varieties was significant at all the stages. The variety BM-2003-2 recorded significantly maximum leaf area over other varieties. The varietal differences in respect of leaf area per plant were also reported by Nayak *et al.* (2014) [9].

Post Harvest Parameters

Mean number grains pod⁻¹

The data on mean number of grains per pod as affected by various treatments is presented in table 7.

The differences amongst the varieties were significant to number of grains per pod. The variety BM-2003-2 recorded significantly higher number of grains per pod as compared to BM-2002-1. The varietal differences for grains per pod were also reported by Mondal *et al.* (2011) [8].

Mean number pods plant⁻¹

The data on mean number of pods per plant as affected by various treatments is presented in table 7.

The differences amongst the varieties were significant for number of pods per plant. Variety BM-2003-2 recorded significantly higher number of pods per plant over rest of

cultivars; however, it was at par with BM-2002-1 and PKV Green Gold the results of investigation are in confirmation with the finding made by Marimuthu and Surendran (2015) [7].

Grain yield /plant/plot/hectare

The data on grain yield per plant as affected by various treatments is presented in table 7. In general BM-2003-2 has significantly higher grain yield per plant, per plot and per hectare over rest of the varieties and is in conformity with finding made by Mondal *et al.* (2011) [8].

Test weight (100 grain weight)

The data on Test Weight as affected by various treatments is presented in table 7.

The non significant differences amongst varieties for test weight. The variety BM-2003-2 recorded significantly higher test weight as compared to other varieties. The results of investigation are in confirmation with the finding made by Yadahalli *et al.* (2006) [12]

Harvest Index

The data on Harvest Index as affected by various treatments is presented in table 7. The non significant differences amongst the varieties for harvest index. The variety BM-2003-2 recorded significantly higher harvest index as compared to other varieties. The results of investigation are in confirmation with the finding made by Mondal *et al.* (2011) [8].

Table 1: Days to 50% flowering

Varieties	Days to 50% flowering
BM-4	37.50
BM-2002-1	37.33
BM-2003-2	35.17
BPMR-4	41.23
PKV AKM-4	37.00
PKV Green Gold	40.84
VAIBHAV	37.65
S.E.±	1.08
C.D. at 5%	3.33
G.M.	38.10

Table 2: Days for physiological maturity

Varieties	Days for physiological maturity
BM-4	60.58
BM-2002-1	61.35
BM-2003-2	58.92
BPMR-145	64.57
PKV AKM-4	62.06
PKV Green Gold	61.77
VAIBHAV	62.95
S.E.±	0.75
C.D. at 5%	2.32
G.M.	61.74

Table 3: Germination count on field

Varieties	Germination count on field
BM-4	83.62
BM-2002-1	86.45
BM-2003-2	87.42
BPMR-4	84.86
AKM-4	83.88
PKV Green Gold	86.07
VAIBHAV	86.51
S.E.±	0.87
C.D. at 5%	NS
G.M.	85.54

Table 4: Plant height (cm) at various stages of crop growth

Varieties	Days after sowing			
	30 DAS	45 DAS	60 DAS	At harvest
BM-4	16.14	37.40	40.80	43.26
BM-2002-1	18.27	38.60	47.78	49.75
BM-2003-2	19.9	44.10	50.20	50.95
BPMR-145	13.1	30.29	34.45	39.77
PKV AKM-4	16.1	38.20	41.92	43.93
PKV Green Gold	17.07	32.10	40.96	42.54
VAIBHAV	16.27	37.62	41.50	44.07
S.E.±	1.13	2.51	2.53	2.20
C.D. at 5%	3.47	7.73	7.78	6.77
G.M.	16.69	36.90	42.52	44.90

Table 5: Number of functional leaves per plant at various stages of plant growth

Varieties	Days after sowing			
	30 DAS	45 DAS	60 DAS	At harvest
BM-4	31.00	49.34	25.52	12.00
BM-2002-1	35.90	56.38	27.00	16.00
BM-2003-2	36.00	58.00	29.00	18.00
BPMR-145	26.39	42.68	20.98	11.00
PKV AKM-4	30.97	45.00	25.00	12.00
PKV Green Gold	34.9	51.14	25.56	13.00
VAIBHAV	32.82	49.84	25.30	12.00
S.E.±	1.75	2.24	1.32	0.96
C.D. at 5%	5.39	6.90	4.07	2.95
G.M.	32.57	50.34	25.48	13.43

Table 6: Mean of leaf area per plant in of different varieties at various stages of crop growth.

Varieties	Days after sowing			
	30 DAS	45 DAS	60 DAS	At harvest
BM-4	149.02	378.07	660.54	540.14
BM-2002-1	177.44	385.00	689.67	580.00
BM-2003-2	188.21	390.33	712.00	610.00
BPMR-145	140.47	342.08	630.00	520.20
PKV AKM-4	146.96	375.00	639.53	542.17
PKV Green Gold	173.54	379.42	691.81	590.00
VAIBHAV	170.23	378.45	685.67	570.23
S.E.±	07.84	05.07	04.42	5.20
C.D. at 5%	24.16	15.63	13.62	16.02
G.M.	163.70	375.48	672.75	564.68

Table 7: Mean of yield attributes of different varieties.

Varieties	No. of grains/ pod	No. of pods/ plant	Grain yield/plant (g.)	Grain yield/ plot (Kg.)	Grain yield/ ha (qt/ha)	Test wt. in (g)	Harvest index in %
BM-4	10.80	23.13	7.20	0.95	8.79	4.23	31.50
BM-2002-1	12.35	26.15	9.16	1.03	10.27	4.51	31.75
BM-2003-2	14.65	29.85	12.20	1.28	11.85	4.85	31.76
BPMR-145	10.72	20.04	6.75	0.9	8.33	4.33	31.05
PKV AKM-4	11.00	22.98	7.30	0.97	8.98	4.18	31.41
PKV Green Gold	12.11	26.43	8.10	0.99	9.16	4.20	31.69
VAIBHAV	11.50	25.02	7.99	0.98	9.07	4.10	31.65
S.E. _±	0.78	1.40	0.61	0.07	0.66	0.15	2.12
C.D. at 5%	2.42	4.30	1.88	0.22	2.03	NS	NS
G.M.	11.88	24.80	8.39	1.01	9.49	4.34	31.54

Conclusion

On the basis of above result concluded that variety BM-2003-2 was superior in respect to pre and post-harvest parameters viz. days to 50% flowering, days to physiological maturity, germination count on field, plant height, functional leaves per plant, leaf area per plant. And also, in respect to yield attributes such as number of grains per pod, number of pods per plant, grain yield per plant, grain yield per plot, grain yield per hectare, test weight and harvest index as compared with other genotypes tested.

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