The Pharma Innovation Journal 2022; 11(12): 2238-2241

www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277-7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2022; 11(12): 2238-2241

www.thepharmajournal.com
Received: 08-10-2022
Accepted: 12-11-2022

SM Mote
M.Sc. (Agri) Department of Agricultural Botany, Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani, Maharashtra, India

AB Bagade
Assistant Professor Department of Agricultural Botany, Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani, Maharashtra, India

PR Thombre
M.Sc. (Agri) Department of Agricultural Botany, Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani, Maharashtra, India

HH Bhadarge
Pearl Millet Breeder, NARP, Aurangabad, Maharashtra, India

Corresponding Author:
PR Thombre
M.Sc. (Agri) Department of Agricultural Botany, Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani, Maharashtra, India

Physiological analysis of growth and yield of green gram cultivars

SM Mote, AB Bagade, PR Thombre and HH Bhadarge

Abstract
The experiment was carried out at Department of Agricultural Botany, VNMKV Parbhani to study the "Physiological Analysis Of Growth And Yield Of 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 physiological parameters, yield contributing characters and yield in the given environment. This variety needs to be tested further in future.

Keywords: Green gram, physiological 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) [6].
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 (Iranna and Kajjidoni, 2008) [7]. 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.

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, Vasantrao 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, Vasantrao 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 19^0 16' N, 76^0 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 Growth and Yield of Green Gram Cultivars

Leaf area plant $^{-1}$ (cm^2)

The data in respect of mean of Leaf area Green Gram as significantly influenced by different treatments is presented in table 1.
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 cm^2, 375.48 cm^2, 672.75 cm^2 and 564.68 cm^2 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) [10].

Absolute growth rate

The data in respect of Absolute growth rate of Green Gram as significantly influenced by different treatments is presented in table 2.
The AGR in varieties was less during 30 (0.08) DAS and at harvest stages (0.045) and higher in 45 (0.076) DAS and 60 (0.070) DAS. The variety BM-2003-2 at 30, 45, 60 DAS stage and at harvest stage recorded more AGR as compared to other varieties. The results of investigation are in confirmation with the finding made by Biswas *et al.* (2002) [5].

Relative growth rate

The data on Relative growth rate as influenced by different treatments is presented in table 3.
The RGR in varieties was increased up to 30 (0.46) and 45 (1.79) 60(2.13) DAS and increased and at harvest decreased upto (2.08). The variety BM-2003-2 at 30, 45, 60 DAS and at harvest stage recorded higher relative growth rate as compared to other varieties. The results of investigation are in confirmation with the finding made by Biswas *et al.* (2002) [5].

Net assimilation rate

The Net assimilation rate was significantly influenced by different treatments is presented in table 4
NAR in different varieties increased upto 45 DAS and there after it decreased. The variety BM-2003-2 at 30, 45, 60, DAS and at harvest stage recorded more NAR as compared to other varieties. The result of investigation are in confirmation with the finding made by Biswas *et al.* (2002) [5].

Leaf area index

The data on leaf area index as affected by various treatments is presented in table 5.
The varietal leaf area index increased up to 30 to 60 DAS and thereafter it decreased. The variety BM-2003-2 at all stages recorded more leaf area index as compared to other varieties.
The varietal differences for leaf area index were also reported by Ayyangouda *et al.* (2003) [3].

Crop growth rate

The data on crop growth rate as affected by various treatments is presented in table 6.
Crop growth rate in varieties was increased up to 60 days and there after it decreased. The variety BM-2003-2 at 30, 45 and 60 DAS and at harvest stage recorded more crop growth rate as compared to other varieties. The results of investigation are in confirmation with the finding made by Biswas *et al.* (2002) [5].

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) [9].

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) [8].

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) [9].

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) [9].

Table 1: 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 2.1: Mean of absolute growth rate in g/plant/day of different varieties at various stages of crop growth. (Plant height)

Varieties	Days after sowing			
	30 DAS	45 DAS	60 DAS	At harvest
BM-4	0.190	0.330	0.599	0.490
BM-2002-1	0.221	0.360	0.630	0.560
BM-2003-2	0.240	0.370	0.640	0.540
BPMR-145	0.215	0.310	0.561	0.520
PKV AKM-4	0.218	0.319	0.590	0.500
PKV Green Gold	0.220	0.350	0.607	0.530
VAIBHAV	0.210	0.340	0.604	0.520
S.E.±	0.01	0.01	0.011	0.035
C.D. at 5%	NS	0.03	0.034	NS
G.M.	0.22	0.34	0.604	0.523

Table 2.2: Mean of absolute growth rate in g/plant/day of different varieties at various stages of crop growth. (Dry matter)

Varieties	Days after sowing			
	30 DAS	45 DAS	60 DAS	At harvest
BM-4	0.072	0.0727	0.0611	0.0409
BM-2002-1	0.084	0.0824	0.0798	0.0528
BM-2003-2	0.086	0.0839	0.0989	0.0576
BPMR-145	0.065	0.0690	0.0500	0.0378
PKV AKM-4	0.074	0.0700	0.0500	0.0392
PKV Green Gold	0.080	0.0807	0.0800	0.0437
VAIBHAV	0.077	0.0800	0.0700	0.0428
S.E.±	0.01	0.003	0.007	0.008
C.D. at 5%	NS	0.010	0.021	NS
G.M.	0.08	0.0769	0.070	0.045

Table 3: Mean of relative growth rate in g/g/day of different varieties at various stages of crop growth

Varieties	Days after sowing			
	30 DAS	45 DAS	60 DAS	At harvest
BM-4	0.43	1.770	2.110	2.090
BM-2002-1	0.53	1.809	2.200	2.150
BM-2003-2	0.63	1.850	2.220	2.200
BPMR-145	0.42	1.750	1.980	1.940
PKV AKM-4	0.36	1.760	2.090	2.000
PKV Green Gold	0.42	1.810	2.200	2.120
VAIBHAV	0.41	1.800	2.110	2.090
S.E.±	0.03	0.01	0.01	0.01
C.D. at 5%	0.10	0.03	0.03	0.04
G.M.	0.46	1.79	2.13	2.08

Table 4: Mean of net assimilation rate in g/dm^2/day of different varieties at various stages of crop growth

Varieties	Days after sowing			
	30 DAS	45 DAS	60 DAS	At harvest
BM-4	0.051	0.550	0.599	0.387
BM-2002-1	0.062	0.580	0.630	0.455
BM-2003-2	0.071	0.590	0.640	0.462
BPMR-145	0.044	0.530	0.561	0.360
PKV AKM-4	0.052	0.540	0.590	0.369
PKV Green Gold	0.060	0.570	0.607	0.454
VAIBHAV	0.057	0.563	0.604	0.449
S.E.±	0.00	0.010	0.012	0.017
C.D. at 5%	0.01	0.031	0.036	0.052
G.M.	0.06	0.560	0.609	0.419

Table 5: Mean of leaf area index of different varieties at various stages of crop growth

Varieties	Days after sowing			
	30 DAS	45 DAS	60 DAS	At harvest
BM-4	0.199	1.32	1.490	1.360
BM-2002-1	0.208	1.42	1.560	1.390
BM-2003-2	0.227	1.46	1.600	1.410
BPMR-145	0.178	1.25	1.450	1.340
PKV AKM-4	0.189	1.32	1.460	1.350
PKV Green Gold	0.208	1.42	1.550	1.380
VAIBHAV	0.200	1.38	1.530	1.370
S.E.±	0.007	0.01	0.017	0.013
C.D. at 5%	0.023	0.04	0.052	0.041
G.M.	0.201	1.37	1.520	1.371

Table 6: Mean of crop growth rate in g/dm^2/day of different varieties at various stages of crop growth

Varieties	Days after sowing			
	30 DAS	45 DAS	60 DAS	At harvest
BM-4	0.033	0.113	0.759	0.349
BM-2002-1	0.036	0.130	0.799	0.370
BM-2003-2	0.041	0.139	0.823	0.377
BPMR-145	0.027	0.089	0.709	0.330
PKV AKM-4	0.032	0.101	0.745	0.346
PKV Green Gold	0.036	0.125	0.780	0.363
VAIBHAV	0.034	0.116	0.759	0.361
S.E.±	0.001	0.006	0.013	0.008
C.D. at 5%	0.004	0.019	0.040	0.024
G.M.	0.034	0.116	0.768	0.357

Table 7: Mean of yield attributesof different varieties.

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

Conclusion

On the basis of above result concluded that variety BM-2003-2 was superior in respect of physiological parameters *viz.* leaf area per plant, absolute growth rate, relative growth rate, net assimilation rate, leaf area index, crop growth rate. And also, in respect of 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 and harvest index as compared with other genotypes tested.

References

1. Anonymous; c2016. http:// faostat.fao.org/foodstat/collections.
2. Asthana AN. Pulse crops research in India. Indian J Agric. Sci. 1998;68:448-452.
3. Ayyangouda Patil Kajjidoni ST, Salimath PM. Genetic analysis of morphophysiological traits in green gram, Karnataka J Agric. Sci. 2003;16(4):542-547
4. Baskaran L, Sundaramoorthy P, Chidambaram ALA, Sankar Ganesh K. Growth and physiological activity of green gram (*Vigna radiata* (L).) under effluent stress. Botany Research International. 2009;2(2):107-114.
5. Biswas DK, Haque MM, Hamid A, Ahmed JU, Rahman MA. Influence of plant population density on growth and yield of two black gram varieties. Journal of Agronomy, 2002;**1**:83-85,
6. Chaturvedi SK, Ali M. Poor man's meat needs fresh fillip. The hindu survey I Agric; c2002. p. 63.
7. Iranna Nagaral and Kajjidoni ST. Estimation of genetic variability parameters among advanced breeding lines of mungbean. Journal of Food legume. 2008;12(1):63-64.
8. Marimuthu S, Surendran U. Effect of nutrients and plant growth regulators on growth and yield of black gram in sandy loam soils of Cauvery new delta zone, India. Cogent Food & Agriculture. 2015;1:1010415.
9. Mondal MMA, Fakir MSA, Nurul Islam M, Samad MA. Physiology of seed yield in mungbean: growth and dry matter production. Bangladesh J Bot. 2011 December;40(2):133-138.
10. Nayak Sharad, Chavan DA, Waghmare YM. Effect of different spacings on growth and yield of black gram (*Vigna mungo* (L.) Hepper) varieties. 3rd International Conference on Agriculture & Horticulture (October27-29, 2014 Hyderabad International Convention Centre, India; c2014.
11. Rajesh K, Narender Reddy S, Pratap Kumar Reddy A, Gopal Singh B. A comparative study of plant growth regulators on morphological, seed yield and quality parameters of green gram. International journal of applied biology and pharmaceutical technology; c2014.
12. Rathore RS, Singh RP, Nawange DD. effect of land configuration, seed rates and fertilizer doses on growth and yield of black gram [*Vigna mungo* (L.) hepper]. Legume Res. 2010;33(4):274-278.
13. Yadahalli GS, Palled YB, Hiremath SM. Effect of sowing dates and phosphorus levels on growth and yield of black gram genotypes. Karnataka J Agric. Sci. 2006;19(3):682-684.