Original Research Article

EFFECT OF PLANT SPACING AND ORGANIC NUTRIENT MANAGEMENT ON GROWTH AND YIELD ATTRIBUTES OF GREEN GRAM (*Vigna radiata* L.)

Abstract

The field experiment ~~entitled Effect of plant spacing and organic nutrient management on growth and yield attributes of green gram (*Vigna radiata* L.)~~ was conducted during *zaid* season of 2021 at the Crop Research Farm, Department of Agronomy, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj (U.P.). The soil of the experiment plot was sandy loam in texture, nearly neutral in soil reaction (pH 7.2), low in organic carbon (0.72%), available N (278.48 kg/ha), available P (27.80 kg/ha) and available K (233.24 kg/ha). The treatments included ~~consisted of~~ three spacings (20 cm x 10 cm, 30 cm x 10 cm and 40 cm x 10 cm), as well as ~~and~~ three organic nutrient managements (4 t/ha Vermicompost + 10% Vermiwash + 10% Jeevamruth at 20 DAS, 5 t/ha Vermicompost + 12% Vermiwash + 5 kg/ha FYM + 12% Jeevamruth at 40 DAS and 6 t/ha Vermicompost + 14% Vermiwash + 6 kg/ha FYM), respectively. The experiment was laid out in a randomized block design with nine treatment~~s~~ combinations and the treatment combinations were replicated thrice. ~~The variety Samrat was sown 12th April 2021 by line sowing.~~ The results obtained showed that growth parameters such as plant height (63.41 cm), number of branches (6.60/plant), and plant dry weight (13.38 g/plant), ~~recorded~~were significantly higher with the application of 30 cm x 10 cm spacing along with ~~+~~ 5 t/ha VC + 12% VW + 5 kg/ha FYM + 12% J at 40 DAS. While yield parameters such as pods (25.52/plant) were ~~obtained~~the highest in 40 cm x 10 cm and~~+~~ 5 t/ha VC + 12% VW + 5 kg/ha FYM + 12% J at 40 DAS. Whereas, seed yield (1,869.82 kg/ha), haulm yield (3,888.33 kg/ha) and harvest index (33.84%) were recorded at their maximum in the treatment combination of 20 cm x 10 cm and~~+~~ 5 t/ha VC + 12% VW + 5 kg/ha FYM + 12% J at 40 DAS. However, ~~in~~from an economic point of view, the maximum gross returns (Rs. 2,28,266.33/ha), net returns (Rs. 1,64,206.33/ha) and benefit: cost ratio (2.89) were obtained ~~highest~~ in the treatment combination of 20 cm x 10 cm ~~+~~and 5 t/ha VC + 12% VW + 5 kg/ha FYM + 12% J at 40 DAS, respectively.

***Keywords*:** Economics, Farmyard Manure, Green gram, Jeevamruth, Seed yield, Vermicompost, Vermiwash,

INTRODUCTION

Green gram locally called as "mung" or "mug" (*Vigna radiata* L.Wilczek) belongs to the family ~~l~~Leguminosae~~aceae~~. Pulses are important not only for their value as human food, but also because of their high protein content for livestock. It has been an important component of agriculture, enabling~~e~~ ~~in~~ the land to restore fertility by fixing atmospheric nitrogen, so as to produce reasonable yields of successful~~succeeding~~ crops and ~~to~~ meet ~~out~~ the demand ~~of~~for dietary requirements regarding proteins, carbohydrates, and other nutrient sources. On an average, ~~P~~pulses contain 22-24% protein, as against 8-10% in cereals. A good amount of lysine is present in pulses. Green gram has a high protein content, with 24% protein, 1.74% fat, 3.5% fiber, and 67% carbohydrates, as well as a high calcium and iron content.~~Green gram is rich protein content contains 24%, 1.74% fat, 3.5% fiber and 67% carbohydrates and also rich source of calcium and iron.~~ It checks ~~the~~ soil erosion. It also forms good silage and green manure ~~crop~~. It has the ability to fix about 22.10kg of atmospheric nitrogen per hectare through its root nodules.

In 2018-19, green gram was cultivated in India ~~in~~on an area of about 9.44 million hectares, with a production of 10.13 million hectares and productivity of 1073 kilograms per hectare. As usual, MP has contributed a significant 36.37% of the total gram area and 45.54% of the total gram production in the country, thereby ranking first both in area and production. Uttar Pradesh contributes about 6.06% in area stands 5th in position

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and 7.18% in production, which put it in ~~stands~~ 4th ~~in position~~place all over India. More than 90% ~~per cent~~ of the production of the country during the period under report has been realized by the 10 states of Madhya Pradesh, Rajasthan, Maharashtra, Uttar Pradesh, Karnataka, Chattisgarh, Andhra Pradesh, Gujarat, and Jharkhand **(Directorate of Economics and Statistics, DAC&FW).**

The crop is mainly cultivated as a rainfed crop under marginal and submarginal conditions without any nutrient management. Generally, ~~the~~ farmers are not adopting any nutrient ~~and~~or bio fertilizer applications. ~~t~~This is a major reason for poor yield in this area. One of the major constraints ~~of~~to the poor yield and spread of green gram~~,~~ is the non-availability of suitable high yielding varieties~~y~~ to replace the traditional varieties. When ~~T~~the ~~C~~crop is grown in neglected lands under residual soil moisture with poor management practices, the crop faces water stress conditions many times, leading to a decrease in productivity and profitability.

Plant spacing and organic nutrient management on green gram growth and yield attributes ~~of green gram is~~ play a vital role for improve the soil physiochemical and biological properties and increase production, productivity and profitability. ~~in green gram.~~ ~~On~~From the point view of sustainability, these practices are~~is~~ helpful, like soil moisture conservation, water holding capacity, and chemical free healthy seeds.

Because a dense plant population will not receive adequate light for photosynthesis and will be prone to disease infestation, spacing is critical in supplying a high yield.~~Spacing plays an important role in supply to the high yield because thick plant population will not get proper light for photosynthesis and high infestation of diseases.~~

On the other hand, a very low plant population will also reduce the output. For the same reason, ~~Due to reason~~ normal population will also reduce the ~~the~~ output. The ~~A~~advantage of optimum spacing under irrigated conditions is due to reduced competition for light, because when the moisture is lacking, light is no longer a limiting factor~~s~~ and the advantage of uniform spacing is lost (Ihsanullah ~~a~~et al., 2002).

Farmyard manure is known to play an important role in improving the fertility and capacity of soils through its positive effects on soil physical, ~~volatility~~volatile, and biological properties ~~and~~as well as the level of plant nutrition. Significant information generated by long-termstudies related to the ability of bulky organic manures to neutralize the rapid yield fall with the continuous use of chemical fertilizers.

Vermicompost is a rich source of N, P, K and micronutrients. Besides containing a good proportion of exchangeable Ca, Mg, Na, etc., it adds organic carbon to the soil and helps to release the nutrients slowly. In vermicompost, some of the secretions of worms and the associated microbes act as growth promoters. It improves the physical, chemical, and biological properties of soil.

Vermiwash is ~~a~~ one ~~of the~~ example~~s~~ ~~for~~of organic liquid fertilizer ~~which~~that is produced with the help of earthworms. Vermiwash contains micro and macro nutrients~~,~~ and hormones ~~which~~that promote plant growth and yield (**Sharma *et al.*, 2005**), increases soil fertility (**Leifeld and Fuhrer, 2010**), reduces agricultural greenhouse gas emissions (**Gomiero *et al.*, 2008**), and reduces nitrogen losses from the system (**Drinkwater *et al.*, 1998**). Furthermore, it is less expensive compared with chemical fertilizer and easier~~e~~ to produce. Vermiwash is an eco-friendly organic liquid fertilizer ~~which~~that could be used as a foliar spray on many different crops (**Jandaik *et al.*, 2015**).

Use~~age~~ of liquid organic manures such as Jeevamruth, microbial consortia, and decomposers results in increased growth and yield of crops and improves the soil physicochemical and biological properties. They contain micro and macro nutrients, many vitamins, essential amino acids, beneficial microorganisms and growth promoting substances ~~viz.,~~like IAA and GA (**Devakumar *et al.*, 2014** and **Tharmaraj *et al.*, 2011**). Jeevamruth is an eco-friendly organic preparation made from cow products. The products ~~from~~ of cow have the ability to bring the flow of cosmic energy, which in turn can revitalize the growth process.

So, there is a need to know the proper spacing to maximize the moog production with efficient organic nutrient management for eastern ~~u~~Utter Pradesh conditions. In ~~sight~~light of the above, ~~the~~a field experiment was carried out to find out the effect of plant spacing and organic nutrient management on the growth and yield attributes of green gram.

MATERIALS AND METHODS

The present experiment, entitled, "Effect of plant spacing and organic nutrient management on growth and yield attributes of green gram (*Vigna radiata* L.)", was conducted during *zaid* season of 2021 at Crop Research Farm, Department of Agronomy, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj (U.P.). The Crop Research Farm is situated at 25.570 N latitude, 87.190 E longitude and at an altitude of 98 m above mean sea level. This area is situated on the right side of the river *Yamuna* and by the opposite side of Prayagraj city. The crop received a mean monthly rainfall of 3.42 mm in May and 3.43 mm in June and zero rainy days were occurred in April month, respectively. The soil of the experimental field was sandy loam having a pH of 7.2, with 0.72 (%) Oorganic carbon. The experiment was laid out in a Randomized Block Design comprised of plant spacing and organic nutrient management with nine treatments, and each were replicated thrice. The variety Samrat was sown on 12th April 12th, 2021 by line sowing. The treatment combinations are T_1 - 20 cm x 10 cm + 4 t/ha Vermicompost + 10% Vermiwash + 10% Jeevamruth at 20 DAS, T_2 - 30 cm x 10 cm + 4 t/ha Vermicompost + 10% Vermiwash + 10% Jeevamruth at 20 DAS, T_3 - 40 cm x 10 cm + 4 t/ha Vermicompost + 10% Vermiwash + 10% Jeevamruth at 20 DAS, T_4 - 20 cm x 10 cm + 5 t/ha Vermicompost + 12% Vermiwash + 5 kg/ha FYM + 12% Jeevamruth at 40 DAS, T_5 - 30 cm x 10 cm + 5 t/ha Vermicompost + 12% Vermiwash + 5 kg/ha FYM + 12% Jeevamruth at 40 DAS, T_6 - 40 cm x 10 cm + 5 t/ha Vermicompost + 12% Vermiwash + 5 kg/ha FYM + 12% Jeevamruth at 40 DAS, T_7 - 20 cm x 10 cm + 6 t/ha Vermicompost + 14% Vermiwash + 6 kg/ha FYM, T_8 - 30 cm x 10 cm + 6 t/ha Vermicompost + 14% Vermiwash + 6 kg/ha FYM, T_9 - 40 cm x 10 cm + 6 t/ha Vermicompost + 14% Vermiwash + 6 kg/ha FYM. The observations were recorded on different parameters at harvest, *viz.* plant height (cm), Bbranches/plant, Nnodules/plant, plant dry weight, Ppods/plant, Sseeds/ pod, Ttest weight (g), Sseed yield (kg/ha), Hhaulm yield (kg/ha), Hharvest index (%) were statistically analyzed and critical difference were concluded

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RESULT AND DISCUSSION

Growth parameters

Plant height

The data pertaining on plant height of green gram recorded at 60 DAS as influenced by plant spacing and organic nutrient management were presented in Table 1. At 60 DAS, maximum plant height (63.41 cm) is recorded in 30 cm x 10 cm + 5 t/ha VC + 12% VW + 5 kg/ha FYM + 12% J at 40 DAS and at par values were noticed in the treatment combination of 40 cm x 10 cm + 5 t/ha VC + 12% VW + 5 kg/ha FYM + 12% J at 40 DAS and 30 cm x 10 cm + 6 t/ha VC + 14% VW + 6 kg/ha FYM (58.82 and 55.48 cm), respectively. The spacing practices had significant effects on plant height. However, an increasing trend with an adequate geometry level could be noticed. This may be due to the competition between the inter and intra plants for sun-light, water, nutrients, and space at closer spacing, which encouraged self-thinning of branches and enhanced vertical growth rather than horizontal growth **(Thavaprakaash, 2017)**. Vermiwash promotes healthier shoot and root growth and improves the nutrient assimilation and uptake by the plant, which results in better growth and development. FYM provides a favourable soil environment and suppliesy more nutrients, thatwhich resultsed in better plant growth and also formsing physico-chemical and biological properties of the soil (**Mishra *et al.*, 2016)**. The higher plant height may also be due to the positive effect of the application of Jeevamruth along with organic manures on the vegetative growth and accumulation of metabolic material. Similar results have been reported by **Palve *et al.* (2011)** and **Tharmaraj *et al.* (2011)**. Similar results have been reported by Palve et al. (2011) and **Tharmaraj et al. (2011).**

Number of branches per plant

The data on number of branches per plant were significantly higher in 30 cm x 10 cm + 5 t/ha VC + 12% VW + 5 kg/ha FYM + 12% J at 40 DAS (6.60/plant). However, 30 cm x 10 cm + 6 t/ha VC + 14% VW + 6 kg/ha FYM (6.33/plant) recorded at par values. Number of branches/plant was found to be significantly higher under wider spacing; this may be attributed to more horizontal growth and plant canopy area under

wider spacing due to less plant density and competition compared to those in closer spacing (**Bahadur and Singh, 2005**). **Number of nodules**

The data on number of nodules per plant at 60 DAS, influenced by different treatment in green gram presented in Table 2. The highest number of nodules (10.03/plant) were observed in 30 cm x 10 cm + 5 t/ha VC + 12% VW + 5 kg/ha FYM + 12% J at 40 DAS and lowest number of nodules (8.87/plant) was observed in 20 cm x 10 cm + 4 t/ha VC + 10% VW + 10% J at 20 DAS. The improvement of nodules population is may be due to the symbiotic association of rhizobium bacteria and the application of organic manures might have enhanced the population of desired microbes in the root zone during the early stage of infection by improving the physical, chemical and biological of properties of soil. Higher population of the desired organisms will always have greater possibilities of infection and consequently formation of more healthy and effective root nodules having higher amount of leghaemoglobin and thus increases the nodule population (**Khan *et al*., 2015**).

Dry weight

The data on dry weight at 60 DAS, was significantly higher in 30 cm x 10 cm + 5 t/ha VC + 12% VW + 5 kg/ha FYM + 12% J at 40 DAS (13.38 g/plant). However, treatments with 40 cm x 10 cm + 5 t/ha VC +12% VW + 5 kg/ha FYM + 12% J at 40 DAS, 30 cm x 10 cm + 6 t/ha VC + 14% VW + 6 kg/ha FYM and 40 cm x 10 cm + 6 t/ha VC + 14% VW + 6 kg/ha FYM (13.23, 11.95 and 11.64 g/plant) were statistically at par to the treatment of 30 cm x 10 cm + 5 t/ha VC + 12% VW + 5 kg/ha FYM + 12% J at 40 DAS, respectively. Higher dry matter production is observed in 30 cm x 10 cm spacing due to better photosynthetic activity due to greater exposure to light and increased availability of nutrients to plants have also resulted in higher root dry weight on the plants results reported by **Salman khan (2017)**.

Fig 1. Mixing of vermicompost

Fig 2. 20 cm × 10 cm line Sowing

Fig 3. Irrigation 35DAS at flowering

Yield parameters

The data pertaining to yield parameters have been presented in Table 2. The important yield parameters Pods/ plant, Seeds/ pod, Test weight (g), Seed yield (kg/ha), Haulm yield (kg/ha) and Harvest index (%), were influenced significantly by various treatment.

Pods per plant

Pods per plant ~~recorded~~had a significant difference among treatment combinations. Significantly higher pods/plant (25.52) was recorded ~~However, pods (25.52/plant) recorded significantly higher~~ in 40 cm x 10 cm + 5 t/ha VC + 12% VW + 5 kg/ha FYM + 12% J at 40 DAS, which was followed by the treatment combinations of 40 cm x 10 cm + 6 t/ha VC + 14% VW + 6 kg/ha FYM, 30 cm x 10 cm + 6 t/ha VC + 14% VW + 6 kg/ha FYM and 40 cm x 10 cm + 4 t/ha VC + 10% VW + 10% J at 20 DAS (24.20, 24.02 and 23.22/plant), respectively.

Seed per pod

Seed per pod was noticed maximum (6.97/pod) in 40 cm x 10 cm + 5 t/ha VC + 12% VW + 5 kg/ha FYM + 12% J at 40 DAS treatment combination. However, least number of seeds (5.87/pod) was noticed in the 20 cm x 10 cm + 4 t/ha VC + 10% VW + 10% J at 20 DAS treatment combination, respectively.

Test weight

Test weight recorded at harvest, is presented in Table 2. The data showed~~n~~ a non-significant effect among the treatments. The highest test weight (32.06 g) ~~were~~was recorded in 40 cm x 10 cm + 5 t/ha VC + 12% VW

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+ 5 kg/ha FYM + 12% J at 40 DAS. ~~While, t~~The lowest test weight (28.92 g) ~~were~~was observed in 20 cm x 10 cm + 4 t/ha VC + 10% VW + 10% J at 20 DAS.

Seed yield

Seed yield recorded a significant difference among treatment combinations. However, ~~S~~seed yield (1869.82 kg/ha) ~~recorded~~was significantly higher in 20 cm x 10 cm + 5 t/ha VC + 12% VW + 5 kg/ha FYM + 12% J at 40 DAS. Whereas, 20 cm x 10 cm + 6 t/ha VC + 14% VW + 6 kg/ha FYM and 20 cm x 10 cm + 4 t/ha VC + 10% VW + 10% J at 20 DAS were noticed at par values (1861.42 and 1634.34 kg/ha), respectively.

Haulm yield

Significantly higher haulm yield was recorded in 20 cm x 10 cm + 5 t/ha VC + 12% VW + 5 kg/ha FYM + 12% J at 40 DAS (3888.33 kg/ha) which was followed by 20 cm x 10 cm + 6 t/ha VC + 14% VW + 6 kg/ha FYM, 20 cm x 10 cm + 4 t/ha VC + 10% VW + 10% J at 20 DAS and 30 cm x 10 cm + 5 t/ha VC + 12% VW + 5 kg/ha FYM + 12% J at 40 DAS(3630.14, 3423.34 and 3179.59 kg/ha) which were presented in Table 2.respectively.

Harvest index

Harvest index recorded at 60 DAS. However, significantly higher harvest index (33.84%) was noticed in 20 cm x 10 cm + 5 t/ha VC + 12% VW + 5 kg/ha FYM + 12% J at 40 DAS which was followed by 20 cm x 10 cm + 6 t/ha VC + 14% VW + 6 kg/ha FYM (32.35%), respectively. This could be due to the fact that organic manures supplied the crop with a balanced nutrition, better translocation of nutrients, better soil conditions, manures are sustaining other growth factors, apparently linked to organic matter and trace elements resulted increased growth and development, leading to greater yield attributes and yield. Application of organic manures, vermiwash and Jeevamruth could have led to increased energy transfers. These manures contain NPK and many other micronutrients, which ~~are present in these manures that~~ are components of many enzymes and their remobilization to reproductive parts of plants. As a result, the increased number of leaves, flowering, fruiting, and seed formation could be attributed to increased yield (**Yadav *et al.*, 2007**).

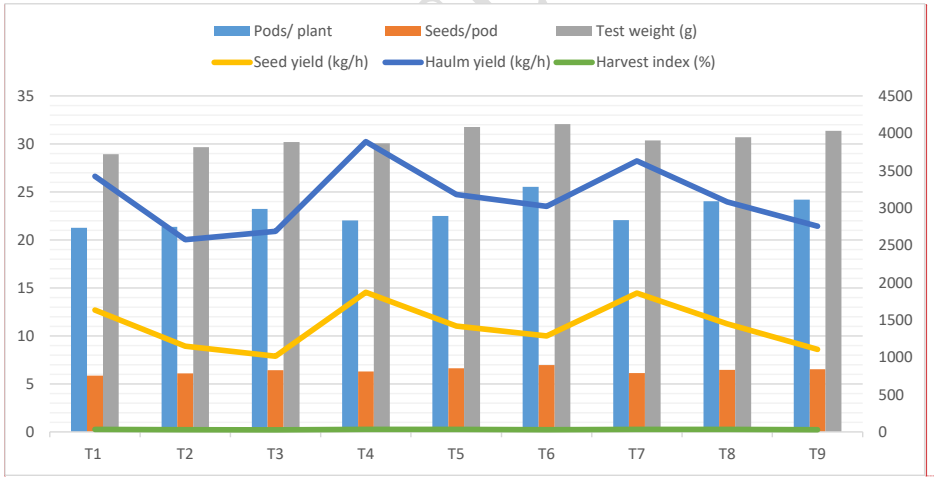

Fig 4: Histogram showing the different Yield parameter

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Table 1. Effect of plant spacing and organic nutrient management on growth attributes of green gram

Treatments	Plant height(cm)	Branches/plant	Nodules/plant	Dry weight (gm per plant)
20 cm x 10 cm + 4 t/ha VC + 10% VW + 10% J at 20 DAS	39.02	4.03	8.87	9.81
30 cm x 10 cm + 4 t/ha VC + 10% VW + 10% J at 20 DAS	45.32	4.17	9.17	10.59
40 cm x 10 cm + 4 t/ha VC + 10% VW + 10% J at 20 DAS	40.96	4.60	8.93	10.02
20 cm x 10 cm + 5 t/ha VC + 12% VW + 5 kg/ha FYM + 12% J at 40 DAS	45.50	5.03	30.06	11.03
30 cm x 10 cm + 5 t/ha VC + 12% VW + 5 kg/ha FYM + 12% J at 40 DAS	63.41	6.60	31.78	13.38
40 cm x 10 cm + 5 t/ha VC + 12% VW + 5 kg/ha FYM + 12% J at 40 DAS	55.48	5.40	32.06	13.23
20 cm x 10 cm + 6 t/ha VC + 14% VW + 6 kg/ha FYM	41.31	4.77	30.36	10.14
30 cm x 10 cm + 6 t/ha VC + 14% VW + 6 kg/ha FYM	58.82	6.33	30.70	11.95
40 cm x 10 cm + 6 t/ha VC + 14% VW + 6 kg/ha FYM	45.96	5.17	31.37	11.64
F-Test	S	S	NS	S
SEm±	3.96	0.39	1.79	0.67
CD (P=0.05)	11.89	1.17		2.00

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Table 2 Effect of plant spacing and organic nutrient management on yield attributes and yield of green gram

Treatments	Pods/ plant	Seeds /pod	Test weight (g)	Seed yield (kg/ha)	Haulm yield (kg/ha)	Harvest index (%)
20 cm x 10 cm + 4 t/ha VC + 10% VW + 10% J at 20 DAS	21.27	5.87	28.92	1634.34	3423.34	32.20
30 cm x 10 cm + 4 t/ha VC + 10% VW + 10% J at 20 DAS	21.36	6.10	29.67	1147.93	2574.62	30.87
40 cm x 10 cm + 4 t/ha VC + 10% VW + 10% J at 20 DAS	23.22	6.43	30.21	1013.60	2686.55	27.45
20 cm x 10 cm + 5 t/ha VC + 12% VW + 5 kg/ha FYM + 12% J at 40 DAS	22.02	6.30	30.06	1869.82	3888.33	33.84
30 cm x 10 cm + 5 t/ha VC + 12% VW + 5 kg/ha FYM + 12% J at 40 DAS	22.50	6.63	31.78	1419.16	3179.59	32.08
40 cm x 10 cm + 5 t/ha VC + 12% VW + 5 kg/ha FYM + 12% J at 40 DAS	25.52	6.97	32.06	1285.91	3020.50	28.85
20 cm x 10 cm + 6 t/ha VC + 14% VW + 6 kg/ha FYM	22.07	6.13	30.36	1861.42	3630.14	32.35
30 cm x 10 cm + 6 t/ha VC + 14% VW + 6 kg/ha FYM	24.02	6.47	30.70	1448.47	3080.96	31.84
40 cm x 10 cm + 6 t/ha VC + 14% VW + 6 kg/ha FYM	24.20	6.53	31.37	1106.46	2755.15	28.64
F-Test	S	NS	NS	S	S	S
SEm+	0.82	0.45	1.79	135.67	259.13	0.50
CD (P=0.05)	2.46	-	-	406.75	776.88	1.50

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Economics

Data with respect to different treatments on economic point of view like cost of cultivation, gross returns, net returns and benefit: cost ratio were calculated and has been presented in Table 3.

Data showed that maximum cost of cultivation (INR 73,300/ha) was observed similar in 20 cm x 10 cm + 6 t/ha VC + 14% VW + 6 kg/ha FYM, 30 cm x 10 cm + 6 t/ha VC + 14% VW + 6 kg/ha FYM and 40 cm x 10 cm + 6 t/ha VC + 14% VW + 6 kg/ha FYM, respectively.

The data clearly revealed that grass monetary return per unit area was maximum (INR 2,28,266.33/ha) was noticed in with the application of 20 cm x 10 cm + 5 t/ha VC + 12% VW + 5 kg/ha FYM + 12% J at 40 DAS, also recorded– highest net returns per unit area (INR 1,64,206.33/ha) respectively. The treatment combination of 20 cm x 10 cm + 5 t/ha VC + 12% VW + 5 kg/ha FYM + 12% J at 40 DAS which obtained highest B:C ratio (2.56) because of least cost of cultivation-. The above results might be due to the more yield of green pods and resulted higher gross returns and net returns, while high benefit: cost ratio may be due to maximum economic yield of the crop and favorable effect of the treatments applied in the crop. The results are in line with the findings of **Saket *et al.* (2014); Qureshi *et al.* (2016)** and **Choudhary *et al.* (2018).**

Fig 5: Chart showing the cost of cultivation and Returns

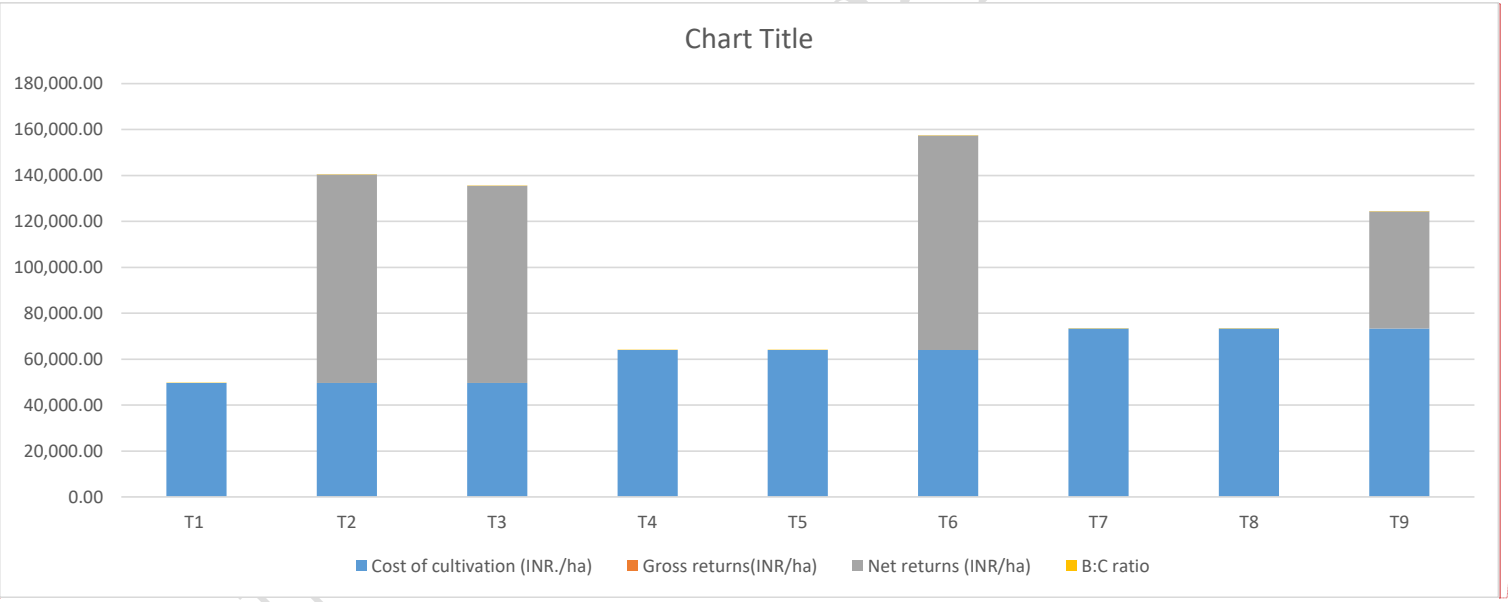

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Table 3. Effect of plant spacing and organic nutrient management on economics of green gram

S. No.	Treatments	Cost of cultivation(INR/ha)	Gross returns (INR/ha)	Net returns (INR/ha)	B:C ratio
1.	20 cm x 10 cm + 4 t/ha VC + 10% VW + 10% J at 20 DAS	49,700.00	1,99,544.14	1,49,844.14	2.33
2.	30 cm x 10 cm + 4 t/ha VC + 10% VW + 10% J at 20 DAS	49,700.00	1,40,326.22	90,626.22	1.41
3.	40 cm x 10 cm + 4 t/ha VC + 10% VW + 10% J at 20 DAS	49,700.00	1,35,530.35	85,830.35	1.33
4.	20 cm x 10 cm + 5 t/ha VC + 12% VW + 5 kg/ha FYM + 12% J at 40 DAS	64,060.00	2,28,266.33	1,64,206.33	2.56
5.	30 cm x 10 cm + 5 t/ha VC + 12% VW + 5 kg/ha FYM + 12% J at 40 DAS	64,060.00	1,73,478.79	1,09,418.79	1.70
6.	40 cm x 10 cm + 5 t/ha VC + 12% VW + 5 kg/ha FYM + 12% J at 40 DAS	64,060.00	1,57,330.10	93,270.10	1.46
7.	20 cm x 10 cm + 6 t/ha VC + 14% VW + 6 kg/ha FYM	73,300.00	2,27,000.94	1,53,700.94	2.10
8.	30 cm x 10 cm + 6 t/ha VC + 14% VW + 6 kg/ha FYM	73,300.00	1,76,896.96	1,03,596.96	1.41
9.	40 cm x 10 cm + 6 t/ha VC + 14% VW + 6 kg/ha FYM	73,300.00	1,24,318.15	51,018.15	0.69

CONCLUSION

From the present investigation, it is concluded that spacing of 20 cm x 10 cm along with 5 t/ha Vermicompost, 12% Vermiwash, 5 kg/ha FYM, and 12% Jeevamruth at 40 DAS is a highly remunerative practice, registering higher productivity and thereby realizing a higher monetary advantage.

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