Original Research Article

Effect of Integrated Nutrient Management on growth and yield of irrigated blackgram*(Vignamungo*.L)

ABSTRACT

WHERE IS THE INTRODUCTION AND AIM OF THE STUDY???

A field experiment was carried out at Research Farm of Karunya Institute of Technology and Sciences, Coimbatore, Tamil Nadu during *rabi* season, (2022-2023) to Effect of Integrated Nutrient Management on growth and yield of irrigated blackgram crop with seven treatments and three replications under Randomized block design(RBD). The results indicated that the treatment with 50% RDF + 25% farmyard manure (FYM) + 25% Vermicompost (T_7) performed well among all the treatments and recorded higher plant height (36.73cm), total dry matter production (2325 kg ha^{-1}), grain yield (930 kg ha^{-1}), stover yield (1395 $kgha^{-1}$), number of pods (20.65). The net return (25892 $Rsha^{-1}$) and B:C ratio (1.88) was recorded higher in 100% RDF.

Keywords:Blackgram, RDF, Farmyard Manure, Vermicompost, Growth, Yield, Economics

1.INTRODUCTION

Pulses are also known as food legumes and they are second only to cereals in terms of production and consumption in India. Black gram (*Vigna mungo* L.) 2n=24 is a self-pollinated crop that grows up to 30-50 cm tall with yellow flowers and a side inflorescence. It is one of the oldest and most important pulse crops of Asia (Kokani*et al*., 2014) [1]. It later spread throughout Asia during trade and became a staple food grain legume in other parts of the world. According to FAOSTAT(2020) [2], the world's pulse crops occupy 93.54 million hectares of land and produce 92.13 million tonnes of yield at an average rate of 985 kg per hectare. India is one of the major producers of pulses, with an area of 287.83 lakh hectares, a production of 254.63 lakh tonnes and a productivity of 885 kg per hectare (*DES, 2020-21*) [3]. Tamil Nadu, a state in India, has a pulse cultivation area of 8.03 lakh hectares, a production of 4.72 lakh tonnes and a productivity of 588 kg per hectare (*DES, 2020-21*) [3].

Integrated Nutrient Management (INM) is a key component of sustainable agriculture that requires managing resources in a way that meets the changing human needs without degrading the quality of the environment and conserving vital natural resources. INM involves maintaining soil fertility at an optimal level for crop productivity by obtaining maximum benefits from all possible sources of plant nutrients, both organic and inorganic, in an integrated manner (Aulakh and Grant 2008) [4]. INM includes the smart use of organic, inorganic, and biological resources to achieve optimal yields, improve or maintain soil physical and chemical properties, and provide crop nutrition packages that are technically sound, economically attractive, practically feasible and environmentally safe.

Among the organic manures, Farmyard manure (FYM) is one of the most traditional sources, most readily available and widely used by farmers since ancient times. Adding organic material to the soil such as FYM helps maintain soil fertility and productivity. Vermicompost is rich in all essential plant nutrients and it has excellent effects on overall plant growth. It encourages the growth of new leaves and improves the quality and shelf life of the produce. It improves soil structure, texture, aeration and water holding capacity and prevents soil erosion. Integrating farmyard manure or vermicompost with reduced doses of inorganic fertilizers resulted in improved soil fertility, growth and yield of crops

To improve the yield of black gram, it is beneficial to combine the recommended dose of fertilizers with farmyard manure and vermicompost. These sources of nutrients provide a balanced and sustained supply of nutrients for the crop, enhancing photosynthesis and yield components. Farmyard manure and vermicompost also improve the soil quality by increasing the availability of essential plant nutrients and improving the physical and chemical properties of the soil. However, organic sources alone may not meet the immediate nutrient demand of the crop, as they release nutrients slowly through mineralization. Therefore, using both organic (farmyard manure and vermicompost) and inorganic (fertilizers) sources of nutrients can ensure optimal nutrient delivery throughout the growth period. The aim of this study was to examine the effect of integrated nutrient management on the growth and yield of irrigated black gram.

2. MATERIAL AND METHODS

The experiment was conducted to examine the effect of Integrated Nutrient Management on growth and yield of irrigatedblackgram. The investigation was performed at Research Farm, Department of Agronomy, Karunya Institute of Technology and Sciences, Coimbatore, Tamil Nadu. The experimental site is geographically located in the western agro climatic zone of Tamil Nadu at 10^0 56'N latitude and 76^0 44'E longitude at an elevation of 474 m above mean sea level. The soil of the experimental site was silty clay loam with a pH of 7.2, EC (0.23 dS m^{-1}), OC (1.03 %), nitrogen (197 kg ha^{-1}), phosphorus (19.7 kg ha^{-1}) and potassium (281 kg ha^{-1}). The experiment was performed during *Rabi* season of 2022. The design used to analyze and perform experiment was Randomized Block Design with Seven treatments and Three replications. Treatments used are following: T_1- Control (No fertilizer); T_2- 100% RDF; T_3- 100% Farm yard manure; T_4- 100% Vermicompost; T_5- 50% RDF + 50% Vermicompost; T_6- 50% RDF + 50% Farm yard manure; T_7- 50% RDF + 25% Farm yard manure + 25% Vermicompost. The recommended fertilizer doses (RDF) for blackgram were 20:40:20 kg NPK ha^{-1}. The blackgram VBN-8 variety, which has a duration of 65-75 days, was sown in the first week of November with a spacing of 30cm × 10cm and a seed rate of 20 kg ha^{-1}. All growth and yield characteristics were calculated using established procedures (PLEASE PROVIDE CITATION OR PROTOCOL FOR THESE PROCEDURES).PLEASE PROVIDE CITATION OR PROTOCOL FOR THE USED STATISTICAL ANALYSIS.

3.RESULTS AND DISCUSSION

3.1. EFFECT OF INTEGRATED NUTRIENT MANAGEMENT ON GROWTH ATTRIBUTES OF BLACKGRAM

The data presented in Table 1 revealed that the plant height of blackgram at different growth stages showed significance difference among the treatments. The treatment T_7- 50% RDF + 25% Farm yard manure + 25% vermicompost recorded the higher plant height (36.73cm) among all the treatments, which is statistically at par with T_5- 50% RDF + 50% Vermicompost (36.15cm) and T_2- 100% RDF (35.47cm) treatments. The combined application of 50% recommended dose of fertilizer + 50%vermicompost to the blackgram improved accessibility of major and minor nutrient to plant might have enhanced early root growth and cell multiplication leading to more absorption of other nutrients from deeper layers of soil ultimately resulting in increased plant growth attributes and finally increase plant growth rate (Kumar *et al*. 2020) [5].

The higher dry matter production (DMP) (2325 kg ha^{-1}) was recorded in the T_7-50% RDF + 25% Farm yard manure + 25% vermicompost which is statistically at par with T_5- 50% RDF + 50% Vermicompost (2069 kg ha^{-1}). The largest yield attributes from the highest N level with FYM + VC may be attributed to the greatest rise in dry matter production and its successful partitioning to the economic sink. This observation is consistent with Uma Shankar Bagri (2019) [6].

3.2. EFFECT OF INTEGRATED NUTRIENT MANAGEMENT ON YIELD ATTRIBUTES OF BLACKGRAM

The higher grain yield (930kgha^{-1}) of black gram was recorded in T_7-50% RDF + 25% Farm yard manure + 25% vermicompost followed by T_5- 50% RDF + 50% Vermicompost (862kgha^{-1}) which is significantly differed from other treatments. The combined application of organic and inorganic fertilizers

has a favourable influence on yield because organic fertilizers help to reduce the danger of nutrient leaching even after inorganic fertilizers are applied to the soil. Furthermore, vermicompost is one of the finest cures for maintaining soil health as well as crop plant productivity, especially when used in conjunction with chemical fertilizers. These findings are consistent with Parthasarathi*et al.* (2008) [7], Dhyani (2011) [8], and Sunil Kumar and Yadav (2018) [9].

The higher stover yield (1395kgha^{-1}) was recorded in T_7-50% RDF + 25% Farm yard manure + 25% vermicompost followed by T_5- 50% RDF + 50% Vermicompost (1207kgha^{-1}). The favourable effect of vermicompost and RDF resulted in a significant improvement in yield attributes and an unexpected increase in seed and stover yield of blackgram. These findings agree with those of Bakthavathsalam and Deivanayaki (2007) [10], Geetha and Velayutham (2009) [11], Bhattacharya *et al*., (2019) [12], and Hussain *et al*., (2011) [13]. ShashiKumar*et al*, (2013) [14].

The maximum number of pods per plant was higher in T_7-50% RDF + 25% Farm yard manure + 25% vermicompost (20.65) which is statistically at par with T_5- 50% RDF + 50% Vermicompost (20.54). Rajeshwari (2011) [15] reported that the number of pods per plant is another important yield attributing factor which differed significantly with vermicompost @ 1 tha^{-1} + RDF and broadcast method application of FYM @ 5 tha^{-1} + RDF as compared to only RDF This might be attributed to better availability of nutrients. These results are in conformity with Shete*et al.* (2010) [16] in green gram, Singh *et al.* (2008) [17] in blackgram.

3.3. ECONOMICS

The maximum net return was recorded in T_2-100% RDF (25892 Rsha^{-1}) with the BCR (1.88). Prasad Jha *et al*., 2015 [18] reported that higher net return and B:C ratio was recorded with 100% RDF+Zn+Fe. Significantly increased net return and benefit cost ratio due to inorganic nutrient sources are consistent with the findings of Gupta *et al*. (2007) [19], Shashikumar *et al*. (2013) [14], and Kumawat *et al*. (2013) [21].

4.CONCLUSION

Based on the findings of the aforesaid experiment, it is possible to conclude that growing of blackgram in the southern zone of Coimbatore with an application of T_7 (50% RDF+25% farmyard manure + 25% vermicompost) considerably boosted blackgram grain and stover yields. As a result, it can be recommended to farmers as a superior treatment. T_5 (50% RDF + 50% vermicompost) can also be considered as a second alternative for increasing blackgram production.

5.FUTURE SCOPE

1. In order to provide accurate recommendations for farmers, it is essential to conduct studies in various agro-climatic zones.

2. Exploring additional agronomic practices can be beneficial in order to optimize the yield of blackgram.

3. Evaluating different blackgram varieties can be done to enhance yield potential.

Table 1. Effect of Integrated nutrient management on growth and yield parameters of blackgram

Treatments	Plant height (cm)	Number of Pods plant^{-1}	Dry matter Production (kg ha^{-1})	Grain yield (kg ha^{-1})	Stover yield (kg ha^{-1})	Harvest index
T_1-Control	31.26	16.74	1323	630	756	45.45
T_2- 100% RDF	35.47	20.17	1952	849	1189	41.65
T_3- 100% Farmyard manure	33.05	19.65	1756	798	958	45.44
T_4-100% Vermicompost	33.14	19.86	1797	817	1062	43.48
T_5- 50% RDF + 50% Vermicompost	36.15	20.54	2069	862	1207	41.66
T_6- 50% RDF + 50% Farmyard manure	34.15	19.95	1826	830	1079	43.47
T_7-50% RDF + 25% Farmyard manure + 25% Vermicompost	36.73	20.65	2325	930	1395	40
Mean	31.3	19.65	1864	817	1092	-
Sed	35.5	0.54	134.8	58.9	80.65	-
CD (p=0.05)	33.1	1.12	281.7	123	168.49	-

Table 2. Effect of Integrated nutrient management on Economics of Blackgram.

Treatments	Net return (Rs. ha^{-1})	B:C ratio
T_1-Control	17500	1.74
T_2-100% RDF	25892	1.88
T_3-100% Farmyard manure	2070	1.04
T_4-100% Vermicompost	7470	1.16
T_5-50% RDF + 50% Vermicompost	18793	1.50
T_6-50% RDF + 50% Farmyard manure	14628	1.37
T_7-50% RDF + 25% Farmyard manure + 25% Vermicompost	19983	1.49

REFERENCE

1. Kokani, JM, Shah K A, Tandel BM, Nayakan P. 2014. Growth, yield attributes and yield of summer Black Gram (*Vigna mungo* L.) as influenced by FYM, phosphorus and sulphur. *Ecoscan*. 2014;429-433.
2. FAOSTAT, Food and Agriculture organization of the United Uations, 2020.
3. Ministry of Agriculture and Farmers Welfare, Government of India. Agriculture statistics at a Glance. 2021.
4. Aulakh MS, Grant CA. Integrated nutrient management for sustainable crop production. (The Haworth Press, Taylor and Francis Group: New York), 2008.
5. Kumar R, Baba AY, Bhusan A, Singh, K, Kumar M. Growth, yield and economics performance of black gram (Vigna mungo [L.] Hepper) as influenced by organic and inorganic source of nutrients under sodic soil conditions. Plant Arch. 2020;*20*(2), pp.7991-7994.
6. Uma Shankar Bagri. Response of Organic, Inorganic and Integrated Nutrient Management practices on yield and economics of blackgram (*Vigna mungo* L.). M.sc (Ag.) Thesis, Jawaharlal Nehru, krishivishwavidyalaya, Jabalpur (M.P). 2019.
7. Parthasarathi K, Balamurugan M, L.S. Ranganathan. Influence of vermicompost on the physico-chemical and biological properties in different types of soil along with yield and quality of the pulse crop-blackgram.J. Environ. Health Sci. Eng. 2008;5:51-58.
8. Dhyani BP, Shahi YK, Kumar A, Singh RR, Singh SP, Swaroop R, *et al*. Effect of nitrogen, phosphorus, vermicompost and bio-fertilizers on growth and yield of black gram (*Vigna mungo*). Pantnagar j. res. 2011;9(1):72-74.
9. Sunil Kumar, Yadav SS. Effect of Phosphorus Fertilization and Bio-organics on Growth, Yield and Nutrient Content of Mungbean (*Vignaradiata*L.).Res. J. Agric. Sci. 2018;9(6):1252-1257.
10. Bakthavathsalam, R, Deivanayaki M. Effect of Rhizobium on growth and yield of black gram, [*Vignamungo* (Hepper)] cultivated in pots under different nutrient media. Ecol. 2007;25(2)**:** 360-368.
11. Geetha P, Velayutham A. Refinement of nutrient management techniques for growth, yield and nutrient uptake of rice fallow black gram.Madras Agric. J. 2009; 96(1/6):163-166.
12. Bhattacharya S. Effects of vermicompost and urea on the seed germination and growth parameters of *Vigna mungo* L. and *Vigna radiata* L. Wilzek. j. appl. nat. sci. 2019;11(2):321- 326.
13. Hussain N, Mehdi M, Kant RH. Response of Nitrogen and Phosphorus on Growth and Yield Attributes of Black gram (*Vigna mungo*).Res. J. Agric. Sci. 2011; 2(2):334-336.
14. Shashikumar, Basavarajappa R, Salkinkop SR, Hebbar M, Basavarajappa MP, Patil HY, *et al*. Effect of growth regulator, organic and inorganic foliar nutrition on the growth and yield of blackgram*(Vigna mungo L.)* under rainfed condition. J. Agric. 2013;26: 311-313.
15. Rajeshwari. Integrated nutrient management in blackgram (*Vigna mungo* L.) in northern transistion zone of Karnataka. M.sc (Ag) Thesis, college of agriculture, Dharwad, Karnataka. 2011.
16. Shete PG, Thanki JD, Adhav SL, Kushare YM. Response of rabigeen gram (*Vignaradiata*L.) to land configuration and inorganic fertilizer with and without FYM. Crop Res. 2010;39(1-3): 43-46.
17. Singh A, Singh VK, Rana N S, Sanjaykumar, Panwar GS, Yogeshkumar, *et al.* Response of urdbean farmyard manure and phosphorus application under urdbean wheat cropping sequence. J. Food Legume. 2008;21(2): 119-121.
18. Jha DP, Sharma SK, Amarawat T. 2015. Effect of organic and inorganic sources of nutrients on yield and economics of blackgram (Vigna mungo L.) grown during kharif. Res. J. Agric. Sci. 2015;35(3), pp.224-228.
19. Gupta BR, Tiwari R, Tiwari T P, Tiwari KN. Maximizing Yield, Nutrient Use Efficiency, and Profit in Summer Blackgram. Better Crops. 2007;91: 22-23.
20. Kumawat PK, Tiwari RC, Golada SL, Godara AS, Garhwal RS, Choudhary R. (2013). Effect of Phosphorus sources, levels and Biofertilizers on Yield attributes, Yield and Economics of Blackgram (*Phaseolus Mungo* L.).Legum. 2013;36: 70-73.