



STUDIES ON THE EFFECT OF INTEGRATED NUTRIENT MANAGEMENT ON YIELD ATTRIBUTES OF IRRIGATED BLACKGRAM

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Abstract

A Field experiment was conducted at the Experimental Farm, Department of Agronomy, Annamalai University to study the effect of integrated nutrient management on the growth and yield of irrigated blackgram during February-April 2023. The experiment was laid out in Randomized Block Design (RBD) with twelve treatments replicated thrice by using blackgram variety ADT 5. Among the different treatments experimented, the application of vermicompost @ 2.5 t ha⁻¹ + 100 % P₂O₅ ha⁻¹ through PROM + TNAU Pulse wonder @ 5 kg ha⁻¹ foliar spray at peak flowering stage recorded the highest values of all yield attributes and yield viz., number of pods¹ (19.67), pod length (6.42), number of seeds pod⁻¹ (7.2), seed yield (1361 kg ha⁻¹) and haulm yield (2084 kg ha⁻¹).

Keywords: Blackgram, Prom, Vermicompost, TNAU Pulse wonder

Introduction

Pulses are an important group of food crops that can play a vital role in addressing national food and nutritional security and also tackle environmental challenges. India has made remarkable strides in achieving self-sufficiency in food grain production and has attained a growth rate that is adequate to fulfill the needs of its growing population. The recommended dietary allowance of protein for an average Indian adult is 0.8 to 1 g per kilogram of body weight. Due to the importance of pulses which are rich in protein, the United Nations has declared 2016 to be the International Year of Pulses (IYP) in recognition of the numerous health advantages provided by pulses. Therefore, proper care must be taken to increase pulse production to meet dietary protein needs as well as to increase public awareness of pulses to achieve both environmental sustainability and nutritional food

security. The cultivation of blackgram makes up around 19% of India's total pulse area and contributes to 23% of the total pulse production. One of the important reason for low productivity is poor fertility levels of the soil. The problem is compounded by the fact that the majority of the farmers in the rainfed regions are lack of awareness on new and high yielding varieties, poor resources with low risk bearing capacity and they generally do not apply recommended practices (Saravanakumar *et al.*, 2021). The improper supply of nutrients negatively affects the yield, soil health, microbial population, and also productivity in blackgram (*Vigna mungo* L.).

The higher production is not satisfactory due to several reasons such as non-availability of quality seed, growing under rainfed condition, growing less fertile soil with low inputs, improper management, inappropriate post-harvest handling, lack of knowledge and attitude of the farmers (Chakrobarty *et al.*, 2021). Considering all constraints integrated nutrient management is the only viable option for those, especially marginal farmers who are unable to afford nutrient supply through costly chemical fertilizers. Foliar application is considered an efficient and economical method of supplementing a portion of the nutrient requirement at critical stages. Phosphate Rich Organic Manure (PROM) also referred as “green chemistry phosphatic fertilizer” is an effective source of P to replace the costly chemical phosphatic fertilizers and proves a better source for phosphorous application (Bhavna Singh Rathore *et al.*, 2022). Vermicompost as a soil additive, provides the required amounts of the nutrient and increases the water-holding capacity of soil. Consequently, use of combined inorganic fertilizers and organic manures are found to be more effective in improving productivity in several crops, (Bhattacharya *et al.*, 2019, Hossain *et al.*, 2017; Uddin *et al.*, 2022).

Materials and methods

The field experiment was conducted at the Experimental farm, Department of Agronomy, Faculty of Agriculture, Annamalai Nagar, Tamil Nadu, India. The experimental field is geographically located at 11°38'N latitude and 79°72'E longitude and at an altitude of ± 5.79 m above the mean sea level. The soil of the experimental field is clay loam in texture with low in available nitrogen, medium in available phosphorus and high in available potassium. The blackgram variety ADT 5 was chosen for the study. The experiment was laid out in randomized block design (RBD) with three replications. The spacing of 30 cm between the rows and 10 cm within plants was adopted. The treatments are T₁ - control (N:K₂O – 25:25 kg ha⁻¹), T₂ - 50 % P₂O₅ ha⁻¹ through PROM, T₃ - 75 % P₂O₅ ha⁻¹ through PROM, T₄ - 100 % P₂O₅ ha⁻¹ through PROM, T₅ - Control (N:K₂O – 25:25 kg ha⁻¹) + TNAU Pulse wonder @ 5 kg ha⁻¹ foliar spray at peak flowering, T₆ - 50 % P₂O₅ ha⁻¹ through PROM + TNAU Pulse wonder @ 5 kg ha⁻¹ foliar spray at peak flowering, T₇ - 75 % P₂O₅ ha⁻¹ through PROM + TNAU Pulse wonder @ 5 kg ha⁻¹ foliar spray at peak flowering, T₈ - 100 % P₂O₅ ha⁻¹ through PROM + TNAU Pulse wonder @ 5 kg ha⁻¹ foliar spray at peak flowering, T₉ - vermicompost @ 2.5 t ha⁻¹ + control (N:K₂O – 25:25 kg ha⁻¹) + TNAU Pulse wonder @ 5 kg ha⁻¹ foliar spray at peak flowering, T₁₀ - vermicompost @ 2.5 t ha⁻¹ + 50 % P₂O₅ ha⁻¹ through PROM + TNAU Pulse wonder @ 5 kg ha⁻¹ foliar spray at peak flowering, T₁₁ - vermicompost @ 2.5 t ha⁻¹ + 75 % P₂O₅ ha⁻¹ through PROM + TNAU Pulse wonder @ 5 kg ha⁻¹ foliar spray at peak flowering, T₁₂ - vermicompost @

2.5 t ha⁻¹ + 100 % P₂O₅ ha⁻¹ through PROM + TNAU Pulse wonder @ 5 kg ha⁻¹ foliar spray at peak flowering. The data on yield attributes and yield were statistically analyzed and interpreted.

Results and discussion

All the yield and yield attributing characters viz., number of pods plant⁻¹, pod length, number of seeds pod⁻¹, seed yield, grain yield and harvest index of blackgram were highly influenced by different treatments of integrated nutrient management practices and foliar application of nutrients. (Table1) Among the different treatments, application of vermicompost @ 2.5 t ha⁻¹ along with 100% P₂O₅ through PROM and foliar spraying of TNAU Pulse wonder @ 5 kg ha⁻¹ during peak flowering stage (T₁₂) recorded maximum number of pods⁻¹(19.67), pod length(6.42), number of seeds pod⁻¹(7.2), seed yield (1361kg ha⁻¹) and haulm yield (2084kg ha⁻¹) respectively.

Phosphorus source of nutrient is more essential for pulse crops, as it helps in early root growth and formation of effective root nodules. PROM is an organic source of nutrition and organic matter that supplies various essential nutrients, including phosphorus, which helps beneficial microorganisms in the field to thrive better. Application of PROM increased the translocation of photosynthetic assimilates towards seed, resulting in the formation of bold seeds. The PROM also contains other organic micronutrients that can result in an increased yield of blackgram. Similar findings have been documented by Yadav *et al.* (2017) and Bhabai *et al.* (2019). Prom is considered as an effective organic source of phosphorus and micronutrients. In addition of supplying nutrient it adds organic matter to the soil, thus it helps in better survival of microorganisms in the rhizosphere area. The combined use of organic and inorganic fertilizers have a positive impact on crop yield because organic fertilizers help to reduce the risk of nutrient leaching even after inorganic fertilizers have been applied to the soil. The application of organic manures like vermicompost might contribute to an increased grain yield and yield attributing characters, due to the prolonged and unfluctuating availability of major nutrients throughout the crop's growth cycle as concluded by Dayana *et al.* (2021). Vermicompost is an excellent solution for maintaining soil health and promoting crop productivity particularly when used in conjunction with chemical fertilizers. These findings are consistent with Sunil Kumar and Yadav (2018). Application of pulse wonder at critical stages helps in reducing flower shedding percentage, improving biotic and abiotic crop tolerance, increased seed setting percentage and delayed senescence resulted in continuous translocation of photosynthetic assimilates to reproductive parts, which was also an important reason for increased yield. These results were in agreement with the findings of Kunjammal and Sukumar (2019).

Table 1. Effect of integrated nutrient management practices on yield attributes and yield of irrigated blackgram

Treatment	Number of pods plant ⁻¹	Pod length (cm)	Number of seeds pod ⁻¹	Seed yield (kg ha ⁻¹)	Haulm yield (kg ha ⁻¹)
T ₁	10.73	3.69	3.4	831	1364
T ₂	13.26	4.38	4.4	968	1552
T ₃	15.8	5.19	5.53	1107	1743
T ₄	18.13	5.98	6.53	1247	1965
T ₅	11.67	3.86	3.67	875	1429
T ₆	14.13	4.73	4.87	1013	1608
T ₇	16.53	5.54	5.87	1150	1832
T ₈	18.86	6.28	6.87	1306	2018
T ₉	12.53	4.17	3.98	922	1488
T ₁₀	14.86	4.92	5.13	1056	1670
T ₁₁	17.33	5.80	6.2	1195	1897
T ₁₂	19.67	6.42	7.2	1361	2084
S.Ed	0.44	0.07	0.12	19.16	25.37
CD (P=0.05)	0.91	0.13	0.25	39.74	52.61

Conclusion

The application of phosphorus through PROM, along with vermicompost and pulse wonder spray, has proven to be beneficial in sustainable agriculture. It is environmentally friendly, reliable, cost-effective and readily available. Based on the experiment, it can be concluded that phosphorus fertilization through PROM (Phosphorus

Rich Organic Manure) was able to meet the phosphorus requirements of the crop from the initial growth to the maturity stage. This led to higher yield attributes and yield.

Acknowledgement

The authors sincerely thankful to the department of Agronomy, Faculty of agriculture, Annamalai university for the immense help and support during the course of research study.

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