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Effect of integrated nutrient management productivity and economics of kharif greengram (*Vigna mungo* L.)

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Abstract
A field experiment was conducted during rabi season of 2023-24 on loamy sand of in the rural area of Kanpur district of Mandhana, located 10 km from Kanpur in Uttar Pradesh to Effect of Integrated Nutrient Management Productivity and Economics of Kharif Greengram (*Vigna mungo* L.). The soil was normal in pH of 7.62, electrical conductivity (EC) of 0.25 dSm^{-1}, organic carbon content of 0.42%, and available nutrients including nitrogen (N), phosphorus (P), and potassium (K) at levels of 216.01, 19.51, and 149.56 kg ha^{-1}, respectively. The experiment was laid out during Rabi season of 2023-24. The experiment consisted of 20 treatment combinations, (four levels of FYM and five levels of phosphorus and PSB) was laid out in Factorial Randomized Block Design (FRBD) with three replications.

Keywords: INM, green gram, FYM

Introduction

One of the major pulse crops farmed in our nation's arid and semi-arid regions is greengram, or *Vigna radiata* (L.) Wilczek. Among pulses, greengram comes in third place, behind pigeon pea and chickpea. In addition to being grown as a catch crop in between the rabi and kharif seasons, it is a short-duration kharif pulse crop. In regions with variable rainfall, it can be grown successfully on well-drained loamy to sandy loam soil because of its moderate drought tolerance. It can also be used as a crop for green manure in the summer. Since it is a leguminous crop, atmospheric nitrogen can be fixed by it. After the mature pods are removed, the green plants are used as fodder. Greengram is a great source of protein (about 25%), containing high levels of tryptophan (60 mg/g N) and lysine (4600 mg/g N). It can be prepared in various ways for table use and is also eaten as a whole grain. Patients prefer greengram because they believe it to be readily absorbed. Greengram seeds produce ascorbic acid, or vitamin C, when they are allowed to sprout. Additionally, there is an increase in thiamine and riboflavin.

Pulses are a significant commodity crop group that offer high-quality protein to supplement cereal proteins for the nation's sizable vegetarian population. About 20 percent of the land used for growing food grains is dedicated to pulses, which also produce 7–10 percent of the nation's total food grains.

The world's biggest producer, importer, and consumer of pulses is India. 25% of the world's pulses are produced in India. It is the world's largest importer of pulses at 14% and consumes 27% of the total amount consumed worldwide.

The area planted to pulses increased from 19 million hectares in 1950–1951 to 28 million hectares in 2020–21; in contrast, during the same period, pulse production increased from 8.41 million hectares to 24 million hectares, a rise of more than 200 percent. In 2021–2022, the pulse yield per hectare is 823 kg/hectare.

The most common pulse, accounting for about 40% of the total production, is chickpea. It is followed in percentage terms by tur/arhar (15–20%), Urd/Black Matpe, and moong (8–10%). Karnataka, Rajasthan, Uttar Pradesh, and Madhya Pradesh are the top five states that produce pulses.

Even though they are grown in both the Kharif and Rabi seasons, over 60% of the production comes from Rabi pulses. The commodity has three crop seasons: Rabi, which includes Gram, Lentil, Pea, Lathyrus, and Rajmash; Summer, which includes Greengram, Blackgram, and Cowpea; Kharif Arhar (Tur), Urd (Blackgram), Moong (Greengram), Lobia (Cowpea), Kulthi (Horsegram), and Moth.

During the 2020–21 triennial, 280 lakh hectares of land were in India, with Madhya Pradesh, Rajasthan, Maharashtra, Karnataka, and Uttar Pradesh contributing the most. Andhra Pradesh, Gujarat, Tamil Nadu, Jharkhand, Chhattisgarh, and Odisha are other states with sizable areas.

Greengram accounts for 17.83 lakh tonnes of pulse production in India and occupies 34.37 lakh hectares (Anonymous, 2019–20) [1]. Rajasthan, Maharashtra, Karnataka, Madhya Pradesh, Gujarat, Tamil Nadu, and Uttar Pradesh are significant states for growing greengram. With an annual production of 0.14 lakh tonnes, Uttar Pradesh had 0.49 lakh ha under greengram cultivation. (Anonymous, 2019–20) [1].

FYM is a high-organic matter and nutrient-rich organic manure that is excellent for plants. As it breaks down, carbon dioxide and organic acids are released, which aid in dissolving minerals and increasing their availability to developing plants. It aids in protecting soils from abrupt chemical changes. Additionally, FYM provides energy for the development of soil microorganisms. It enhances the soil's chemical, biological, and physical properties. Long-term use of FYM and fertilizers has been shown to improve the physical characteristics of the soil, organic carbon, and available nitrogen, phosphorus, and potassium (Babulkar *et al*., 2000) [2]. Applying FYM to agricultural crops also prevents its unnecessary burning.

After nitrogen, phosphorus is the second most important nutrient. On all soil types, its deficiency is typically the single most significant factor causing low pulse yield. It is a significant component of nucleic acids and proteins. An essential component of energy-rich bound phosphates (ADP and ATP) is phosphorus. It promotes nodulation, stimulation, root development, growth, and maturity of crops faster while also enhancing quality attributes. Therefore, it is more significant in legumes than nitrogen because the latter is fixed by bacterial symbiosis with Rhizobium.

The soil contains P in both organic and inorganic forms. P is typically absorbed by plants from soil solutions in the inorganic form (H2PO4-, HPO42-) (Bagyaraj *et al*. 2000) [3]. Seed germination, cell division, stem strength, flowering, fruiting, crop quality, synthesis of starch and fat, and numerous other biochemical processes are some growth factors/processes linked to P in plants. P facilitates biomass production, nitrogen fixation, efficient nutrient use, effective partitioning of photosynthates between source and sink, and root nodulation in leguminous crops (Gitari and Mureithi 2003) [6]. Many metabolic processes are impacted by its deficiency, including stunted plant growth, a weak root system, reddish stems, early leaf fall, and poor fruit setting. It is necessary for the general well-being and vitality of plants, particularly legumes. It raises the legumes' ability to fix nitrogen and their leghaemoglobin content. Furthermore, according to Turner *et al*. (2002) [7] and Condron *et al*. (2005) [5], it is an essential component of several important molecules, including phospholipids, phosphoprotein, deoxyribonucleic acid (DNA), ribonucleic acid (RNA), adenosine triphosphate (ATP), and adenosine diphosphate (ADP). The available phosphorus status of Indian soils ranges from poor to medium. In the soil system, phosphorus is immobile, and crops only use 15–25% of the applied P. While the remainder is fixed in the soil and is impacted by different biological, physico-chemical, and other characteristics of the soil (Raju *et al*. 2005) [8].

Microorganisms have the ability to mineralize organic P into a soluble form in addition to solubilizing it. The rhizosphere is the site of these reactions, and because the microorganisms release more P into the solution than is necessary for their own growth and metabolism, plants can absorb the excess. Typically, during a season, these bacteria are able to solubilize between 15 and 20 kg P_2O_5. It was discovered that their inoculation increased crop yield by 10–20% (Chandra and Kumar, 2005) [4].

Material and methods

A field experiment was conducted during rabi season of 2023-24 on loamy sand of in the rural area of Kanpur district of Mandhana, located 10 km from Kanpur in Uttar Pradesh to Effect of Integrated Nutrient Management Productivity and Economics of Kharif Greengram (*Vigna mungo* L.).The soil was normal in pH of 7.62, electrical conductivity (EC) of 0.25 dSm^{-1}, organic carbon content of 0.42%, and available nutrients including nitrogen (N), phosphorus (P), and potassium (K) at levels of 216.01, 19.51, and 149.56 kg ha^{-1}, respectively. The experiment was laid out during Rabi season of 2023-24. The experiment consisted of 20 treatment combinations, (four levels of FYM and five levels of phosphorus and PSB) was laid out in Factorial Randomized Block Design (FRBD) with three replications. Factor A - Levels of FYM (t ha^{-1}) – 4 F0- Control F1 - 1.0, F2 - 2.0, F3 - 3.0, Factor B - Levels of phosphorus (kg ha^{-1}) – 5 P1 - PSB only P2 - 20 kg P_2O_5, P3 - 20 kg P_2O_5 +PSB P4 - 40 kg P_2O_5, P5- 40 kg P_2O_5 +PSB data were gathered on five plants chosen from each plot.

Results and Discussion

Plant height (cm)

Application of 3t/ha FYM at 60 DAS stage resulted in noticeably taller plants than other doses and control. The highest plant height was measured at the harvest stage with 3t/ha FYM, which was considerably higher than the other levels.

Plant height (cm) at 30 DAS stage under various FYM levels revealed no statistically significant difference; 40 kg P_2O_5/ha + PSB produced the highest plant height. All levels of FYM had a significant impact on plant height at the 60 DAS stage; the highest plant height was observed at 40 kg P_2O_5/ha + PSB. When the plants were harvested, the highest plant height was observed at 40 kg P_2O_5/ha + PSB, which was comparable to 40 kg P_2O_5/ha alone but noticeably better at lower P_2O_5 dosages **(**Rathod et. al 2014) [9].

Fresh Weight/plant (g)

At 30 DAS, 60 DAS, and harvest, the 3t FYM/ha group recorded the highest fresh weight (g), which was significantly higher than that of the 2t FYM, 1t FYM, and control groups. The data also clearly shows that phosphorus levels had a major impact. At 30 DAS, 60 DAS, and harvest, the highest fresh weight (g) was observed at 40 kg P_2O_5 + PSB, which was comparable to 40 kg P_2O_5/ha but noticeably better than the other treatments (Saravanan *et al* 2013) [10].

Dry weight/plant (g)

Different doses of FYM affected the total dry matter accumulation/plant (g) at 30 DAS. Under 3t/ha, the maximum dry weight accumulation was observed, which was noticeably better than the other treatments. (Kumar *et al* 2008) [14].

Maximum dry matter/plant (11.14 g) at 60 DAS stage was recorded with 3t/ha FYM, which was comparable to 2t/ha but considerably better than 1t/ha and control. At the harvest stage, 3t/ha produced significantly more dry matter/plant (11.59 g), comparable to 2t FYM/ha but significantly better than 1t

FYM/ha and control (Singh *et al* 2012) [11].

During the first stage at 30 DAS, 40 kg P_2O_5 + PSB (2.43 g) had the significantly highest dry matter accumulation, which was comparable to 40 kg P_2O_5/ha and 20 kg P_2O_5 + PSB but significantly better than 20 kg P_2O_5/ha and PSB alone. The 40 kg P_2O_5+ PSB had the highest dry matter accumulation (10.87 g) at the 60 DAS stage, which was comparable to the 40 kg P_2O_5/ha but much better than the 20 kg P_2O_5/ha + PSB, 20 kg P_2O_5/ha, and PSB (Kumar *et al* 2015) [15]. Data collected at harvest time showed that 40 kg P_2O_5/ha + PSB had the highest dry matter accumulation/plant (11.31 g), which was comparable to 40 kg P_2O_5/ha alone but much better than 20 kg P_2O_5/ha + PSB, 20 kg P_2O_5/ha, and PSB (Singh *et al* 2017) [12].

Table 1: Effect of treatment on plant height (cm) at 30 DAS, 60 DAS and at harvest

Treatment	Plant height (cm) 30 DAS	Plant height (cm) 60 DAS	Plant height (cm) harvest.
Level of FYM t ha^{-1}			
0	14.82	33.79	35.07
1	14.95	34.67	36.13
2	15.03	36.01	38.68
3	15.13	37.47	40.55
SEd ±	0.22	0.33	0.42
CD at 5%	NS	0.67	0.84
Level of Phosphorus			
PSB	14.89	34.51	36.42
20 kg P_2O_5	14.96	35.39	37.33
20 kg P_2O_5 + PSB	14.99	35.53	37.73
40 kg P_2O_5	15.03	35.79	38.03
40 kg P_2O_5 + PSB	15.05	36.21	38.53
SEd ±	0.25	0.37	0.46
CD at 5%	NS	0.75	0.94

Table 2: Effect of treatments on fresh weight (g) at 30 DAS, 60 DAS and at harvest

Treatment	Fresh weight (g) 30 DAS	Fresh weight (g) 60 DAS	Fresh weight (g) harvest
Level of FYM t ha^{-1}			
0	22.71	98.16	98.39
1	23.94	103.51	103.25
2	24.41	106.10	105.50
3	24.96	108.98	108.10
SEd ±	0.19	0.43	0.68
CD at 5%	0.39	0.87	1.38
Level of Phosphorus			
PSB	23.54	102.30	101.21
20 kg P_2O_5	23.95	103.64	103.45
20 kg P_2O_5+ PSB	23.99	104.12	104.03
40 kg P_2O_5	24.23	105.10	105.01
40 kg P_2O_5+ PSB	24.31	105.77	105.33
SEd ±	0.22	0.48	0.76
CD at 5%	0.44	0.97	1.54

Table 3: Effect of treatments on dry weight (g) at 30 DAS, 60 DAS and at harvest

Treatment	Dry weight (g) 30 DAS	Dry weight (g) 60 DAS	Dry weight (g) harvest
Level of FYM t ha^{-1}			
0	2.27	10.06	10.41
1	2.38	10.56	10.93
2	2.43	10.79	11.17
3	2.49	11.10	11.49
SEd ±	0.021	0.123	0.139
CD at 5%	0.043	0.249	0.281
Level of Phosphorus			
PSB	2.34	10.34	10.70
20 kg P_2O_5	2.38	10.57	10.94
20 kg P_2O_5+ PSB	2.40	10.64	11.01
40 kg P_2O_5	2.42	10.77	11.15
40 kg P_2O_5+ PSB	2.43	10.82	11.20
SEd ±	0.024	0.137	0.155
CD at 5%	0.048	0.278	0.314

Conclusion
The data showed that the highest growth parameter observation, including plant height, fresh weight, dry weight, yield, and yield-attributing characteristics, was obtained with 3 tons of FYM plus 40 kg of P_2O_5.

References
1. Anonymous. Kharif Pulses Prospects-2020-21; c2019-20. p. 3.
2. Babulkar PS, Wandile RM, Badole WP, Balpande SS. Residual effect of long term application of FYM and fertilizers on soil properties (vertisol) and yield of soybean. Journal of the Indian Society of Soil Science. 2000;48(1):89-92.
3. Bagyaraj DJ, Krishnaraj PU, Khanuja SPS. Mineral phosphate solubilization: agronomic implications, mechanism and molecular genetics. Proc Indian Natl Sci Acad. 2000;66:69-82.
4. Chandra R, Kumar S. Biofertilizers: An eco-friendly source of plant nutrient. Indian Farmers Digest. 2005;4:8-9.
5. Condron LM, Turner BL, Cade-Menun BJ. Chemistry and dynamics of soil organic phosphorus. In: Sims JT, Sharpley AN, editors. Phosphorus: Agriculture and the Environment. 2005. p. 87-121.
6. Gitari JN, Mureithi JG. Effect of phosphorus fertilisation on legume nodule formation and biomass production in Mount Kenya region. East Afr Agric For J. 2003;69:183-187.
7. Turner BL, Paphazy MJ, Haygarth PM, McKelvie ID. Inositol phosphates in the environment. Philos Trans R Soc Lond B Biol Sci. 2002;357:449-469.
8. Raju RA, Subba Rao A, Rupa TR. Strategies for integrated phosphorus management for sustainable crop production. Indian Journal of Fertilizers. 2005;1(8):25-28.
9. Rathod SL, Gawande MB. Response of green gram variety to different fertilizer grades. International Journal of Science and Research. 2014;3(7):1313-1315.
10. Saravanan P, Sathish SK, Ignesh A. Effect of organic manures and chemical fertilizers on the yield and macronutrient concentrations of green gram. International Journal of Pharmaceutical Science Invention. 2013;2(1):18-20.
11. Singh AK, Singh RS. Effect of phosphorus levels and bio-inoculants on growth and yield of long duration pigeon pea (*Cajanus cajan* Millsp.). J Food Legumes. 2012;25(1):73-75.
12. Singh KR, Dawson J, Srivastava N. Effect of sources of nutrient on growth and yield of black gram (Vigna mungo L.) varieties in NEPZ of India. Journal of Pharmacognosy and Phytochemistry. 2017;6(4):1064-1066.
13. Singh M, Mishra JS, Bhatt BP. Effect of integrated nutrient management on production potential and quality of summer mung bean (*Vigna radiata* L.). Journal of Krishi Vigyan. 2017;5(2):39-45.
14. Kumar A, Majumdar VL. Response of mung bean (*Vigna radiata* L.) to integrated use of molybdenum, vermi-compost and bio-fertilizers. J Arid Legumes. 2008;5(2):121-123.
15. Kumar R, Deka BC, Ngachan SV. Response of summer green gram to sowing time, seed rates and integrated nutrient management. Legume Res. 2015;38(3):348-352.