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Effect of nutrient management on mungbean (*Vigna radiata* L.)

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Abstract
A field experiment was conducted at "Effect of nutrient management on mungbean (*Vigna radiata* L.)" conducted during *kharif 2024* at Agriculture farm, Suresh Gyan Vihar University, Jaipur on loamy sandy soi. Results revealed that application of 50% RDF + 2% NPK mixture (12:32:16) spray at 20 and 40 DAS to the mung bean crop significantly number of pods per plant, number of seeds per pods, seed, straw and biological yield of green gram as compared to control RDF (20 kg N, 40 kg P2O5), 50% RDF + 2% urea spray at 40 DAS, 50% RDF + 2% NPK mixture (12:32:16) spray at 40 DAS, 75% RDF + Rhizobium (25 g kg^{-1} seeds) and 75% RDF + PSB (25 g kg^{-1} seeds) and remained statistically at par with 50% RDF + 2% urea spray at 20 and 40 DAS. The highest net returns (₹ 96458 ha^{-1}) were obtained with 50% RDF + 2% NPK mixture (12:32:16) spray at 20 and 40 DAS followed by 50% RDF + 2% urea spray at 20 and 40 DAS (₹ 91999 ha^{-1}), 50% RDF + 2% NPK mixture (12:32:16) spray at 40 DAS (₹ 80887 ha^{-1}. The highest B: C ratio B:C ratio (4.25) was obtained with 50% RDF + 2% NPK mixture (12:32:16) spray at 20 and 40 DAS.

Keywords: Pods, seed, stover, yields

Introduction
Greengram is a cultivated leguminous crop in India serving various purposes as a vegetable, pulse, fodder, and green manure crop. Its seeds are highly palatable, nutritive and digestible in nature. It is a good source of protein and carbohydrates. India is the largest producer of pulses in the world. mungbean is an excellent source of protein (24.5%) with high lysine content (460 mg/g) and tryptophan (60 mg/g) (Khairnar *et al*. 2019) [3]. In India, mungbean is grown on 5.13 million hectares area with total production of 3.31 million tonnes and an average productivity of 570 kg ha^{-1} (Anonymous, 2023-24). The important mungbean growing states are Rajasthan, Madhya Pradesh, Uttar Pradesh, Punjab, Haryana, Maharashtra, Karnataka, Andhra Pradesh and Tamil Nadu. Among states, Rajasthan occupied first position in total mungbean production of India, which produces 1.6 million tonnes from 2.62 million hectares with an average productivity of 545 kg ha^{-1} (Anonymous, 2023 24). Integrated nutrient management includes blending and application of organic, inorganic (chemical fertilizers), and biofertilizers nutrients to soils to promote crop growth and increase the yields of high-quality products. Saini *et al.* (2024) [8]. Integrated nutrient management includes the intelligent use of organic, inorganic and biological sources so as to sustain optimum yields, improve or maintain the soil physical and chemical properties, and provide crop nutrition packages which are technically sound, economically attractive, practically feasible and environmentally safe (Mishra *et al.*, 2023) [7]. Integrated nutrient management with a combination of chemical fertilizers, organic manures, and bio-fertilizers is of paramount importance in the face of declining soil health and fertility (Kumawat *et al.*, 2022) [4].

Methods and Materials
The experiment was conducted during kharif 2024 at Agronomy farm, School of Agriculture, Suresh Gyan Vihar University, Jaipur. Geographically, the study area is located at 75o48'84" E longitude and 26o82'47" N latitude and this region falls under agro-climatic zone III A (Semi-

arid Eastern Plain Zone) of Rajasthan. The experiment consisting eight treatments (control, 75% RDF, 100% RDF and 125% RDF) and organic manure (RDF (20 kg N, 40 kg P2O5), 50% RDF + 2% urea spray at 40 DAS, 50% RDF + 2% NPK mixture (12:32:16) spray at 40 DAS, 50% RDF + 2% urea spray at 20 and 40 DAS, 50% RDF + 2% NPK mixture (12:32:16) spray at 20 and 40 DAS, 75% RDF + Rhizobium 25 g kg^{-1} seeds and 75% RDF + PSB 25 g kg^{-1} seeds). The total seven treatment combinations were tested in randomized block design with three replications.

Results and Discussion

The highest number of pods per plant and seeds per pod were recorded with application of 50% RDF + 2% NPK mixture (12:32:16) spray at 20 and 40 DAS (61.00) followed by 50% RDF + 2% urea spray at 20 and 40 DAS (59.67), RDF (20 kg N, 40 kg P2O5 (56.67) and 50% RDF + 2% urea spray at 40 DAS (54.33). RDF with seed inoculated PSB and rhizobium might have played a pivotal role in various plant processes, including starch cell division, enhanced sugar utilization, and the rate of photosynthesis through increased availability of nutrient which ultimately resulted in better yield attributing characters of the crop. This enhancement is primarily due to increased photosynthetic efficiency which facilitated greater movement of photosynthates from the source to the sink sites, ultimately resulting in higher yields and contributing positively to the characteristics of the yield (Meena *et al.* 2016 and Kalsaria *et al.* 2017) [6, 2]. The seed, stover and biological yield were significantly increased with application of 50% RDF + 2% NPK mixture (12:32:16) spray at 20 and 40 DAS which was statistically at par with 50% RDF + 2% urea spray at 20 and 40 DAS. An improvement in the yield of seeds is also linked to the cumulative effect of number of pods $plant^{-1}$ and number of seeds pod^{-1}. The above observation was found to be in conformity with the findings of Mishra *et al.* (2023) [7] who observed that integrated use of organic manures along with optimum doses of chemical fertilizers increased the growth parameters and yield of green gram.

The highest net returns (₹ 96458 ha^{-1}) was obtained with 50% RDF + 2% NPK mixture (12:32:16) spray at 20 and 40 DAS followed by 50% RDF + 2% urea spray at 20 and 40 DAS (₹ 91999 ha^{-1}), 50% RDF + 2% NPK mixture (12:32:16) spray at 40 DAS (₹ 80887 ha^{-1}), 50% RDF + 2% urea spray at 40 DAS (₹ 80099 ha^{-1}), control (₹ 48387ha^{-1}). The highest B: C ratio B:C ratio (4.25) was obtained with 50% RDF + 2% NPK mixture (12:32:16) spray at 20 and 40 DAS. The higher seed and stover yields obtained through the application of 50% RDF + 2% NPK mixture (12:32:16) spray at 20 and 40 DAS might be the reason for the resultant net return, and B: C ratio. Similar finding also reported on green gram by Lal *et al.*, (2022) [5].

Table 1: Effect of integrated nutrient management on yield attributes

Treatments	Pods/plant	Seeds/pod
Control	14.67	4.67
RDF (20 kg N, 40 kg P_2O_5)	26.67	7.67
50% RDF + 2% urea spray at 40 DAS	24.33	7.00
50% RDF + 2% NPK mixture (12:32:16) spray at 40 DAS	23.33	6.67
50% RDF + 2% urea spray at 20 and 40 DAS	29.67	8.00
50% RDF + 2% NPK mixture (12:32:16) spray at 20 and 40 DAS	31.00	8.11
75% RDF + Rhizobium (25 g kg^{-1} seeds)	23.00	6.67
75% RDF + PSB (25 g kg-1 seeds)	22.33	6.33
S.Em±	1.67	0.35
CD (p=0.05)	5.06	1.06
CV (%)	11.86	8.80

Table 2: Effect of integrated nutrient management on yields (kg/ha)

Treatments	Seed yield	Straw yield	Biological yield	HI (%)
Control	690	1642	2332	29.57
RDF (20 kg N, 40 kg P_2O_5)	1003	2450	3453	29.06
50% RDF + 2% urea spray at 40 DAS	1029	2573	3602	28.57
50% RDF + 2% NPK mixture (12:32:16) spray at 40 DAS	1040	2600	3640	28.57
50% RDF + 2% urea spray at 20 and 40 DAS	1153	2883	4037	28.57
50% RDF + 2% NPK mixture (12:32:16) spray at 20 and 40 DAS	1203	3033	4234	28.41
75% RDF + Rhizobium (25 g kg^{-1} seeds)	1010	2525	3535	28.57
75% RDF + PSB (25 g kg^{-1} seeds)	977	2442	3418	28.57
S.Em±	34	88	120	0.28
CD (p=0.05)	103	267	365	NS
CV (%)	5.79	6.20	5.90	5.02

Table 3: Effect of integrated nutrient management on economics (₹/ha)

Treatments	Gross return (₹/ha)	Net return (₹/ha)	B: C ratio
Control	67887	48387	2.48
RDF (20 kg N, 40 kg P_2O_5)	98997	75897	3.29
50% RDF + 2% urea spray at 40 DAS	101799	80099	3.69
50% RDF + 2% NPK mixture (12:32:16) spray at 40 DAS	102887	80887	3.68
50% RDF + 2% urea spray at 20 and 40 DAS	114099	91999	4.16
50% RDF + 2% NPK mixture (12:32:16) spray at 20 and 40 DAS	119158	96458	4.25
75% RDF + Rhizobium (25 g kg^{-1} seeds)	99919	77419	3.44
75% RDF + PSB (25 g kg-1 seeds)	96622	74122	3.29
S.Em±	3343	3343	0.15
CD (p=0.05)	10140	10140	0.46

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