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Effect of different NPK doses on the performance of green gram (*Vigna radiata* L.) cultivar in Central Uttar Pradesh

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Abstract
The objective of the study was to evaluate the growth response of mungbean [*Vigna radiata* (L.)] cultivars subjected to different levels of applied N fertilizer. To achieve the aim, an experiment conducted in the experimental field of University Research Farm, Rama University Mandhana, Kanpur 209217 (U.P.). The soil of the study area was basic in reaction, salt free, medium textured having low organic matter & total N contents. Three different cultivars of mungbean *viz.*, (IPM 02-3, PDM-139, IPM 410-3) grown in kharif season for one consecutive years i.e., 2023. Three different levels of RDF applied @ 75%, 100% and 125% ha^{-1}. While, a constant dose of P_2O_5 and K_2O also applied to each N level (except control, zero). Urea fertilizer used as a source of N, while DAP and MOP as sources of P & K, respectively. The plot size kept as 21 m^2 (7x3), and arranged in a Spilt plot design (SPD). Results showed that different fertilizer levels did significantly (p<0.05) influence most of the growth attributes of the mungbean. Maximum plant height (63.51 cm), dry matter $plant^{-1}$ (9.46 g) and leaf area index (6.84) in 125% RDF. Whereas number of branches $plant^{-1}$ (3.49), yield (9.20 q ha^1) recorded for plants subjected to highest 100% RDF ha^{-1}. Similar responses toward also noted for various cultivars of mungbean. Maximum plant height (61.75 cm), dry matter accumulation (9.89 g), number of branches (3.45), leaf area index (6.95), number of root nodules $plant^{-1}$ (15.90), number of pod $plant^{-1}$ (23.04), number of grain pod^{-1} (7.95), test weight (41.21 g), grain yield (9.26 q ha^{-1}), strow yield (26.18 q ha^{-1}), and biological yield (36.11 q ha^{-1}) recorded for IPM 02-3. Whereas, the maximum number of flower initiation days (35.77) in PDM139. But length of pod (8.39 cm) obtained for mungbean cultivar IPM 410-3.

Keywords: NPK doses, *Vigna radiata* L., mungbean

1. Introduction
Green gram (*Vigna radiata* L.) is the most significant and widely cultivated crop. The Sanskrit word "mudga," from which the Hindi word "mung" is derived, is commonly used to refer to several foods such as mungbean, moongdal, golden gram, and monggo. Greengram is a member of the Papilionaceae subfamily of the Leguminosae family. It is a little annual herbaceous plant that reaches a height of 30 to 100 cm. It is a crop that can withstand short periods of drought. It can be cultivated twice a year, in both spring and fall, in both irrigated and rainfed places, and it fits well into our current crop rotation (Ahmad *et al*., 2003) [1]. Greengram is highly digestible, which is why doctors recommend it to their patients. It is low in methionine and cysteine but high in carbs (60–62%), proteins (20–24%), fibers (4.0%), lipids (1.0%), riboflavin, thiamine, and vitamins C (ascorbic acid) (Wikipedia, 2024). Greengram seeds that had sprouted produced an impressive amount of ascorbic acid. Because it is a leguminous crop, the bacterium Rhizobium helps the crop fix atmospheric nitrogen (30–40 kg N ha^{-1}). Green gram has a lot of promise to benefit human health, preserve soil, safeguard the environment, and increase global food security. They produce grains or seeds in a pod that vary in size, shape, and color and are used for both food and feed. Pulse byproducts like as leaves, pod coatings, and bran are also utilized for various uses. Pulses are high in lipids, carbs, riboflavin, thiamine, and vitamin B6. On the other hand, pulses are higher in zinc, magnesium, potassium, iron, lysine, folate, and protein.

Conventional protein sources, such as animals, were thought to offer better nutritional and functional qualities. But using animal meat as a protein source brought up a lot of ethical concerns. Furthermore, because of the growing population, it is no longer possible to use it as the only source of protein. Consequently, scientists and farmers are becoming more interested in pulses because of their higher protein content than cereal grains. The crucial factor that significantly influences this crop's growth characteristics and output is fertilizer control. Though legumes fix atmospheric N_2 through symbiotic processes, the growth and productivity of legume crops can be enhanced by applying nitrogenous fertilizer as a starting or initial dose (Ardeshana *et al*., 1993) [6]. Since nitrogen is a key component of protein, pulse crops benefit most from it (Anon., 2005) [4]. Since mungbean is a drought-tolerant crop, it is primarily grown in regions of the nation that receive rain, where yield levels are rather low. The lack of cultivars with high yield potential is a significant contributing factor to its inferior productivity. According to Salah Uddin *et al*. (2009) [13], the majority of the growth components greatly impacted by both chemical and biological fertilizers. According to Abbas (1994) [2], the highest grain production of 1666 kg ha^{-1} was obtained by applying NPK at 25–50–75 kg ha^{-1}. Additionally, research revealed that applying 20 kg N and 40 kg P2O5 enhanced mungbean grain yield, but applying K had no discernible impact (Singh *et al*., 1993) [14]. According to Khan *et al*. (1999) [11], using phosphorus greatly raised the yield of mungbean. Numerous other researchers also found that raising P_2O_5 to 50 kg ha^{-1} enhanced the grain production of legumes (Thakuria & Saharia, 1990) [17]. In fertilizer treatment @ 45:80:55 kg NPK ha^{-1} + Rhizobium inoculation, the maximum number of pods $plant^{-1}$ (20.87), pods length (8.71 cm), seeds pod^{-1} (8.53), 1000 seeds (27.82 g), and seed yield (1.40 t ha^{-1}) were obtained (Hossain *et al*., 2011) [9]. Regarding mungbean growth features in response to applied NPK fertilizers, very little is known. Thus, the current study's goals were to identify the mungbean cultivars with the most promising growth characteristics and to ascertain the maximum amount of fertilizer to apply. A collection of growth features to be employed in upcoming mungbean cultivar breeding programs was also intended to be identified by establishing a relationship between key growth parameters and grain production.

2. Methods and Materials

The current experiment contained nine treatment combination: main plot (V_1 - IPM 02-3, V_2- PDM-139, V_3- IPM 410-3) and sub plot (N_1-75% RDF, N_2-100% RDF, N_3-125% RDF). Three replications utilized in split plot design. The experiment was conducted at the University Research Farm, Rama University Mandhana, Kanpur 209217 (U.P.) during *kharif* season in 2023. The experimental site is situated between latitude 26.56 North and longitudes 80.21 East and having an altitude of 119 m above sea level. This region falls under Agro-climatic zone -III (Central Plateaus & Hills Region) of Uttar Pradesh. The climatic conditions of Central Uttar Pradesh are characterized by hot and semi-arid climate. The rainfall in this area typically occurs from June to September, with an average of 850 mm falling there each year. When it comes to a crop's optimal growth, yield, and development all of which contribute to a larger yield the soil is extremely important. Before seeding, ten samples were randomly taken from the experimental field at a depth of 0 to 15 cm. The experimental field soil's pH 7.85, EC (0.28 dSm^{-1}), Organic carbon (0.41 %), bulk density (1.24 g cc^{-1}), particle density (2.48 g cc^{-1}), and available nitrogen (192 kg ha^{-1}), phosphorus (9.42 kg ha^{-1}), and potassium (208.04 kg ha^{-1}) were estimated using the collected samples. 20 kg of seed per hectare was maintained, with a single row hand drill spaced 15 cm away from each other and 30 cm between cultivars. At the initial irrigation, prescribed nitrogen dosages (50+30 kg PK ha^{-1}) were applied together with a basal dose of potassium and phosphorus (urea, TSP, and SOP, respectively). Five randomly chosen plants from each cultivar were used to measure the following parameters prior to physiological maturity: plant height (cm), number of branches $plant^{-1}$, number of leaves $plant^{-1}$, days until 50% flowering, and leaf area (cm2). Using a soil auger, a composite soil sample was obtained from both year fields at depths of 0–15, 16–30, and 31–45 cm (before to planting and fertilizer application). After that, they conducted a physicochemical analysis using the method that Anonymous (1953) [5] had outlined. According to Table 1, the study area's soil was determined to be basic in response, salt-free, with low levels of organic matter and total nitrogen, medium water-holding capacity, and medium texture. The method outlined by Steel & Torrie (1986) [15] was followed in the combined analysis of the data gathered for both year fields. The computer program MSTAT-C is used to calculate the least significant difference test (LSD) and analysis of variance (ANOVA) to separate the mean values. For the aforementioned entries, simple correlation coefficients (r) investigations have also been carried out with the methodology outlined by Fisher & Yates (1953) [8]. A detailed explanation and discussion of the correlation between the growth parameters of mungbean cultivars and their relative grain production has already been provided by Achakzai & Habibullah (2012) [3].

3. Results and Discussion

3.1 Growth attributes

In this attributes, different types of growth parameters were studied on different green gram varieties carefully and their interaction with different recommended dose of fertilizer were observed and recorded are being described separately below.

3.1.1 Emergence count and final plant stand

The observation data regarding to emergence count and final plant stand which was recorded at initial stage and at physiological maturity stage are represented in Table 1. The data in which was analyzed reveals that plant population recorded at both the growth stages i.e., emergence count at 15 DAS and at harvest did not shows any significant differences among varieties due to green gram cultivars. For recommended dose of fertilizers, there is also no significant differences were seen. Data concerning to interaction effect of green gram varieties and recommended dose fertilizers also didn't reach at the level of significance at both emergence and at final plant stand.

3.1.2 Plant height (cm)

The data regarding to plant height (cm) which was recorded at particular time interval i.e., 30 DAS, 45 DAS, 60 DAS and at harvest are represented in Table 2.

The analyzed data reveals that among varieties at 30, 45, 60 DAS and at harvest there is no significant effect is found. Among doses, at 30 DAS there is no significant effect is seen but at 45, 60 and at harvest significant effects were seen. At 45 DAS, data reveals that application of 125% RDF recorded highest plant height (42.42 cm) and 100% RDF was found at par (40.37 cm) with it but their interaction effect is found to be non-significant. At 60 DAS, among doses there is significant effect is seen in which at 125% RDF highest plant height (63.91 cm) was observed and 100% RDF found at par (63.42 cm) with it but

their interaction effect is found to be non-significant. At the time of harvest, 125% RDF had highest plant height (63.51 cm) and 100% RDF is found to be at par (62.88 cm) with it but their interaction effect is found to be non-significant.

Table 1: Effect of different fertilizer doses on different green gram varieties on emergence count and final plant stand

Treatments	Plant population (m2)	
	Emergence count (15 DAS)	Final plant stand
Varieties		
IPM 02-3	32.80	32.34
PDM-139	32.33	30.87
IPM 410-3	32.65	31.11
SEm±	0.32	0.12
CD (P=0.05)	NS	NS
CV (%)	7.65	5.80
Fertilizer doses		
75% RDF	31.36	31.05
100% RDF	32.36	30.73
125% RDF	31.97	31.21
SEm±	0.36	0.28
CD (P=0.05)	NS	NS
CV (%)	5.07	6.23
Interaction effect	NS	NS

Table 2: Effect of various fertilizer doses on plant height of different green gram varieties at different time intervals.

Treatments	Plant height (cm)			
	30 DAS	45 DAS	60 DAS	At harvest
Varieties				
IPM 02-3	21.43	40.42	61.28	61.75
PDM-139	21.08	40.07	61.05	60.77
IPM 410-3	21.48	40.61	61.51	61.22
SEm±	0.07	0.09	0.54	0.60
CD (P=0.05)	NS	S	S	S
CV (%)	6.16	5.44	5.04	5.21
Fertilizer doses				
75% RDF	21.13	38.35	58.39	59.56
100% RDF	21.10	40.37	63.91	62.88
125% RDF	22.41	42.42	63.42	63.51
SEm±	0.26	0.59	0.68	1.85
CD (P=0.05)	NS	4.28	6.66	5.71
CV (%)	5.69	5.93	6.05	5.18
Interaction effect	NS	S	S	S

3.1.3 Plant dry matter (g plant-1)

The data regarding to plant dry matter (g plant^{-1}) which was recorded at particular time interval i.e., 30, 45, 60 DAS and at harvest are represented in Table 3. Analysis of the data reveals that at 30 DAS, among varieties, doses and their interaction had no significant effect among them.

At 45 DAS, varieties, doses and their interaction are found to be non-significant. At 60 DAS, among varieties, dry matter is found to be significant in which variety IPM 02-3 produces maximum dry matter (9.41 g plant^{-1}) followed by IPM 410-3 (9.02 g plant^{-1}) and among doses 125% RDF produces maximum dry matter (9.45 g plant^{-1}) followed by 100% RDF (9.42 g plant^{-1}) but their interaction effect is found to be non-significant. At harvest, among the varieties, effect is found to be significant in which IPM 02-3 produces maximum dry matter (9.89 g plant^{-1}) followed by IPM 410-3 (9.75 g plant^{-1}) and among doses effect is found statistically significant in which 125% RDF is found maximum (9.46 g plant^{-1}) followed by 100% RDF (9.9.39 g plant^{-1}).

However, the interaction effects of green gram varieties and doses were found non- significant at the time of harvest.

Table 3: Effect of various fertilizer doses on plant dry matter of different green gram varieties at different time intervals.

Treatments	Plant dry matter (g plant-1)			
	30 DAS	45 DAS	60 DAS	At harvest
Varieties				
IPM 02-3	4.33	9.06	9.41	9.89
PDM-139	3.91	7.46	8.38	8.75
IPM 410-3	4.18	7.45	9.02	9.75
SEm±	0.05	0.12	0.09	0.11
CD (P=0.05)	NS	NS	1.15	1.05
CV (%)	12.02	10.19	6.04	5.30
Fertilizer doses				
75% RDF	3.92	7.76	8.26	8.54
100% RDF	4.12	7.93	9.42	9.39
125% RDF	4.29	8.29	9.45	9.46
SEm±	0.04	0.08	0.07	0.05
CD (P=0.05)	NS	NS	1.23	1.75
CV (%)	11.35	8.94	7.42	10.09
Interaction effect	NS	NS	S	S

3.1.3 Number of branches plant-1

Table 4: Effect of various fertilizer doses on the branches count of different green gram varieties at different time intervals.

Treatments	Number of branches plant-1			
	30 DAS	45 DAS	60 DAS	At harvest
Varieties				
IPM 02-3	1.67	1.98	3.43	3.45
PDM-139	1.68	1.69	2.98	3.15
IPM 410-3	1.73	1.88	2.99	3.28
SEm±	0.01	0.01	0.01	0.02
CD (P=0.05)	NS	S	S	NS
CV (%)	8.66	10.12	6.78	5.19
Fertilizer doses)				
75% RDF	1.78	1.81	3.20	3.25
100% RDF	1.88	1.93	3.28	3.49
125% RDF	2.07	2.07	3.27	3.40
SEm±	0.01	0.02	0.03	0.05
CD (P=0.05)	NS	S	S	NS
CV (%)	8.37	10.36	9.90	8.19
Interaction effect	NS	S	S	NS

The data regarding to number of branches plant^{-1} which was recorded at particular time interval i.e., 30 DAS, 45 DAS, 60 DAS and at harvest are represented in Table 4. It is clearly evident from the data that at 30, 45, 60 DAS and at harvest the varieties, different doses and their interaction i.e., green gram varieties and fertilizer doses differed insignificant.

A perusal of results further indicated that among the varieties, IPM 02-3 produces maximum number of branches plant^{-1} but remained statistically comparable with other varieties i.e., PDM-139 and IPM 410-3. Among the different doses, 125% RDF had the maximum number of branches in comparison to 75% and 100% RDF but remained statistically comparable with them.

3.1.4 Leaf area index

The data regarding leaf area index which was recorded at particular time interval i.e., 30 and 60 DAS are represented in Table 5.

The observation data reveals that at 30 and 60 DAS among the varieties there is no significant effect is found but significant effect among the doses is found in which 125% RDF produces maximum LAI (0.83) and 100% RDF is at par (0.78) with it at

30 DAS and at 60 DAS, 125% RDF produces maximum (6.84) which was at par with 100% RDF (6.27) but their interactions is found to be non-significant.

Table 5: Effect of various fertilizer doses on the leaf area index of different greengram varieties at 30 and 60 DAS.

Treatments	Leaf area index	
	30 DAS	60 DAS
Varieties		
IPM 02-3	0.61	6.95
PDM-139	0.66	6.02
IPM 410-3	0.77	6.19
SEm±	0.00	0.04
CD (P=0.05)	NS	NS
CV (%)	11.70	8.58
Fertilizer doses		
75% RDF	0.73	6.20
100% RDF	0.78	6.27
125% RDF	0.83	6.84
SEm±	0.01	0.06
CD (P=0.05)	0.14	0.50
CV (%)	12.54	4.10
Interaction effect	NS	NS

Table 6: Effect of various fertilizer doses on the leaf area index of different green gram varieties at 45 DAS.

Treatment	LAI at 45 DAS			
	75% RDF	100% RDF	125% RDF	Mean
IPM 02-3	3.69	3.64	4.35	3.89
PDM-139	2.56	3.44	3.58	3.19
IPM 410-3	3.59	3.52	4.20	3.77
Mean	3.28	3.53	4.04	
Treatments	SEm±	C.D. (P=0.05)	CV (%)	
Variety (V)	0.12	0.78	10.90	
Doses (N)	0.16	0.49		
Interaction of VxN	0.27	1.09	7.8	

The data regarding leaf area index which was recorded particularly at 45 DAS are represented in Table 6. At 45 DAS, among varieties significant effect were seen in which variety IPM 02-3 produces maximum LAI (mean 3.89) followed by IPM 410- 3 (mean 3.77) and PDM-139 (mean 3.19). The scrutiny of data further reported that among the recommended dose of fertilizers, effect found to be significant in which 125% RDF produces maximum LAI (mean 4.04) followed by 100% RDF (3.53). Combined effect of different green gram varieties and different doses is also found to be significant.

3.1.5 Number of root nodules plant-1

The data regarding to number of root nodules plant^{-1} which was recorded at particular time interval i.e., 30 and at harvest are represented in Table 7. Observation data of root nodule count at 30 DAS, shows that among the green gram varieties there is no significant effect was found. Although, effect of fertilizer was found to be significant in which 100% RDF produces maximum root nodules (21.03) followed by 125% RDF (18.61) and their interactions were found to be non-significant. However, at the time of harvest varieties, different doses and their interaction is found to be non-significant.

From the given data in Table 8. Observation reveals that at 45 DAS differences among varieties in root nodule count didn't seem due to cultivars. Different RDF doses had significant impact on green gram plants in which 100% RDF produces maximum root nodules with mean 32.22 followed by 125% RDF with mean value of 29.28.

Table 7: Effect of various fertilizer doses on the root nodule count of different green gram varieties at 30 DAS and at harvest.

Treatments	Root nodule count plant-1	
	30 DAS	At harvest
Varieties		
IPM 02-3	20.41	15.90
PDM-139	16.48	14.08
IPM 410-3	19.48	14.66
SEm±	0.26	0.13
CD (P=0.05)	NS	NS
CV (%)	13.13	9.53
Fertilizer doses		
75% RDF	16.89	14.07
100% RDF	21.03	15.46
125% RDF	18.61	15.35
SEm±	0.18	0.12
CD (P=0.05)	4.30	NS
CV (%)	12.73	9.27
Interaction effect	NS	NS

From Table 9. At 60 DAS, green gram varieties have significant impact on root nodule count plant^{-1} in which variety IPM 02-3 had maximum number of root nodules with mean value of 24.79 whereas variety IPM 410-3 is at par with mean value 22.27 and variety PDM-139 had lowest root nodule count with mean value of 22.23.

Among doses, significant effect was seen in which 100% RDF had significant impact on root nodule count which was maximum with mean value of 24.64 followed by 125% RDF is at par with mean value 23.46 and 75% of RDF had the lowest number of root nodule with mean value of 20.18. Also, interaction between green gram varieties and different doses of fertilizers at 45 and 60 DAS found to be significant.

Table 8: Effect of various fertilizer doses on the root nodule count of different greengram varieties at 45 DAS.

Treatment	Root nodule count plant-1 at 45 DAS			
	75% RDF	100% RDF	125% RDF	Mean
IPM 02-3	23.99	38.11	28.28	30.12
PDM-139	24.09	26.22	30.47	26.92
IPM 410-3	27.21	32.33	29.10	29.54
Mean	25.09	32.22	29.28	
Treatments	SEm±	C.D. (P=0.05)	CV (%)	
Variety (V)	0.76	NS	7.94	
Doses (N)	1.05	3.22		
Interaction of VxN	1.81	7.11	6.24	

Table 9: Effect of various fertilizer doses on the root nodule count of different green gram varieties at 60 DAS.

Treatment	Root nodule count plant-1 at 60 DAS			
	75% RDF	100% RDF	125% RDF	Mean
IPM 02-3	19.69	27.31	27.38	24.79
PDM-139	19.57	22.38	21.74	22.23
IPM 410-3	21.30	24.23	21.28	22.27
Mean	20.18	24.64	23.46	
Treatments	SEm±	C.D. (P=0.05)	CV (%)	
Variety (V)	0.61	3.72	8.11	
Doses (N)	0.68	2.10		
Interaction of VxN	1.18	4.64	5.22	

4. Pheno-logical studies

4.1 Flower initiation days

The data regarding to flower initiation in days was recorded which was represented in Table 10.

Table 10: Effect of various fertilizer doses on flower initiation days of different green gram varieties.

Treatments	Flower initiation days
Varieties	
IPM 02-3	33.99
PDM-139	35.77
IPM 410-3	34.91
SEm±	0.49
CD (P=0.05)	NS
CV (%)	8.12
Fertilizer doses	
75% RDF	35.71
100% RDF	35.06
125% RDF	33.53
SEm±	0.26
CD (P=0.05)	3.04
CV (%)	4.87
Interaction effect	NS

The Table 10. of flower initiation days shows that recommended dose of fertilizers had a significant effect on flower initiation in which 125% RDF treatment taken lesser number of days (33.53) in initiation of flowers. Also 100% RDF is at par (35.06) with it and 75% RDF had taken highest numbers of days (36.22) in initiation of flowers. Although, green gram varieties didn't show any significant effect, but variety IPM 02-3 taken lesser numbers of days (33.99) for the initiation of flowers and variety PDM-139 taken highest (35.77) numbers of days in initiation of flowers. Although, interaction between green gram varieties and doses failed to differ significant.

4.2 Yield attributing parameters

The data regarding to number of pods plant^{-1} are represented in Table 11. The data concerned with number of pods plant^{-1} reveals that among the green gram varieties effect is found to be significant in which variety IPM 02-3 contains highest number of pods plant^{-1} with mean value 23.04 followed by variety IPM 410-3 with mean 21.00 and variety PDM-139 contains lowest number of pods plant^{-1} with mean value 20.59. The data shows that the fertilizer doses are found to be significant in which 125% RDF produces highest number of pods plant^{-1} with mean of 22.66 followed by 100% RDF with mean 22.90 and 75% RDF contains lowest number of pods plant^{-1} with mean value of 20.07. Although, interaction between green gram varieties and doses were found to be significant.

Table 11: Effect of various fertilizer doses on number of pods plant-1 of different green gram varieties.

Treatment	Number of pods plant-1			
	75% RDF	100% RDF	125% RDF	Mean
IPM 02-3	21.30	22.97	24.85	23.04
PDM-139	20.32	21.58	19.87	20.59
IPM 410-3	18.60	21.15	23.27	21.00
Mean	20.07	21.90	22.66	
Treatments	SEm±	C.D. (P=0.05)	CV (%)	
Variety (V)	0.46	2.82	6.41	
Doses (N)	0.77	2.37	6.14	
Interaction of VxN	1.33	5.24		

The given observation data of yield attributes i.e., number of grains pod^{-1}, length of pods (cm) and test weight (g) has been presented in Table 12.

It is clearly seen that number of grains pod^{-1} didn't seem significant among the green gram varieties however, among the doses effect is significant in which 125% RDF produces maximum grains (7.95) followed by 100% RDF (7.77).

Data regarding to length of pods (cm) shows that length of pod is found to be significant among the green gram varieties in which longest pods were found in variety IPM 02-3 (8.07 cm) followed by variety IPM 410-3 (8.39 cm) and variety PDM-139 had minimum (7.66 cm) pod length. Among the fertilizer doses effect is also found to be significant in which longest pods (8.53 cm) were observed in 125% RDF followed by 100% RDF (8.37 cm) and shortest pod length (7.63 cm) was observed in 75% RDF.

Data regarding to test weight (g) reveals that nonetheless, green gram varieties and different doses of fertilizers were found significant. However, highest test weight was found in variety IPM 02-3 (41.21 g) which was at par with variety IPM 410-3 (39.48 g) and lowest test weight were found in variety PDM-139 (39.01 g) and among the doses, highest (39.71 g) test weight is of 125% RDF and lowest (39.51 g) was of 75% RDF. However, interaction effect of number of grains, length of pods and test weight is found to be non-significant.

Table 12: Effect of various fertilizer doses on number of pods, grains pod-1, length of pods (cm) and test weight (g) on different green gram varieties.

Treatments	Yield attributes		
	No. of grains pod-1	Length of pods (cm)	Test weight (g)
Varieties			
IPM 02-3	7.95	8.07	41.21
PDM-139	6.71	7.66	39.01
IPM 410-3	7.15	8.39	39.48
SEm±	0.05	0.07	0.12
CD (P=0.05)	S	1.12	NS
CV (%)	9.17	6.46	5.42
Fertilizer doses			
75% RDF	5.93	7.63	39.51
100% RDF	7.77	8.37	39.66
125% RDF	7.95	8.53	39.71
SEm±	0.03	0.06	0.41
CD (P=0.05)	1.22	1.10	NS
CV (%)	9.09	7.26	4.00
Interaction effect	S	S	NS

4.3 Yields

The data regarding to grain yield, straw yield (q ha^{-1}) and harvest index (%) of green gram which was recorded are represented in Table 13. The data of grain yield reveals that green gram varieties were influenced significantly due to cultivars, among them highest (9.26 q ha^{-1}) grain yield were found in variety IPM 02-3 and the lowest grain yield were found in variety PDM-139 (7.47 q ha^{-1}) among doses, significant differences were seen in which highest (9.20 q ha^{-1}) grain yield were found in 100% RDF which was at par (8.45 q ha^{-1}) with 125% RDF and the lowest (7.60 q ha^{-1}) were found in 75% RDF. The data of stover yield (q ha^{-1}) reveals that, among green gram varieties, doses and their interactions were found to be non-significant however, highest (26.18 q ha^{-1}) stover yield is of variety IPM 02-3 and the lowest (25.32 q ha^{-1}) were observed in variety PDM-139. Among the doses highest (26.19 q ha^{-1}) stover yield were observed in 125% RDF and the lowest (24.37 q ha^{-1}) were observed in 75% RDF.

The data of harvest index (%) reveals that among the varieties and doses there in no significant effect were observed. Also, among the interactions of different green gram varieties and different fertilizer doses there is no significant effects were observed.

Table 13: Effect of various fertilizer doses on grains, straw yield and harvest index on different green gram varieties.

Treatments	Yields (q ha-1)		H.I. (%)
	Grain yield	Straw yield	
Varieties			
IPM 02-3	9.26	26.18	26.11
PDM-139	7.47	25.32	22.93
IPM 410-3	8.35	25.91	23.86
SEm±	0.09	0.11	0.19
CD (P=0.05)	1.16	NS	NS
CV (%)	6.73	5.34	9.42
Fertilizer doses			
75% RDF	7.60	24.37	23.25
100% RDF	9.20	26.12	24.84
125% RDF	8.45	26.19	24.72
SEm±	0.08	0.13	0.17
CD (P=0.05)	1.11	NS	NS
CV (%)	7.36	6.60	6.66
Interaction effect	NS	NS	NS

Table 14: Effect of various fertilizer doses on biological yield of different green gram varieties.

Treatment	Biological yield (q ha-1)			
	75% RDF	100% RDF	125% RDF	Mean
IPM 02-3	35.95	36.19	36.19	36.11
PDM-139	28.45	34.53	35.31	32.76
IPM 410-3	32.83	35.85	35.53	34.73
Mean	32.41	35.52	35.67	
Treatments	SEm±	C.D. (P=0.05)	CV (%)	
Variety (V)	0.84	NS	7.27	
Doses (N)	0.88	2.71	4.39	
Interaction of VxN	1.52	5.98		

From the above given Table 14 of biological yield (q ha^{-1}) reveals that the differences among varieties is found to be non-significant and among the different fertilizer doses it was found significant in which highest mean is 35.67 q ha^{-1} were observed in 125% followed by 100% RDF with mean 35.52 q ha^{-1} and lowest yield were observed in 75% RDF with 32.41 q ha^{-1} and their interaction is also found to be significant.

5. Conclusion

On the basis of summarized results it may be concluded that, application of 100% RDF was found most suitable achieving maximum number of branches and yield in moong bean as compare to the other nutrient doses.

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