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Effect of integrated nutrient management on nutrient uptake of mung bean

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Abstract
Background: A field experiment entitled "Integrated Nutrient Management on Summer Mung bean (*Vigna radiata*)" under Malwa Region was conducted during summer season of year 2021 and 2022 at the field of Agronomy, SAGE University, Indore. The experiment was laid out in a randomized block design with nine treatments and four replications. The experimental data pertaining to the NPK content (%) in seed and straw, NPK uptake (%) by seed, straw and crop as whole and protein content in seed (%) as influenced by different integrated nutrient management treatments was statistically analyzed and presented.

Keywords: Seed, NPK, integrated nutrient management

Introduction
Mung bean (*Vigna mungo* (L.) Wilczek) is quite possibly of the most significant heartbeat crops among the different grain vegetables. As indicated by Vavilov (1951) [11] it is local to India, have a place with the family Leguminosae. It is a rich protein food, contains about 26% protein, 1.2% fat and 56.6% starches on dry weight premise and it is rich wellspring of calcium and iron. Perhaps of the main test confronting humankind today is to monitor/support regular assets, including soil and water, for expanding food creation while safeguarding the climate. As the total populace develops, weight on regular assets increments, making it hard to keep up with food security. Long-haul food security requires a harmony between expanding crop creation, keeping up with soil wellbeing and natural manageability. In India, viable supplement the board plays had a significant impact in achieving the tremendous expansion in food grain creation from 52 million tons in 1951-52 to 230 million tons during 2007-08. Notwithstanding, utilization of imbalanced or potentially unreasonable supplements prompted declining supplement use productivity making manure utilization uneconomical and delivering unfriendly outcomes on air (Aulakh and Adhya, 2005) [4] and groundwater quality (Aulakh *et al*., 2009) [6] causing well-being dangers and environmental change. On other hand, supplement mining has happened in many soils due to absence of reasonable manure sources and where less or no natural deposits are gotten back into the dirts. Soils of Karnataka are innately poor in natural matter, ripeness and water-holding limit. In these dirts, N, P and S lack head yield-restricting variables for crop creation. INM, which involves the support/change of soil ripeness to an ideal level for crop efficiency to acquire the most extreme advantage from all potential wellsprings of plant supplements - organics as well as inorganics - in a coordinated way (Aulakh and Award 2008; Sangeeta *et al*., 2014) [5, 12], is a fundamental stage to address the twin worries of supplement overabundance and supplement consumption. INM is additionally significant for peripheral ranchers who can't stand to supply crop supplements through exorbitant compound manures (Aulakh, 2009) [6]. The biofertilizers have shown empowering brings about supporting the yield efficiency and working on the soil fruitfulness (Govindan and Thirumurugan, 2005) [13]. Ghosh and Joseph (2008) [14] additionally announced that heartbeat crop vaccinated with Rhizobium culture fundamentally recorded larger number of cases, number of seeds, test weight and seed yield. Natural composts, on the opposite side give a decent substrate to the development of miniature living beings and keep a positive supplement supply climate and further develop soil actual properties. In this manner, the aforementioned results have cleared approach to increment the efficiency of harvests utilizing the blend of inorganic sources and biofertilizers.

In this manner, coordinated approach of supplement supply by substance composts alongside biofertilizers is acquiring significance as this framework not just decreases the utilization of unnecessary utilization of inorganic manures, however supporting the harvest efficiency by further developing soil wellbeing and is likewise a climate-agreeable methodology. Reconciliation of inorganic composts and biofertilizers brought about better development, yield and supplement takes-up in dark gram (Kumpawat, 2010) [8], green gram (Mandal and Pramanick, 2014) [9], sesame (Nayek *et al*., 2014) [10] and rice (Kumar *et al*., 2014) [7] when contrasted with sole utilization of inorganic composts. Notwithstanding, data on the conjunctive utilization of inorganic composts and biofertilizers is ailing in many yields including dark gram. The ideal plant thickness can give amicable circumstances to have most extreme light interference right from early development stage to unit filling stage. By changing the plant dispersing, it is conceivable to accomplish ideal vegetative and conceptive development to help up crop efficiency per unit region (Anil kumar, 2004) [2]. Consequently, keeping above realities in view, the current examination was completed to concentrate on the impact of incorporated supplement the executives rehearses on development and yield boundaries of dark gram cv. LBG 625 (Rashmi).

Material and Methods

The Treatment details are as follows

The experiment was laid out in a randomized block design with nine treatments and four replications *viz*. T_1 (Control), T_2 (RDF (20 kg N + 40 kg P_2O_5/ha), T_3 (RDF + Rhizobium PSB), T_4 (FYM (10 Kg/Ha), T_5 (FYM(Rh+ PSB)), T_6 (RDF (50%) + FYM (2.5 t/ha) + (Rh+ PSB), T_7 (RDF (50%) + FYM(5 t/ha) + (Rh+ PSB), T_8 (RDF (25%) + FYM (5 t/ha) + (Rh+ PSB) and T_9 (RDF (75%) + FYM (5 t/ha)+(Rh+ PSB),(Nitrogen, phosphorus and Potassium were applied as per treatment, half dose of nitrogen, full dose of phosphorus and potassium were applied at time of sowing and rest dose of nitrogen in two equal split one at 45 and 2nd at 60 days after sowing. FYM and vermicompost were applied before 15 days of sowing. Seed treatment was done with PSB + Rhizobium (bio-fertilizer).

Results

The experimental data pertaining to the NPK content (%) in seed and straw, NPK uptake (%) by seed, straw and crop as whole and protein content in seed (%) as influenced by different integrated nutrient management treatments was statistically analyzed and presented in Table 4.1 to Table 4.10 of the mungbean during the summer season of the year 2020-21 and 2021-22.

Nitrogen Content (%) in Seed

The evidence of experimental data presented in Table 4.1 indicated that the nitrogen content (%) in seed was significantly affected by different treatment combinations of integrated nutrient management applied during the summer season of the year 2020-21 and 2021-22 on mungbean. The nitrogen (%) in seed was observed lowest in control plot (T_1) i.e., 2.925 per cent, 2.975 per cent and 2.950 during the summer season of the year 2020-21, 2021-22 and pooled, respectively whereas it was observed highest nitrogen content (%) in seed under T_9 with the application of RDF (75%) + FYM (5t/ha) + (Rh + PSB) treatment combination i.e., 3.374 per cent, 3.379 per cent, and 3.377 per cent, respectively closely followed by T8 treatment combination i.e., 3.307 per cent, 3.311 per cent and 3.309 per cent, respectively with the application of RDF (50%) + FYM (5t/ha) + (Rh + PSB) and T_7 treatment combination i.e., 3.305 per cent, 3.309 per cent and 3.307 per cent with application of RDF (25%) + FYM (5t/ha) + (Rh + PSB).

Table 1: Effect of Integrated Nutrient Management on Nitrogen Content (%) in Seed of Mungbean during summer

Treatments	Nitrogen Content (%) in Seed		
	2021	2022	Pooled
T_1: Control	2.925	2.975	2.950
T_2: RDF (20 kg N + 40 kg P_2O_5/ha)	3.156	3.161	3.159
T_3: RDF + Rhizobium + PSB	3.266	3.271	3.268
T_4: FYM (10 Kg/Ha)	3.267	3.272	3.269
T_5: FYM + Rh + PSB	3.285	3.290	3.288
T_6: RDF (50%) + FYM (2.5 t/ha) + (Rh+ PSB)	3.295	3.300	3.297
T_7: RDF (50%) + FYM (5 t/ha) + (Rh+ PSB)	3.305	3.309	3.307
T_8: RDF (25%) + FYM (5 t/ha) + (Rh+ PSB)	3.307	3.311	3.309
T_9: RDF (75%) + FYM (5 t/ha) + (Rh+ PSB)	3.374	3.379	3.377
SEm±	0.026	0.017	0.014
CD at 5%	0.075	0.048	0.039

Nitrogen Content (%) in Straw

The experimental data presented in Table 4.2 indicated that the nitrogen content (%) in straw was significantly affected by different treatment combinations of integrated nutrient management applied during the summer season of the year 2020-21 and 2021-22 of mungbean. The nitrogen content (%) in straw was observed highest under T_9 treatment combination with the application of RDF (75%) + FYM (5t/ha) + (Rh + PSB) i.e., 1.153 per cent, 1.155 per cent, and 1.154 per cent, respectively closely followed by T_8 treatment combination i.e., 1.130 per cent, 1.132 per cent and 1.131 per cent, respectively with the application of RDF (50%) + FYM (5t/ha) + (Rh + PSB) and T_7 treatment combination i.e., 1.129 per cent, 1.132 per cent and 1.131 per cent with application of RDF (25%) + FYM (5t/ha) + (Rh + PSB) while it was observed minimum in control plot (T_1) i.e., 1.005 per cent, 1.014 per cent and 1.009 during the summer season of the year 2020-21, 2021-22 and pooled, respectively.

Table 2: Effect of Integrated Nutrient Management on Nitrogen Content (%) in Straw of Mungbean

Treatments	Nitrogen Content (%) in Straw		
	2021	2022	Pooled
T_1: Control	1.005	1.014	1.009
T_2: RDF (20 kg N + 40 kg P_2O_5/ha)	1.079	1.081	1.080
T_3: RDF + Rhizobium + PSB	1.116	1.119	1.117
T_4: FYM (10 Kg/Ha)	1.116	1.119	1.118
T_5: FYM + Rh + PSB	1.123	1.125	1.124
T_6: RDF (50%) + FYM (2.5 t/ha) + (Rh+ PSB)	1.126	1.129	1.127
T_7: RDF (50%) + FYM (5 t/ha) + (Rh+ PSB)	1.129	1.132	1.131
T_8: RDF (25%) + FYM (5 t/ha) + (Rh+ PSB)	1.130	1.132	1.131
T_9: RDF (75%) + FYM (5 t/ha) + (Rh+ PSB)	1.153	1.155	1.154
SEm±	0.008	0.008	0.005
CD at 5%	0.023	0.023	0.015

Phosphorus Content (%) in Seed

The evidence of experimental data presented in Table 4.3 indicated that the phosphorus content (%) in seed was exceedingly influenced by different treatment combinations of integrated nutrient management applied during the summer season of the year 2020-21 and 2021-22 in mungbean. The

phosphorus content (%) in seed was found lowest in control plot (T_1) i.e., 0.744 per cent, 0.753 per cent and 0.748 during the summer season of the year 2020-21, 2021-22 and pooled, respectively whereas it was observed highest phosphorus content (%) in seed under T_9 with the application of RDF (75%) + FYM (5t/ha) + (Rh + PSB) treatment combination i.e., 0.894 per cent, 0.896 per cent, and 0.895 per cent, respectively closely followed by T8 treatment combination i.e., 0.876 per cent, 0.878 per cent and 0.877 per cent, respectively with the application of RDF (50%) + FYM (5t/ha) + (Rh + PSB) and T_7 treatment combination i.e., 0.875 per cent, 0.878 per cent and 0.876 per cent with application of RDF (25%) + FYM (5t/ha) + (Rh + PSB).

Table 3: Effect of Integrated Nutrient Management on Phosphorus Content (%) in Seed of Mungbean during summer

Treatments	Phosphorus Content (%) in Seed		
	2021	2022	Pooled
T_1: Control	0.744	0.753	0.748
T_2: RDF (20 kg N + 40 kg P_2O_5/ha)	0.836	0.839	0.837
T_3: RDF + Rhizobium + PSB	0.865	0.867	0.866
T_4: FYM (10 Kg/Ha)	0.865	0.868	0.867
T_5: FYM + Rh + PSB	0.870	0.872	0.871
T_6: RDF (50%) + FYM (2.5 t/ha) + (Rh+ PSB)	0.873	0.875	0.874
T_7: RDF (50%) + FYM (5 t/ha) + (Rh+ PSB)	0.875	0.878	0.876
T_8: RDF (25%) + FYM (5 t/ha) + (Rh+ PSB)	0.876	0.878	0.877
T_9: RDF (75%) + FYM (5 t/ha) + (Rh+ PSB)	0.894	0.896	0.895
SEm±	0.005	0.006	0.003
CD at 5%	0.013	0.016	0.010

4.1.4 Phosphorus Content (%) in Straw

The experimental data presented in Table 4.4 indicated that the phosphorus content (%) in straw was remarkably affected by different treatment combinations of integrated nutrient management applied during the summer season of the year 2020-21 and 2021-22 in mungbean. The phosphorus content (%) in straw was observed maximum under T_9 treatment combination with the application of RDF (75%) + FYM (5t/ha) + (Rh + PSB) i.e., 0.309 per cent, 0.311 per cent, and 0.310 per cent, respectively closely followed by similar trend of T8 with the application of RDF (50%) + FYM (5t/ha) + (Rh + PSB) and T_7 with application of RDF (25%) + FYM (5t/ha) + (Rh + PSB) treatment combination i.e., 0.303 per cent, 0.305 per cent and 0.304 per cent, respectively while it was found minimum in control plot (T1) i.e., 0.268 per cent, 0.280 per cent and 0.274 during the summer season of the year 2020-21, 2021-22 and pooled, respectively.

Table 4: Effect of Integrated Nutrient Management on Phosphorus Content (%) in Straw of Mungbean during summer

Treatments	Phosphorus Content (%) in Straw		
	2021	2022	Pooled
T_1: Control	0.268	0.280	0.274
T_2: RDF (20 kg N + 40 kg P_2O_5/ha)	0.290	0.292	0.291
T_3: RDF + Rhizobium + PSB	0.300	0.302	0.301
T_4: FYM (10 Kg/Ha)	0.300	0.302	0.301
T_5: FYM + Rh + PSB	0.301	0.303	0.302
T_6: RDF (50%) + FYM (2.5 t/ha) + (Rh+ PSB)	0.302	0.304	0.303
T_7: RDF (50%) + FYM (5 t/ha) + (Rh+ PSB)	0.303	0.305	0.304
T_8: RDF (25%) + FYM (5 t/ha) + (Rh+ PSB)	0.303	0.305	0.304
T_9: RDF (75%) + FYM (5 t/ha) + (Rh+ PSB)	0.309	0.311	0.310
SEm±	0.004	0.002	0.002
CD at 5%	0.011	0.006	0.005

Potassium Content (%) in Seed

The evidence of experimental data presented in Table 4.5 indicated that the potassium content (%) in seed was exceedingly influenced by different treatment combinations of integrated nutrient management applied during the summer season of the year 2020-21 and 2021-22 in mungbean. The potassium content (%) in seed was found lowest in control plot (T_1) i.e., 0.827 per cent, 0.834 per cent and 0.830 during the summer season of the year 2020-21, 2021-22 and pooled, respectively whereas it was observed highest potassium content (%) in seed under T9 with the application of RDF (75%) + FYM (5t/ha) + (Rh + PSB) treatment combination i.e., 0.960 per cent, 0.965 per cent, and 0.963 per cent, respectively which was closely followed by T_8 treatment combination i.e., 0.941 per cent, 0.946 per cent and 0.944 per cent, respectively with the application of RDF (50%) + FYM (5t/ha) + (Rh + PSB) and T_7 treatment combination i.e., 0.941 per cent, 0.946 per cent and 0.943 per cent with application of RDF (25%) + FYM (5t/ha) + (Rh + PSB).

Table 5: Effect of Integrated Nutrient Management on Potash Content (%) in Seed of Mungbean during summer

Treatments	Potash Content (%) in Seed		
	2021	2022	Pooled
T_1: Control	0.827	0.834	0.830
T_2: RDF (20 kg N + 40 kg P_2O_5/ha)	0.899	0.904	0.901
T_3: RDF + Rhizobium + PSB	0.930	0.935	0.932
T_4: FYM (10 Kg/Ha)	0.930	0.935	0.933
T_5: FYM + Rh + PSB	0.935	0.940	0.938
T_6: RDF (50%) + FYM (2.5 t/ha) + (Rh+ PSB)	0.938	0.943	0.940
T_7: RDF (50%) + FYM (5 t/ha) + (Rh+ PSB)	0.941	0.946	0.943
T_8: RDF (25%) + FYM (5 t/ha) + (Rh+ PSB)	0.941	0.946	0.944
T_9: RDF (75%) + FYM (5 t/ha) + (Rh+ PSB)	0.960	0.965	0.963
SEm±	0.007	0.007	0.004
CD at 5%	0.020	0.020	0.013

Potassium Content (%) in Straw

The experimental data presented in Table 4.6 indicated that the potassium content (%) in straw was significantly affected by different treatment combinations of integrated nutrient management applied during the summer season of the year 2020-21 and 2021-22 in mungbean. The potassium content (%) in straw was observed maximum under T_9 treatment combination with the application of RDF (75%) + FYM (5t/ha) + (Rh + PSB) i.e., 1.200 per cent, 1.220 per cent, and 1.210 per cent, respectively closely followed by similar trend of T_8 with the application of RDF (50%) + FYM (5t/ha) + (Rh + PSB) i.e., 1.138 per cent, 1.149 per cent and 1.144 per cent, respectively and T_7 with application of RDF (25%) + FYM (5t/ha) + (Rh + PSB) treatment combination i.e., 1.138 per

cent, 1.148 per cent and 1.143 per cent, respectively while it was found minimum in control plot (T_1) i.e., 0.995 per cent, 1.017 per cent and 1.006 during the summer season of the year 2020-21, 2021-22 and pooled, respectively.

Table 6: Effect of Integrated Nutrient Management on Potash Content (%) in Straw of Mungbean

Treatments	Potash Content (%) in Straw		
	2021	2022	Pooled
T_1: Control	0.995	1.017	1.006
T_2: RDF (20 kg N + 40 kg P_2O_5/ha)	1.088	1.098	1.093
T_3: RDF + Rhizobium + PSB	1.125	1.135	1.130
T_4: FYM (10 Kg/Ha)	1.125	1.135	1.130
T_5: FYM + Rh + PSB	1.131	1.142	1.136
T_6: RDF (50%) + FYM (2.5 t/ha) + (Rh+ PSB)	1.135	1.145	1.140
T_7: RDF (50%) + FYM (5 t/ha) + (Rh+ PSB)	1.138	1.148	1.143
T_8: RDF (25%) + FYM (5 t/ha) + (Rh+ PSB)	1.138	1.149	1.144
T_9: RDF (75%) + FYM (5 t/ha) + (Rh+ PSB)	1.200	1.220	1.210
SEm±	0.018	0.010	0.009
CD at 5%	0.053	0.029	0.026

Protein Content (%) in Seed

The result on protein content (%) in seed as influenced by different treatment combinations of integrated nutrient management practices in the mungbean during the summer season of the year 2020-21 and 2021-22 was statistically analyzed and presented in Table 4.7.

The evidence of experimental data presented in Table 4.7 indicated that the protein content (%) in seed was remarkably influenced by different treatment combinations of integrated nutrient management applied during the summer season of the year 2020-21 and 2021-22 in mungbean. The protein content (%) in seed was found lowest in control plot (T_1) i.e., 18.28 per cent, 18.59 per cent and 18.44 during the summer season of the year 2020-21, 2021-22 and pooled, respectively whereas it was observed highest protein content (%) in seed under T9 with the application of RDF (75%) + FYM (5t/ha) + (Rh + PSB) treatment combination i.e., 21.09 per cent, 21.12 per cent, and 21.10 per cent, respectively which was closely followed by T_8 treatment combination i.e., 20.67 per cent, 20.70 per cent and 20.68 per cent, respectively with the application of RDF (50%) + FYM (5t/ha) + (Rh + PSB) and T_7 treatment combination i.e., 20.66 per cent, 20.68 per cent and 20.67 per cent with application of RDF (25%) + FYM (5t/ha) + (Rh + PSB).

Table 7: Effect of Integrated Nutrient Management on Protein Content (%) in Seed of Mungbean during summer

Treatments	Protein Content (%) in Seed		
	2021	2022	Pooled
T_1: Control	18.28	18.59	18.44
T_2: RDF (20 kg N + 40 kg P_2O_5/ha)	19.73	19.76	19.74
T_3: RDF + Rhizobium + PSB	20.41	20.44	20.43
T_4: FYM (10 Kg/Ha)	20.42	20.45	20.43
T_5: FYM + Rh + PSB	20.53	20.56	20.55
T_6: RDF (50%) + FYM (2.5 t/ha) + (Rh+ PSB)	20.59	20.62	20.61
T_7: RDF (50%) + FYM (5 t/ha) + (Rh+ PSB)	20.66	20.68	20.67
T_8: RDF (25%) + FYM (5 t/ha) + (Rh+ PSB)	20.67	20.70	20.68
T_9: RDF (75%) + FYM (5 t/ha) + (Rh+ PSB)	21.09	21.12	21.10
SEm±	0.16	0.10	0.09
CD at 5%	0.47	0.30	0.25

Nitrogen Uptake (%) by Crop

The result on nitrogen uptake (kg ha $^{-1}$) by crop as influenced by different treatment combinations of integrated nutrient management practices in the mungbean during the summer season of the year 2020-21 and 2021-22 was statistically analyzed and presented in Table 4.8.

The evidence of experimental data presented in Table 4.8 indicated that the nitrogen uptake (kg ha^{-1}) by crop was significantly influenced by different treatment combinations of integrated nutrient management applied during the summer season of the year 2020-21 and 2021-22 in mungbean. It was observed that maximum nitrogen uptake (kg ha^{-1}) by crop under T9 with the application of RDF (75%) + FYM (5t/ha) + (Rh + PSB) treatment combination i.e., 112.18 kg ha^{-1}, 116.15 kg ha^{-1}, and 114.07 kg ha^{-1}, respectively which was followed by T8 treatment combination i.e., 103.65 kg ha^{-1}, 110.43 kg ha^{-1} and 107.04 kg ha^{-1}, respectively with the application of RDF (50%) + FYM (5t/ha) + (Rh + PSB) and T_7 treatment combination i.e., 98.33 kg ha^{-1}, 106.10 kg ha^{-1} and 102.22 kg ha^{-1} with application of RDF (25%) + FYM (5t/ha) + (Rh + PSB) while the nitrogen uptake (kg ha^{-1}) by crop was found lowest in control plot (T_1) i.e., 41.16 kg ha^{-1}, 42.75 kg ha^{-1} and 41.95 kg ha^{-1} during the summer season of the year 2020-21, 2021-22 and pooled, respectively.

Table 8: Effect of Integrated Nutrient Management on Nitrogen Uptake (Kg/ha) by Crop of Mungbean during summer

Treatments	Nitrogen Uptake (Kg/ha) by Crop		
	2021	2022	Pooled
T_1: Control	41.16	42.75	41.95
T_2: RDF (20 kg N + 40 kg P_2O_5/ha)	60.32	65.14	62.73
T_3: RDF + Rhizobium + PSB	73.20	79.06	76.13
T_4: FYM (10 Kg/Ha)	84.02	90.70	87.36
T_5: FYM + Rh + PSB	89.29	96.38	92.84
T_6: RDF (50%) + FYM (2.5 t/ha) + (Rh+ PSB)	82.07	88.60	85.33
T_7: RDF (50%) + FYM (5 t/ha) + (Rh+ PSB)	98.33	106.10	102.22
T_8: RDF (25%) + FYM (5 t/ha) + (Rh+ PSB)	103.65	110.43	107.04
T_9: RDF (75%) + FYM (5 t/ha) + (Rh+ PSB)	112.18	116.15	114.17
SEm±	1.52	1.56	1.02
CD at 5%	4.45	4.57	2.91

Phosphorus Uptake (Kg ha $^{-1}$) by Crop

The result on phosphorus uptake (kg ha $^{-1}$) by crop as influenced by different treatment combination of integrated nutrient management practices in the mungbean during the summer season of the year 2020-21 and 2021-22 was statistically analyzed and presented in Table 4.9

The evidence of experimental data presented in Table 4.9 indicated that the phosphorus uptake (kg ha^{-1}) by crop was remarkably influenced by different treatment combinations of integrated nutrient management applied during the summer season of the year 2020-21 and 2021-22 in mungbean. The

phosphorus uptake (kg ha $^{-1}$) by crop was observed minimum in control plot (T_1) i.e., 10.62 kg ha^{-1}, 11.09 kg ha^{-1} and 10.86 kg ha^{-1} during the summer season of the year 2020-21, 2021-22 and pooled, respectively whereas it was found maximum phosphorus uptake (kg ha^{-1}) by crop under T_9 with the application of RDF (75%) + FYM (5t/ha) + (Rh + PSB) treatment combination i.e., 29.82 kg ha $^{-1}$, 30.93 kg ha^{-1}, and 30.38 kg ha^{-1}, respectively which was followed by T8 treatment combination i.e., 27.56 kg ha^{-1}, 29.41 kg ha^{-1} and 28.48 kg ha^{-1}, respectively with the application of RDF (50%) + FYM (5t/ha) + (Rh + PSB) and T_7 treatment combination i.e., 26.14 kg ha^{-1}, 28.25 kg ha^{-1} and 27.20 kg ha^{-1} with application of RDF (25%) + FYM (5t/ha) + (Rh + PSB).

Table 9: Effect of Integrated Nutrient Management on Phosphorus Uptake (Kg/ha) by Crop of Mungbean during summer

Treatments	Phosphorus Uptake (Kg/ha) by Crop		
	2021	2022	Pooled
T_1: Control	10.62	11.09	10.86
T_2: RDF (20 kg N + 40 kg P_2O_5/ha)	16.05	17.37	16.71
T_3: RDF + Rhizobium + PSB	19.47	21.06	20.26
T_4: FYM (10 Kg/Ha)	22.34	24.16	23.25
T_5: FYM + Rh + PSB	23.74	25.67	24.70
T_6: RDF (50%) + FYM (2.5 t/ha) + (Rh+ PSB)	21.82	23.59	22.71
T_7: RDF (50%) + FYM (5 t/ha) + (Rh+ PSB)	26.14	28.25	27.20
T_8: RDF (25%) + FYM (5 t/ha) + (Rh+ PSB)	27.56	29.41	28.48
T_9: RDF (75%) + FYM (5 t/ha) + (Rh+ PSB)	29.82	30.93	30.38
SEm±	0.44	0.42	0.28
CD at 5%	1.28	1.23	0.81

Potassium Uptake (Kg ha $^{-1}$) by Crop

The result on potassium uptake (kg ha $^{-1}$) by crop as influenced by different treatment combination of integrated nutrient management practices in the mungbean during the summer season of the year 2020-21 and 2021-22 was statistically analyzed and presented in Table 4.10.

The evidence of experimental data presented in Table 4.10 indicated that the potassium uptake (kg ha^{-1}) by crop was remarkably influenced by different treatment combinations of integrated nutrient management applied during the summer season of the year 2020-21 and 2021-22 in mungbean. It was observed that maximum potassium uptake (kg ha^{-1}) by crop under T9 with the application of RDF (75%) + FYM (5t/ha) + (Rh + PSB) treatment combination i.e., 56.06 kg ha^{-1}, 58.02 kg ha^{-1}, and 57.04 kg ha^{-1}, respectively which was followed by T8 treatment combination i.e., 50.19 kg ha^{-1}, 52.68 kg ha^{-1} and 51.44 kg ha^{-1}, respectively with the application of RDF (50%) + FYM (5t/ha) + (Rh + PSB) and T_7 treatment combination i.e., 47.63 kg ha^{-1}, 50.37 kg ha^{-1} and 49.00 kg ha^{-1} with application of RDF (25%) + FYM (5t/ha) + (Rh + PSB) while the potassium uptake (kg ha^{-1}) by crop was found lowest in control plot (T_1) i.e., 19.62 kg ha^{-1}, 20.63 kg ha^{-1} and 20.13 kg ha^{-1} during the summer season of the year 2020-21, 2021-22 and pooled, respectively.

Table 10: Effect of Integrated Nutrient Management on Potassium Uptake (Kg/ha) by Crop of Mungbean during summer

Treatments	Potassium Uptake (Kg/ha) by Crop		
	2021	2022	Pooled
T_1: Control	19.62	20.63	20.13
T_2: RDF (20 kg N + 40 kg P_2O_5/ha)	29.29	31.11	30.20
T_3: RDF + Rhizobium + PSB	35.49	37.62	36.55
T_4: FYM (10 Kg/Ha)	40.72	43.11	41.92
T_5: FYM + Rh + PSB	43.27	45.78	44.53
T_6: RDF (50%) + FYM (2.5 t/ha) + (Rh+ PSB)	39.78	42.12	40.95
T_7: RDF (50%) + FYM (5 t/ha) + (Rh+ PSB)	47.63	50.37	49.00
T_8: RDF (25%) + FYM (5 t/ha) + (Rh+ PSB)	50.19	52.68	51.44
T_9: RDF (75%) + FYM (5 t/ha) + (Rh+ PSB)	56.06	58.02	57.04
S.Em±	1.12	0.85	0.64
CD at 5%	3.26	2.47	1.83

Conclusion

The nutrients *viz.*, Nitrogen Content (%), Phosphorus Content (%) and Potassium Content (K) in seed and straw of mungbean during the both years 2020-21 and 2021-22 with pooled data did not significantly affected due to different treatment combinations of integrated nutrient management were presented in Table 4.24 to Table 4.29. The plot receiving the T_9: RDF (75%) + FYM (5t/ha) + (Rh + PSB) was resulted higher N, P and K content in seed and straw of mungbean during both the years 2020-21 and 2021-22 with pooled data while the T_1: Control treatment plot was shown the lowest N, P, and K content in seed and straw. The nutrients Nitrogen Content (Kg ha^{-1}), Phosphorus Content (Kg ha^{-1}) and Potassium Content (Kg ha^{-1}) uptake by seed, straw and crop, respectively were significantly affected due to different treatment combinations of integrated nutrient management with rhizobium and PSB presented in Table 4.31 to 4.39. Treatment T9 treatment combination with the application of RDF (75%) + FYM (5t/ha) + (Rh + PSB) were recorded remarkable higher amount of N, P, and K uptake by seed, straw and crop respectively while Treatment T_1: Control recorded lowest amount of N, P, and K uptake by seed, straw and crop, respectively. This might be because the trend of nutrient uptake was very well resembled with per hectare yield data of various treatments. The enhanced uptake of these nutrients in the corresponding treatments could be due to the increased and sustained availability of nutrients through organic and inorganic fertilizers with rhizobium and PSB. The increased uptake by mungbean might be due to improvement in physical, chemical and biological health of soil through

application of organic manures and inorganic fertilizers with rhizobium and PSB culture under integrated nutrient management.

Our study reflects those integrated use of chemical fertilizers, organic manures with rhizobium and PSB, assume greater significance of improving efficiency of chemical fertilizers in soil health or soil biodiversity, developing the biological activities, increasing the environmental hygiene, conservation and supporting the ecology. Integrated use of organic and inorganic fertilizer also increased seed protein content compared to use of chemical fertilizer alone.

Therefore, it is concluded that the mungbean crop grown in Malwa region of Madhya Pradesh under different treatment combinations of integrated nutrient management at different growing intervals may be used and the crop should be fertilized with application of T9 treatment combination RDF (75%) + FYM (5t/ha) + (Rh + PSB).

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