International Journal of Chemical Studies

P-ISSN: 2349–8528
E-ISSN: 2321–4902
www.chemijournal.com
IJCS 2020; 8(6): 123-125

Received: 30-08-2020
Accepted: 10-10-2020

Uma Devi
Department of Agronomy, CCS Haryana Agricultural University, Hisar, Haryana, India

Pawan Kumar
Department of Agronomy, CCS Haryana Agricultural University, Hisar, Haryana, India

Manoj Kumar
Department of Agronomy, CCS Haryana Agricultural University, Hisar, Haryana, India

Meena Sewhag
Department of Agronomy, CCS Haryana Agricultural University, Hisar, Haryana, India

Shweta
Department of Agronomy, CCS Haryana Agricultural University, Hisar, Haryana, India

Neelam
Department of Agronomy, CCS Haryana Agricultural University, Hisar, Haryana, India

Corresponding Author:
Uma Devi
Department of Agronomy, CCS Haryana Agricultural University, Hisar, Haryana, India

Impact of integrated nitrogen sources on nutrient content and uptake of Mungbean

Uma Devi, Pawan Kumar, Manoj Kumar, Meena Sewhag, Shweta and Neelam

DOI: https://doi.org/10.22271/chemi.2020.v8.i6b.10758

Abstract
A field experiment was conducted to study the effect of organic sources of nitrogen (FYM, Vermicompost, biogas slurry, spent mushroom compost and improved FYM*) integrated with chemical fertilizers on nutrient content and uptake of mungbean during *kharif* 2019 at the Agronomy Research Farm of Chaudhary Charan Singh Haryana Agricultural University, Hisar. The soil of the experimental field is sandy loam in texture, slightly alkaline in reaction, low in nitrogen and organic carbon, medium in available phosphorus and potassium. The experiment was laid out in Randomized Block Design replicated thrice with twelve treatments *viz*. T_1 (100% recommended dose of fertilizers), T_2 (100% RDN* through vermicompost), T_3 (100% RDN* through FYM), T_4 (100% RDN* through mushroom compost), T_5 (100% RDN* through biogas slurry), T_6 (100% RDN* through improved FYM), T_7 (50% RDF through chemical fertilizers), T_8 (50% RDF through chemical fertilizers +50% RDN* through vermicompost), T_9 (50% RDF through chemical fertilizers +50% RDN* through FYM), T_{10} (50% RDF through chemical fertilizers +50% RDN* through mushroom compost), T_{11} (50% RDF through chemical fertilizers +50% RDN* through biogas slurry) and T_{12} (50% RDF through chemical fertilizers +50% RDN* through improved FYM). Results showed that, various combinations of organic manures integrated with chemical fertilizers significantly influenced the N, P and K content, its uptake in grain and straw and total N, P and K uptake. Highest N, P, K content and uptake in mungbean seed and straw as well as total uptake was recorded in 100% recommended dose of chemical fertilizers significantly followed by T_{12} treatments i.e.50% RDF through chemical fertilizers +50% RDN* through improved FYM.

Keywords: RDN (Recommended dose of nitrogen), FYM, Vermicompost, Biogas slurry, Improved FYM (made by waste decomposer)

Introduction
Mungbean is one of the most important pulse crop belongs to family leguminosae cultivated in India ranking third having about 70% of the world area and 45% of production. Mungbean is mostly grown in the state of Rajasthan (30.81%), Maharashtra (19.51%), Karnataka (15.35%), Andhra Pradesh (12.79%), Orissa (7.41%), Tamil Nadu (4.97%), and Uttar Pradesh (2.09%) and in India, it occupies area about 3.0 m ha with total production of 1.1 million tones but average productivity is 3.20 (q/ha). It is one of the worth of crops rich in protein. Mungbean seeds are rich in protein that is used completed, split peas or flour. During summer, it can also be used as a green manure crop. Due to its short duration, it fits in many intensive crop rotations, prevents soil erosion, fixes atmospheric nitrogen through Rhizobial symbiosis and helps in improving soil fertility (Bansal, 2009) [1]. Pulses like mungbean are generally grown in soils with low fertility status or with application of low quantities of organic and inorganic sources of plant nutrients, which has resulted in deterioration of soil health and productivity (Kumpawat, 2010) [6]. Organic manures provide a good substrate for the growth of microorganisms and maintain a favorable nutritional balance and soil physical properties (Chaudhary *et al*, 2004) [2]. The organic acids produced during decomposition of organic waste can exchange with adsorbed P and increase its availability to plants. Application of FYM increased the activity of acid and alkaline phoosphatase, inorganic pycophosphatase and dehydrogenase leading to faster hydrolysis of easter-bond P to plant available P (Dinesh *et al*, 2003) [3]. Nitrogen is a component of chlorophyll and is required for several enzyme reactions for better plant growth.

The right amount of phosphorus can help crops yield more pods and create healthier stocks and root systems (Meena *et al*., 2015b) [9]. Combined application of organic and inorganic nutrient to the crop not only increases the production and profitability but also helps in maintaining the soil fertility status. INM approach is based on the maintenance of plant nutrition supply to attain a certain level of crop production by enhancing the benefits from all potential sources of plant nutrition in a cohesive manner, applicable to each cropping pattern and farming scenario (Mahajan and Sharma, 2005) [7]. The inclusion of organic manures regulates the uptake of nutrients, positively affecting production, improving soil quality (physical, chemical, and biological), and producing a synergistic effect on crops (Yadav and Kumar, 2000) [10]. Nutrient uptake by any crops is largely dependent on the biomass production by plants. However, concentration of various nutrients in the plant system also affects their total uptake. Keeping above-stated aspects in the view, the present experiment was conducted with the aim to investigate benefits of integrated nutrient management on nutrient content and uptake of mungbean under Hisar condition.

Material and Method

Field experiment was conducted during *kharif* 2019 at the Agronomy Research Farm of Chaudhary Charan Singh Haryana Agricultural University, Hisar which is situated at latitude of 29°10' North, longitude of 75°46' East and elevation of 215.2 m above mean sea level in the semi-arid, subtropical climate zone of India. The experiment was laid out in Randomized Block on sandy loam (63.5% sand, 17.3% silt and 19.2% clay) soil which is slightly alkaline in reaction, low in organic carbon and nitrogen, medium in available phosphorus and potassium. The treatment were comprised of twelve treatments viz., T_1 (100% recommended dose of fertilizers), T_2 (100% RDN* through vermicompost), T_3 (100% RDN* through FYM), T_4 (100% RDN* through mushroom compost), T_5 (100% RDN* through biogas slurry), T_6 (100% RDN* through improved FYM), T_7 (50% RDF through chemical fertilizers), T_8 (50% RDF through chemical fertilizers +50% RDN* through vermicompost), T_9 (50% RDF through chemical fertilizers +50% RDN* through FYM), T_{10} (50% RDF through chemical fertilizers +50% RDN* through mushroom compost), T_{11} (50% RDF through chemical fertilizers +50% RDN* through biogas slurry)and T_{12}(50% RDF through chemical fertilizers +50% RDN* through improved FYM). All organic manures (FYM, Vermicompost from vermicompost unit, spent mushroom compost from mushroom unit, biogas slurry from biogas plant and improved FYM was prepared by decomposing the dung with waste decomposer) were taken from taken from IFS model of agronomy department. All manures were applied according to their percentage of nitrogen content present in them after analysis. Mungbean variety MH-421 was sown on 1st July, 2019 at about 5.0 cm depth by drilling in rows using 15 kg seed $ha^{-1}$and spacing of 45cm between rows and 10 cm between plants. Pre-sown irrigation of 5 cm depth was given on 22nd June, 2019. One irrigation was given at critical stage of crop growth and other all the recommended packages of practices were adopted during the crop-growth period. Harvesting of crop was done with the help of sickles manually by cutting the plants from the net area of each plot separately on 18th September 2019.

Five representative plants from each plot were selected randomly and tagged for recording the effect of different treatments on growth parameters and yield attributes. All yield attributes were recorded periodically on these randomly selected and tagged plants. Grain, straw and soil samples were taken after harvest of crop. The uptake of nitrogen, phosphorous and potassium (kg/ha) was calculated on the basis of nutrient content on dry weight basis of grain and straw. Oven dried grain and straw samples weighed 0.2 and 0.5 g, respectively were digested in diacid mixture of H_2SO_4 and $HClO_4$ in the ratio of 9:1 for nutrients (N, P) estimation. After the digestion, a known volume was made with distilled water and stored in well washed plastic bottles after filtration through Whatman filter paper No. 42. Nitrogen content in digested plant material was determined by Nessler's reagent method. Phosphorus content was determined by Vanadomolybdo phosphoric acid yellow colour method (Koening and Jackson, 1942) [4], respectively.

Nutrient uptake was computed as below:

$$\text{Nutrient uptake by grain (kg per ha)} = \frac{\text{Per cent nutrient content in grain x grain yield (kg per ha)}}{100}$$

$$\text{Nutrient uptake by straw (kg per ha)} = \frac{\text{Per cent nutrient content in straw x straw yield (kg per ha)}}{100}$$

The total uptake of nitrogen, phosphorus and potassium at harvest was computed by adding the nutrient uptake by grain and straw.

Results and Discussion

Among various treatment combinations, treatment T_1 produced significantly higher N, P as well as K content and uptake in grain and straw and total NPK uptake of mungbean that was statistically at par with treatment T_{12} i.e. 50% RDN through Improved fym+ 50% RDF followed by T_6 where 100% RDN was given through improved FYM. Due to the combined application of chemical fertilizers, and organic manures more nutrients availability might have increased the cation exchange capacity of roots thereby increasing the nutrient absorption and nutrient contents in grain and straw. (Kumar *et al.* 2002) [5]. Because of better root proliferation and growth in INM treatment higher total uptake of N, P and K was observed. Meena and Verma observed that highest NPK uptake was obtained by 100% RDF.

Table 1: Effect of various combinations of different organic manures and chemical fertilizer on N content (%) and its uptake (kg ha^{-1}) by mungbean

Treatments	N content (%)		N uptake (kg ha^{-1})		
	Grain	Straw	Grain	Straw	Total
T_1 100% RDF through chemical fertilizer	3.31	2.02	55.47	99.51	152.98
T_2 100% RDN through vermicompost	2.72	1.73	40.26	80.39	120.64
T_3 100% RDN through FYM	2.75	1.80	37.34	79.78	117.11
T_4 100% RDN through mushroom compost	2.56	1.37	27.61	44.86	72.46
T_5 100% RDN through biogas slurry	2.72	1.81	37.51	75.99	113.50

T_6 100% RDN through improved FYM (by waste decomposer)	2.88	1.94	45.28	92.75	138.03
T_7 50% RDF through chemical fertilizer	2.56	1.22	25.24	37.66	62.50
T_8 50% RDN through vermicompost+50% RDF	2.78	1.87	42.56	87.85	130.41
T_9 50% RDN through FYM +50% RDF	2.82	1.96	39.30	82.05	121.35
T_{10} 50% RDN through mushroom compost+ 50% RDF	2.70	1.42	34.48	55.16	89.64
T_{11} 50% RDN through biogas slurry+ 50% RDF	2.82	1.94	41.4	88.15	129.54
T_{12} 50% RDN through Improved FYM (by waste decomposer)+ 50% RDF	3.13	2.00	51.75	99.58	151.33
CD at 5%	0.13	0.11	5.78	5.192	10.97

Table 2: Effect of various combinations of different organic manures and chemical nitrogen fertilizers on P content (%) and its uptake (kg ha^{-1}) by mungbean

Treatments	P content (%)		P uptake (kg ha^{-1})		
	Grain	Straw	Grain	Straw	Total
T_1 100% RDF through chemical fertilizer	0.74	0.34	11.97	16.75	28.72
T_2 100% RDN through vermicompost	0.64	0.26	9.47	11.93	21.40
T_3 100% RDN through FYM	0.68	0.28	9.22	12.24	21.46
T_4 100% RDN through mushroom compost	0.46	0.21	4.99	6.75	11.74
T_5 100% RDN through biogas slurry	0.53	0.25	7.35	10.64	17.99
T_6 100% RDN through improved FYM (by waste decomposer)	0.70	0.29	11.02	13.86	24.88
T_7 50% RDF through chemical fertilizer	0.41	0.20	4.08	6.16	10.23
T_8 50% RDN through vermicompost+50% RDF	0.68	0.28	10.45	12.97	23.42
T_9 50% RDN through FYM +50% RDF	0.71	0.30	9.93	12.70	22.63
T_{10} 50% RDN through mushroom compost+ 50% RDF	0.50	0.25	6.34	9.71	16.05
T_{11} 50% RDN through biogas slurry+ 50% RDF	0.59	0.28	8.71	12.72	21.43
T_{12} 50% RDN through Improved FYM (by waste decomposer)+ 50% RDF	0.72	0.32	11.97	15.93	27.90
CD at 5%	0.06	0.05	1.041	2.283	3.32

Table 3: Effect of various combinations of different organic manures and chemical fertilizers on K content (%) and its uptake (kg ha^{-1}) by mungbean

Treatments	K content (%)		K uptake (kg ha^{-1})		
	Grain	Straw	Grain	Straw	Total
T_1 100% RDF through chemical fertilizer	1.13	1.33	18.27	65.52	83.79
T_2 100% RDN through vermicompost	0.90	1.21	13.37	56.07	69.44
T_3 100% RDN through FYM	0.93	1.23	12.61	54.42	67.03
T_4 100% RDN through mushroom compost	0.88	1.18	9.51	38.65	48.17
T_5 100% RDN through biogas slurry	0.91	1.23	12.50	51.64	64.14
T_6 100% RDN through improved FYM (by waste decomposer)	1.00	1.28	15.79	61.04	76.83
T_7 50% RDF through chemical fertilizer	0.84	1.15	8.32	35.40	43.72
T_8 50% RDN through vermicompost+50% RDF	0.94	1.24	14.42	58.00	72.42
T_9 50% RDN through FYM +50% RDF	0.98	1.28	13.69	53.58	67.27
T_{10} 50% RDN through mushroom compost+ 50% RDF	0.90	1.22	11.54	47.26	58.80
T_{11} 50% RDN through biogas slurry+ 50% RDF	0.94	1.26	13.75	57.25	71.00
T_{12} 50% RDN through Improved FYM (by waste decomposer)+ 50% RDF	1.08	1.30	17.93	64.89	82.82
CD at 5%	0.06	0.06	1.88	4.576	6.46

Conclusion

From the obtained results it can be concluded that application of 100% recommended dose of fertilizers results in higher N, P and K content and uptake in grain and straw, total N, P and K uptake of mungbean.

References

1. Bansal RK. Synergistic effect of Rhizobium, PSB and PGPR on nodulation and grain yield of mungbean. J Food Leg 2009;22(1):37-39.
2. Chaudhary DR, Bhandari SC, Shukla LM. Role of vermicompost in sustainable agriculture: A review. Agril Rev 2004;25:29-39.
3. Dinesh R, Ganeshamurthy AN, Choudhuri SG, Prasaad SG. Dissolution of rockphosphate as inluenced by farm yard manure, fresh poultry manure and earthwarms in soil of an oilpalm plantation. J Indian Soc Soil Sci 2003;51:308-312.
4. Koenig RA, Johnson CR. Colorimetric determination of phosphorus in biological materials. Ind. Engng. Chem. Analyst 1942;14:155.
5. Kumar M, Singh H, Hooda RS, Khippal AK, Singh T, Sheoran P. Effect of genotypes and nitrogen levels on N, P and K content and uptake by irrigated pearl millet [*Pennisetum glaucum* (L.) R.Br. Emend Stuntz.]. Research on Crops 2002;3(3):493-497.
6. Kumpawat BS. Integrated nutrient management in blackgram (Vigna mungo) and its residual effect on succeeding mustard (Brassica juncea) crop. Indian J Agril Sci 2010;80(1):76-79.
7. Mahajan A, Sharma R. Integrated nutrient management (INM) system: Concept, need and future strategy. Agrobios. News 2005;1(4):29-32.
8. Meena Verma. Mungbean yield and nutrient uptake performance in response of NPK and lime levels under acid soil in Vindhyan region, India. Journal of Applied and Natural Science 2016;8(2):860-863.
9. Meena RS, Yadav RS, Meena H, Kumar S, Meena YK, Singh A. Towards the current need to enhance legume productivity and soil sustainability worldwide: A book review. Journal of Cleaner Production 2015b;104:513-515.
10. Yadav DS, Kumar A. Integrated nutrient management in rice-wheat cropping system under eastern Uttar Pradesh. Indian Farm 2000;50:28-30.