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RESEARCH ARTICLE

Impact of nutrient management on nutrient uptake and soil properties under summer green gram (*Vigna radiata* L.)

■ V. R. Patil, J. B. Patil, M. J. Patil and V. B. Gedam

SUMMARY

An present field experiment was carried out to assess the effect of nutrient management on summer green gram (*Vigna radiata* L.) during summer 2020 at Agronomy Research Farm, RCSM College of Agriculture, Kolhapur (MH), India. The soil of experimental field was sandy clay loam textural class, slightly alkaline in reaction (pH 7.43), having electrical conductivity 0.22 dS m^{-1}, bulk density 1.34 mg m^{-3} and low organic carbon content (0.39%), low in available nitrogen (238.29 kg ha^{-1}), high in available phosphorus (30.61 kg ha^{-1}) and medium in available potassium (251.29 kg ha^{-1}). The field experiment was laid out in Randomized Block Design (RBD) having eight treatments and three replications. A 30 cm x10cm spacing and Phule Vaibhav variety was used for seed sowing.Total uptake of nutrients were (109.23, 24.63 & 69.92 NPK kg ha^{-1}), respectively by green gram crop and available N, P and K were (259.61, 37.74 & 263.63 NPK kg ha^{-1}), respectively, in soil after harvest were found significantly maximum with the application of 100% RDF + Vermicompost 2.5 t ha^{-1} as well as seed treatment with biofertilizer. Neutral pH (7.00), lower bulk density (1.30 mg m^{-3}) and highest organic carbon (0.48%) observed under organic treatment such as application of Vermicompost 5 t ha^{-1} with seed treatment of biofertilizer. However, highest EC (28 dSm^{-1}) recorded under combined application of organic and inorganic sources such as 100% RDF + Vermicompost 5 t ha^{-1} + biofertilizer (ST).

Key Words : Green gram, Nitrogen, Phosphorus, Potassium, pH, EC, Organic carbon

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Pulses are important nutritious food crop grown over large area.Pulses are belongs to legume family.Summer pulses are very important for improving soil health, providing additional income to farmers and crop diversification in northern states of India. Growing crops like summer green gram can certainly lead to increase in house-hold income of farmers and help in combating malnutrition and sustaining

agricultural production.

Green gram or mung bean (*Vigna radiata* L.) is one of the most important grown leguminous crop of India. It is primarily rainy season crop but with development of early maturing varieties, it has also proved to be an ideal crop for spring and summer seasons. Pulses as a candidate crop, contributes immensely towards doubling farmers' income through diminishing cost of production, scaling per unit productivity, efficient marketing networks and successful technology delivery mechanisms by giving emphasis sustainable intensification and crop diversification, climate resilient production technologies backed with strong research outputs in pulses can contribute towards doubling the farmers' income (Singh, 2018).

The humble mung bean is a powerhouse of nutrition. It is valued for the protein enriched seed as an important dietary ingredient to overcome protein malnutrition of human beings. It contains about 25 percent protein, which is almost three times that of cereals.

Green gram fixes atmospheric nitrogen in soil and it requires small dose of nitrogen as starter dose. Integrated use of inorganic sources of nutrient with organic sources of nutrient helps to not only in maintaining higher productivity but also in providing greater stability in crop production. Application of organic amendments may increase supply of macro and micronutrients to plants and could mobilize unavailable nutrients to available forms and as a cumulative effect, nutrient uptake is higher than synthetic fertilizers (Sharma *et al*., 2008). In spite of being widely adapted crop in India, its productivity is very low. Maximum productivity of crop could be achieved with the maximum use of agrochemicals. The impressive gains in food production achieved due to green revolution but due to intensive use of agro-chemicals soil health is being affected. There is now tremendous scope on growers to use integrated nutrient management approach to increase productivity and sustain soil health. Organic amendment offers an alternative or supplementing control tactic to increase production (Meena, 2015).

Organic sources of nutrients like vermicompost are extensively used in various crops. These organic additives can be used to promote the development of beneficial organisms in the soil. Several workers used organic sources of additives to enhance the growth, yield and quality of crops (Meena, 2013 and Mujahid and Gupta, 2010).

Keeping all these views in front, a field experiment entitled "Effect of nutrient management on summer green gram", was planned and conducted at the Post Graduate Research Farm, Agronomy Section of Rajarshee Chhatrapati Shahu Maharaj College of Agriculture, Kolhapur (M.S.), India, during summer, 2020.

MATERIAL AND METHODS

The field experiment was conducted during summer season of 2020 at Agronomy Research Farm, Agronomy Section, RCSM College of Agriculture, Kolhapur (MH).Agro-climatically Kolhapur comes under Sub Mountain Zone of Maharashtra and geographically it is situated on an elevation of 548 meters above the mean sea level on 16^0 42' North latitude and 74^0 14' East longitude.The soil of the experimental field was sandy clay loam in texture, slightly alkaline in reaction (pH 7.43), having electrical conductivity 0.22dS m^{-1} and organic carbon content was (0.39%), low in available nitrogen (238.29 kg ha^{-1}), high in available phosphorus (30.61 kg ha^{-1}) and medium in available potassium (251.29 kg ha^{-1}).The field experiment was laid out in Randomized Block Design, consisting eight treatments which was replicated three times. The different nutrient management treatments included in the field experimental study were T_1-Control (un manured), T_2-100% RDF (20:40:00 NPK kg ha^{-1}), T_3-100% RDF + Vermicompost 2.5 t ha^{-1}1, T_4-100% RDF + Vermicompost 2.5 t ha^{-1} + Biofertilizer (ST), T_5-75% RDF (15:30:00 NPK kg ha^{-1}), T_6-75% RDF + Vermicompost 2.5 t ha^{-1}, T_7-75% RDF + Vermicompost 2.5 t ha^{-1} + Biofertilizer (ST), T_8-Vermicompost 5 t ha^{-1}+ Biofertilizer (ST). Experimental green gram crop Phule Vaibhav variety sowed at the space of 30 x 10 cm by using 16 kg ha^{-1} seed rate.The soil samples were analyzed for estimation of physical properties *viz.,* sand, silt and clay by using International pipette method (Piper, 1966) and chemical properties *viz.*, pH by using potentiometric method (Jackson, 1973), EC by conductometric method (Jackson, 1973), organic carbon by Walkley and Blacks rapid titration method (Jackson, 1973), bulk density by clod method (Dastane, 1972), available N by Alkaline $KMnO_4$ method (Subbiah and Asija, 1956), P determination by Olsen method (Olsen, 1954) and K content by flame photometer method (Jackson, 1973) in kg ha^{-1} by adopting the standard procedures.The experimental data was statistically analyzed by using a standard method of "analysis of variance" as reported by Panse and Sukhatme (1967).

RESULTS AND DISCUSSION

The results obtained from the present investigation as well as relevant discussion have been summarized under following heads :

Nutrient uptake:

The data on total nutrient uptake as influenced by different nutrient management treatments are presented in Table 1. Among different nutrient management treatments, highest total nitrogen uptake(109.29 kg ha^{-1}), phosphorous uptake (24.63 kg ha^{-1}) and potassium uptake (69.92 kg ha^{-1}) were observed under T_4 (100% RDF + Vermicompost 2.5 t ha^{-1} + Biofertilizer) as compared to other treatments. It might be due to higher yield and nutrient availability in soil from respective treatments which uptaken maximum nutrients as compared to other treatments. However,T_1recorded lowest amount of total nitrogen uptake (59.62 kg ha^{-1}), phosphorous uptake (9.15 kg ha^{-1}) and potassium uptake (39.36 kg ha^{-1}) due to lower yield and low nutrient availablity in control plot.These results are similar with those results reported by Konthoujam*et al*., (2013), Kumar and Yadav (2018), Morya*et al*., (2018), Kalaiyarasi*et al*., (2019) and Tyagi and Singh (2019).

Available nutrient:

The mean data on available soil nitrogen kg ha^{-1} as affected by different treatments are presented in Table 2. The mean available soil nitrogen, phosphorous and potassiumwas recorded 245.96, 33.31 and 255.65kg

Table 1: Effect of nutrient management treatments on total nutrient uptake under summer greengram

Treatments	Total nutrient uptake (kg ha^{-1})		
	Nitrogen	Phosphorous	Potassium
T_1 - Control (un manured)	59.62	9.15	39.36
T_2 - 100% RDF (20:40:00 NPK kg ha^{-1})	84.88	16.10	54.03
T_3 - 100% RDF + Vermicompost 2.5 t ha^{-1}	98.81	20.54	63.61
T_4 - 100% RDF + Vermicompost 2.5 t ha^{-1} + Biofertilizer (ST)	109.29	24.63	69.92
T_5 -75% RDF (15:30:00 NPK kg ha^{-1})	77.00	12.39	48.06
T_6 -75% RDF + Vermicompost 2.5 t ha^{-1}	92.53	19.04	60.19
T_7 -75% RDF + Vermicompost 2.5 t ha^{-1} + Biofertilizer (ST)	103.55	22.77	66.39
T_8 - Vermicompost 5 t ha^{-1} + Biofertilizer (ST)	81.17	14.04	51.57
S.E.±	4.12	0.85	2.85
C. D. (P=0.05)	12.52	2.60	8.66
General mean	88.35	17.33	56.64

Table 2: Effect of nutrient management treatments on soil properties under summer greengram

Treatments	pH	EC (dSm^{-1})	OC (%)	Bulk density (mg m^{-3})
T_1 - Control (un manured)	7.24	0.21	0.39	1.34
T_2 - 100% RDF (20:40:00 NPK kg ha^{-1})	7.63	0.24	0.40	1.34
T_3 - 100% RDF + Vermicompost 2.5 t ha^{-1}	7.42	0.25	0.43	1.32
T_4 - 100% RDF + Vermicompost 2.5 t ha^{-1} + Biofertilizer (ST)	7.55	0.28	0.46	1.31
T_5 -75% RDF (15:30:00 NPK kg ha^{-1})	7.40	0.22	0.40	1.34
T_6 -75% RDF + Vermicompost 2.5 t ha^{-1}	7.30	0.23	0.42	1.33
T_7 -75% RDF + Vermicompost 2.5 t ha^{-1} + Biofertilizer (ST)	7.52	0.26	0.45	1.32
T_8 - Vermicompost 5 t ha^{-1} + Biofertilizer (ST)	7.00	0.22	0.48	1.30
S. E. ±	0.11	0.006	0.01	0.01
C. D. (P=0.05)	0.35	0.02	0.03	NS
General mean	7.38	0.23	0.42	1.32
Initial status	7.43	0.22	0.39	1.34

NS= Non-significant

ha^{-1}, respectively. Available N, P and K were (259.61, 37.74 and 263.63 NPK kg ha^{-1}), respectively in soil after harvest was found maximum with the application of 100% RDF + Vermicompost 2.5 t ha^{-1} as well as seed treatment with biofertilizer (T_4). Higher application of nutrient from organic and inorganic source as well as nutrient fixation by crop resulted in available nutrient in soil. Whereas, lowestavailable nitrogen (233.40 kg ha^{-1}),phosphorous(27.38 kg ha^{-1}) andpotassium was 245.39 kg ha^{-1}in post harvest soil observed in un manured plot (T_1) due to lower nutrient application in respective treatment. Konthoujam *et al*. (2013), Meena *et al*. (2016), Dhakal *et al*. (2016) and Kalaiyarasi *et al*. (2019) reported similar results. Available potassium failed to reach the level of significance under nutrient management. These finding are accordance with Kharadi and Bhuriya (2020).

pH, EC, OC and BD:

Neutral pH (7.00), lower bulk density (1.30 mg m^{-3}) and highest organic carbon (0.48%) observed under organic treatment such as application of Vermicompost 5 t ha^{-1} with seed treatment of biofertilizer. Higher amount of Vermicompost application leads to increase organic matter in soil which leads to neutalise the pH, lowers the bulk density, increases organic carbon of soil. However, highest EC (28 dSm^{-1}) recorded under combined application of organic and inorganic sources such as 100% RDF + Vermicompost 5 t ha^{-1} + biofertilizer (ST).

These findings are in accordance with Parthasarathi *et al*. (2008) and Meena *et al*. (2016) and Dhakal *et al*. (2016).

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