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Residual effects of organic manure and micro nutrients on growth and yield parameters of green gram (*Vigna radiata*)" in potato-green gram sequence

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ABSTRACT

Field experiment was conducted during summer season of 2010 and 2011, to assess the residual influence of organic manures and micro nutrients applied to potato on growth and yield of succeeding green gram in an organic cropping system, under alluvial soil. The different sources of organic and micronutrients were integrated into 8 possible treatments *viz.* recommended dose of fertilizer-RDF (NPK @ 200 :150 :150 kg ha^{-1}) , 50% of RDF + well decomposed FYM @ 10t ha^{-1}, 50% of RDF + Neemcake @ 0.5t ha^{-1},RDF+ Zinc sulphate @ 20kg ha^{-1} as soil application, RDF + ammonium molybdate @ 1kg ha^{-1} as soil application, RDF + Sodium tetraborate @ 1kg ha^{-1} as soil application, RDF + Tuber soaking with 40g zinc sulphate + 10g ammonium molybdate + 10g sodium tetraborate, RDF + foliar spray of 1% KNO_3 salt. After harvesting the main crop, green gram was raised as a residual crop on the same field without any alternation. During both the years of investigation, all the growth and yield attributes, yield (seed as well as haulm), of green gram were at their best with the residual effect of organic manure either with or without the use of chemical fertilizers. Growth, grain and haulm yields of green gram were significantly increased by the residual effect of organic manure and micro nutrients applied to the previous crop. Application of organic manure at the rate of 50% RDF + 10t FYM ha^{-1}, recorded highest grain and haulm yields of 952.05 and 2638.85 kg ha^{-1} respectively. Though residual effect of micro nutrients has significant effect on growth, grain and stover yield of succeeding Green gram, the yield are reduced drastically.

Key words: Green gram, Growth, Micro nutrients, Organic manure, Yield.

INTRODUCTION

The integrated plant nutrient system helps in the maintenance and improvement of soil fertility for sustainable crop production. The legume cultivation improves soil fertility. Cultivation of *kharif* pulses benefits the succeeding crops. The organic manure contains both macro and micronutrients and ensures high crop yields. Among summer pulses, rice bean, cowpea showed more beneficial effects in succeeding cereal crops. These benefits in succeeding crop are more when summer pulses are raised with optimum dose of fertilizers phosphorus, cobalt and molybdenum (Pandher *et al*. 1976).

Application of crop residues in the form of FYM, compost, cake, green manure, etc. (Tandon, 1992) and the use of biofertilizers (Dixit and Gupta 2000) in the soil may substantially improved availability of nutrients in the soil. The efficiency of native or inoculated strains of biofertilizers improved when used in conjunction with organic manures (Anonymous, 2000) and micronutrients like S, Mo, Co (Gill *et al*., 2000). The present investigation was an attempt to study the residual effect of organic manure and micro nutrients on growth and yield parameters of green gram in potato-green gram sequence.

MATERIALS AND METHODS

The experiment was conducted during summer season of 2010 and 2011 at the Teaching Farm, Mandouri, Nadia, West Bengal of Bidhan Chandra Krishi Viswavidyalaya located at an altitude of 7.8m above mean sea level having latitude of 22° 57′N and 88° 22′E longitudes. The experimental site falls under the New Alluvial Zone (NAZ). The soil is characterized by alluvial soil with medium fertility status, having sandy loam in texture. In these investigations, potato was grown during *rabi*, followed by greengram during summer as residual crop during both the years. The field experiment was laid out in randomized complete block design with three replication, having eight treatments *viz.* T1 - NPK @ 200 :150 :150 kg ha^{-1}, T2 - 50% of T1 + Well decomposed FYM @ 10t ha^{-1}, T3 - 50% of T1 + Well powder neemcake @ 0.5t ha^{-1}, T4 - T1+ Zinc sulphate @ 20kg ha^{-1}as soil application, T5 - T1 + ammonium molybdate @ 1kg ha^{-1}as soil application, T6 - T1 + sodium tetraborate @ 1kg ha^{-1}as soil application, T7 - T1+ Tuber

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soaking with 40 g zinc sulphate + 10g ammonium molybdate + 10g sodium tetraborate, T8 - T1 + Foliar spray of 1% KNO3 salt, and the same lay out was followed during the second year of study. Both the organic, micro nutrients and inorganic fertilizers were applied to different plots according to the treatment, which were incorporated thoroughly into the soil. The treatments were imposed to potato crops only and greengram raised as residual crop without manurial application. Data were collected on plant height, leaf area index, leaf area duration, crop growth rate, haulm yield and grain yield.

RESULTS AND DISCUSSION

Growth: In order to quantify the response observed due to organic and micro nutrients to the preceding rabi potato, the plant growth and development was assessed on pooled basis in terms of plant height, leaf area index, leaf area duration, crop growth rate, number of nodules/plants (Table 1). Treatment receiving 50% of T1 + well decomposed FYM @ 10t ha^{-1} produced significantly taller plants (55.33 cm), better leaf area index (2.33), leaf area duration (43.28), dry matter production (389.80 **g** m^{-2}) and also significantly maximum number of nodules/plant (34.12). It may be due to the fact that more nutrient availability under INM treatments resulted into increased conversion of carbohydrates into protein which in turn elaborated into protoplasm and cell wall material increased the size of the cell, which expressed morphologically in terms of plant height, leaf area, number of branches and ultimately higher dry matter production. FYM, Neemcake is highly persistent composition material, which requires more time for its decomposition. Thus, organic have not been fully utilized by the potato crop in first crop season and notably benefitted the succeeding green gram crop. Similarly, the beneficial residual effect of organic manure under cropping system on growth attributes was also reported by Singh *et al* (2015), in rice-lentil, Gawai and Pawar (2006) in sorghum-chickpea, Gudadhe (2008) in cotton-chickpea as well as Nawle *et al* (2009) in sorghum-chickpea cropping sequence.

Yield and yield attributes: Yield is a function of various yield attributes. Most of the yield contributing characters *viz*., number of pods per plant, no of seed per pod and test weight (Table 2) were influenced due to residual effect of integrated nutrient management applied in *rabi* potato. Significantly**,** maximum values of number of pods per plant (28.21) were recorded with the application of 50% of T1 + Well decomposed FYM @ 10t ha^{-1},being remained at par with T3 (50% of T1 + Well powder neemcake @ 0.5t ha^{-1}). In case of number of seed/pod and test weight, it did not reach the level of significance. Such effect may be owing to increased availability of nutrient in soil from native pool as well as their residual effect through mineralization and improvement of physico-chemical properties of soil and thereby improving water and nutrient holding capacity of soil. These results are in accordance with Gawai and Pawar (2006) in sorghum-chickpea, Patil (2008) in sorghum-chickpea, Gudadhe (2008) in cotton-chickpea, Nawle (2009)

Table 1: Residual effect of organic manure and micronutrients on growth parameters of green gram.

Treatments	Plant height(cm)	Leaf area index	Leaf Area duration	Dry matter production(g m^{-2})	Numbers of nodules/plant
T1	43.46	2.14	39.41	352.72	22.46
T2	55.33	2.33	43.28	389.80	34.12
T3	53.21	2.3	42.00	384.44	31.60
T4	50.62	2.21	40.87	363.47	27.07
T5	50.31	2.2	41.32	359.01	28.04
T6	50.76	2.24	40.95	366.27	28.23
T7	47.64	2.2	40.53	356.26	24.69
T8	45.89	2.18	40.20	354.92	23.81
S.E.m(±)	1.51	0.01	0.43	7.73	1.55
CD (p=0.05)	4.59	0.04	1.30	23.43	4.70

Table 2: Residual effect of organic manure and micronutrients on yield parameters of green gram.

Treatments	Number of pods/ plant	Number of seeds/ pod	Test weight (g-1000 seeds)	Seed yield (kg/ha)	Stover yield (kg/ha)
T1	14.37	9.56	18.2	579.59	2306.937
T2	28.21	11.54	20.37	952.05	2638.852
T3	26.09	10.9	19.89	830.51	2522.127
T4	22.69	10.45	20.62	753.76	2468.42
T5	21.05	10.34	18.76	742.04	2418.843
T6	22.71	10.17	19.64	753.03	2451.425
T7	17.77	9.84	18.54	629.79	2322.518
T8	16.82	9.78	18.3	605.38	2343.283
S.E.m(±)	1.14	0.53	0.67	43.81	63.25
CD (p=0.05)	3.46	NS	NS	132.89	191.86

in sorghum-chickpea, Shanwad (2010) in maize-bengal gram and Saha (2010) in maize- mustard cropping sequence.

Significantly higher seed yield (952.05 Kg ha[1]) and stover yields (2638.852 Kg ha[1]) of green gram Table-2 was recorded in treatment receiving 50% of T1 + Well decomposed FYM @ 10t ha-1, but it remained statistically at par (830.51 Kg ha^{-1}, 2522.127 Kg ha^{-1}) with the treatment receiving 50% of T1 + Well powder Neemcake @ 0.5t $ha^{-1}$to *rabi* potato. It may be ascertained to the increased availability of nutrients due to mineralization of organic materials, release of CO_2 increasing fertilizer use efficiency, accumulation of organic carbon and improvement of soil physical properties. The increased green gram seed yield might be due to addition of FYM or neemcake to preceding *rabi* potato resulting in improvement in soil structure which reduced the soil crust and also serves as a source of energy for soil microflora which resulted in better root nodulation and nitrogen fixation. Significantly, higher stover yield under above treatments might be due to increase in vegetative growth in terms of plant height, number of branches, leaf area. Similar results reported earlier by Singh *et al* (2015) in rice-lentil, Gawai and Pawar (2006) in sorghum-chickpea, Gudadhe (2008) in cotton-chickpea, Nawle (2009) in sorghum-chickpea, Shanwad (2010) in maize-bengal gram and Saha (2010) in maize- mustard cropping sequence. The farm yard manure or neemcake not only the store house of large number of macro and micro nutrients but also helps considerably to improve the physical, chemical and biological properties of the soil. This might be ascribed to the mineralization of un-decomposed FYM, Neemcake left out in the soil after the harvest of potato crop. The persistent material in organic manures (FYM, Neemcake) requires more time for its decomposition, hence, about 25 to 33% of nitrogen and small fraction of phosphorus and potassium in FYM and neemcake may be available to immediate crop i.e. rabi potato and rest to subsequent crops (Inoko, 1984) which sustain the productivity.

CONCLUSION

The present study revealed that the soil needs multi nutrient supplementation as well as organic manure for sustainable crop production. For getting maximum subsequent green gram yield, *rabi* potato crop should be nourished with FYM @ 10t/ha^{-1}, Neemcake @ 0.5t/ha and mineral nutrients Viz., Zn, Mo, B along with recommended dose of NPK to potato crop provided beneficial residual effects to subsequent greengram crop.

REFERENCES

Anonymous (2000). Annual Report. Use of bioinoculants in integrated nutrient management. Department of Agricultural Chemistry and Soil Science, Rajasthan College of Agriculture. Udaipur, pp. 33.

Dixit, K.G. and Gupta, B.R. 2000. Effect offannyard manure, chemical and biofertilizers on yield and quality of rice (*Oryza saliva* L.) and soil properties. *Journal of Indian Sociely of Soil Science* **38:** 773-780.

Gawai P.P. and Pawar V.S. (2006). Integrated nutrient management for sustainable productivity of important cropping systems in Madhya Pradesh. *Indian J. Agron*., **42:** 13-17

Gill, M.S .• Mankotia, B.S. and Walia, S.S. 2000. Production technology for sustaining pulses productivity. *Ferlilizer News* **45:** 33-43.

Gudadhe, N.N. (2008) Effect of integrated nutrient management system in cotton-chickpea cropping sequence under irrigated conditions Ph.D. thesis submitted to M.P.K.V., Rahuri (M.S.).

Inoko A. (1984) Compost as sources of plant nutrients. In: Organic matter and rice. IRRI, Los Banos, *Philippines.* Pp. 137 – 145.

Nawle S.S., Pawar A.D., Lambade B.M. and Ugale N.S. (2009). Yield maximization of chick pea through inm applied to sorghum-chickpea cropping sequence under irrigated condition. *Legume Research*, **32**(4), 282-285.

Pandher, M.S .• Chahal. V.I'.S. and Gupta. R.I'. 1976. Effect of molybdenum on yield of mung bean (*Phaseolus aureus* L.) crop. *Indian Ecology* **3:** 189-190.

Patil H.M., Tuwar S.S. and Wani A.G. (2008). Integrated nutrient management in sorghum (*Sorghum bicolor*) – chickpea (Cicer arietinum**)** cropping sequence. *International Journal of Agricultural Sciences*, **4**(1): 220-224.

Saha R., Mishra V., Majumdar B., Laxminarayana K. and Ghosh P. (2010). Effect of Integrated Nutrient Management on Soil Physical Properties and Crop Productivity under a Maize (Zea mays)–Mustard (*Brassica campestris*) Cropping Sequence. *Communications in Soil Science and Plant Analysis*, **41:** 2187–2200.

Shanwad U.K., Aravindkumar B.N., Hulihalli U.K., Surwenshi A., Reddy M. and Jalageri B.R. (2010). Integrated nutrient management in Maize-Bengal gram Cropping System. *Research Journal of Agricultural Sciences*, **1**(3): 252-254.

Singh A. K., Singh S. S., Ved Prakas, Kumar S. and Dwivedi S. K. (2015). *Title Journal of Agrisearch*, **2**(2), 75-83.

Tondon H.L.S. (Ed.) (1992) Fertilizers, organic manures, recyclable wastes and bio-fertilizers. Fertilizer Development and Consultation, New Delhi. Pp-14