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Effect of integrated nutrient management practices on Physico-chemical properties of the soil in chickpea (*Cicer arietinum*)

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Abstract
A field experiment was conducted during the year 2013-2014. at College farm (Puriya Park), K.K. Wagh College of Agriculture, Nasik, to study the Response of Chickpea (*Cicer arietinum*) of Integrated Nutrient Management Practices. Application of 5 kg soybean+5 kg maize+1 kg granular sail+1 kg mineral mixture +1 kg charcoal + 100kg, 100 dung gave significantly increase in Organic carbon. Available Nitrogen content increase by application of Vermicompost+ 100% RDF +Seed treatment (Rhizobium) +2 spray of vermiwash. Due to the addition of PSB & vermiwash, cow urine, trichodermathere is increase in available phosphorus & potassium respectively.

Keywords: INM, Nutrient content, chickpea, Nutrient balance

Introduction
The basic concept underlying the integrated nutrient management system (INMS), nevertheless, remains the maintenance and possible improvement of soil fertility for sustained crop productivity to reduce inorganic (fertilizer) input cost. The three main components of INM as defined by FAO, 1998 are: 1. Maintain or enhance soil productivity through a balanced use of fertilizers combined with organic and biological sources of plant nutrients. 2. Improve the stock of plant nutrients in the soils.3. Improve the efficiency of plant nutrients, thus, limiting losses to the environment. Thus, integrated nutrient supply/management (INS) aims at maintenance or adjustment of soil fertility and of plant nutrient supply to an optimum level for sustaining the desired crop productivity through optimization of benefit from all possible sources of plant nutrients in an integrated manner (Roy and Ange, 1991) [8]. Besides inorganic fertilizers as the major component, others include farmyard manure (FYM), composts, green manure, crop residues, crop rotation and biofertilizers. The efficiency of fertilizer use (FUE) in a crop/cropping system would be further enhanced through GM, biofertilizers, nitrification inhibitors and even by splitting the fertilizer (mostly N & K) dose. As demonstrated in long term experiment under intensive cropping, the responses to a fixed dose of NPK also decrease with time unless the fertilizer application is balanced by adding other bulky organics in high doses to correct the imbalances

Materials and Methods
A field experiment was conducted during *rabi* season of 2013-2014 at College farm (Puriya Park), the experiment comprised 10 INM treatments and replicated thrice in randomized block design. The experimental plot was clayey in texture and alkaline in reaction with pH 7.8 and EC 0.34 dS/m. The soil was low in available nitrogen (207.12 kg/ha), available phosphorus (8.14) moderately high in available potash (285.01 kg/ha), The crop was grown with recommended package of practices.
Treatments were: T_1 - Vermicompost + RDF (100%) + Seed treatment (*Rhizobium*) + 2 spray of vermiwash, T_2 - 100% RDF alone (farmer practices). T_3 - 50% N + 100% P + 0% K + *Rhizobium* seed treatment, T_4 - 100% RDF + 2 spray of vermiwash (2 sprays- flowering and pod filling), T_5 - 100% RDF + cow urine spay (2 sprays- flowering and pod filling), T_6 - 100% N + 50% P and o% K + PSB, T_7 - 100%

RDF NSKE spray 5% @ 30 DAS and 45 DAS, T_8 - 100% RDF + *Trichoderma* @3 g/ kg, T_9 - 5 kg Soybean + 5 kg Maize + 1 kg granular salt + 1 kg mineral mixture + 1 kg Charcoal + 100 kg dung/ Vermicompost (Basal, first top dress at flowering and second at pod filling stage), T_{10} - Control Observations on Nutrient status of Soil samples were taken before the experiment and after the harvest of crop. Plot-wise analysis of soil samples for P^H, EC, and Organic Carbon, available nitrogen, phosphorus and potassium were conducted for each of the treatment. Statistical analysis for available nitrogen, phosphorus and potassium was done as per the standard procedures.

Results and Discussion

Effect of different INM treatment on nutrient status of soil

It is recommended that all possible measures be integrated at the farm level in a system of integrated management. Bellaki and Bandanur (1995) [1] reported that available N, P and K increased significantly with organic sources of nutrient either alone or in combination with fertilizers. Similarly, these results are corroborate with those of Shirale and Khating (2009) [10], Kuligod *et al*., (2011) [4], Jat *et al.,* (2012) [2], Mitra and Mandal (2012) [6] and Quddus *et al.,* (2012) [7].

Table 1: Nutrient status of soil after harvest of Gram Crop

Treatments	Bulk density (gcm^{-3})	P^H	EC (dSm^{-1})	Org.carbon (%)	Av.N (kg/ha)	Av.P (kg/ha)	Av. K (kg/ha)
T_1	1.31	7.78	0.34	0.61	210.9	9.8	286.5
T_2	1.31	7.78	0.34	0.60	207.2	8.2	285.3
T_3	1.31	7.78	0.34	0.60	209.7	9.6	284.1
T_4	1.31	7.75	0.32	0.60	208.1	9.2	282.3
T_5	1.31	7.78	0.34	0.60	208.4	8.5	286.6
T_6	1.31	7.70	0.32	0.60	208.9	10.53	286.1
T_7	1.31	7.78	0.34	0.60	207.5	8.3	288.2
T_8	1.31	7.78	0.34	0.61	207.9	8.9	287.2
T_9	1.31	7.78	0.34	0.62	207.4	9.0	286.4
T_{10}	1.31	7.78	0.34	0.60	203.2	7.5	282.6
SE(m±					0.91	0.92	0.95
CD at (5%)					2.326	2.311	2.35
Initial value	1.31	7.78	0.34	0.60	207.12	8.14	285.01

Conclusion

It seems quite logical to conclude that soil available nutrient status in respect of Available Nitrogen, Phosphorus, Potassium was increased by application of Vermicompost + RDF (100%) + Seed treatment (*Rhizobium*) + 2 spray of vermiwash (T1), available Phosphorus 100% N + 50% P and o% K + PSB(T6), available Potassium 100% RDF NSKE spray 5% @ 30 DAS and 45 DAS(T7) respectively. There is slightly increase in organic carbon in treatment 100% RDF + *Trichoderma* @3 g/ kg (T_8) & 5 kg Soybean + 5 kg Maize + 1 kg granular salt + 1 kg mineral mixture + 1 kg Charcoal + 100 kg dung/ Vermicompost (Basal, first top dress at flowering and second at pod filling stage) (T_9) There is no change in bulk density, but slightly decrease in pH and EC in treatment 100%RDF + 2 spray of vermiwash (2 sprays- flowering and pod filling) (T_4), - 100%RDF + cow urine spay (2 sprays- flowering and pod filling) (T_5) due to addition of vermiwash & PSB over initial value.

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