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Effect of integrated nutrient management (INM) on productivity and profitability of chickpea (*Cicer arietinum* L.)

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Abstract
A field experiment was conducted during the rabbi season of 2011-12 and 2012-13 at student instructional farm of chandra shekhar Azad University of agriculture and technology, Kanpur with the view to find out the effect of integrated nutrient management on growth, yield and economies of chickpea. Twelve treatments were tested in R.B.D. with three replications. On the basis of experimental results, it was found that highest grain yield (26.60 Qha^{-1}) was recorded with the treatment where R.D.F. + V.C. @ 5.0 ton/ha + Rhizobium culture + PSB was applied, followed by treatment where R.D.F. + V.C @ 3.0 ton/ha + Rhizobium culture + PSB Trichoderma was applied (26.01 qha^{-1}) both were statistically at par. While net profit was highest in treatment where R.D.F + V.C. @ 5.0 ton/ha + Rhizobium culture + PSB was applied (Rs. 84847.11/ha) followed by treatment where R.D.F + V.C. @ 3.0 ton/ha + Rhizobium culture + PSB. + Trichoderma were applied (Rs. 84172.11/ ha) and R.D.F + V.C. @ 3.0 ton/ha + Rhizobium culture + Trichoderma were applied (82482.11/ha), which were also significantly at par. B:C ratio was also highest in treatments where R.D.F + V.C. @ 3.0 ton/ha + Rhizobium culture + PSB = Trichoderma (2.56) were applied followed by treatments where R.D.F + @ 3.0 t0on.ha V.C + Rhizobium culture + PSB were applied (2.51). The minimum grain yield (14.98 qha^{-1}) and net profit (Rs. 40328.75/ha) was received in control plots.

Keywords: RDF, vermicompost, rhizobium, PSB, tricoderma

Introduction
Chickpea (*Cicer arietinum* L.) is an important pulse crop grown in tropical, subtropical and temperate regions of the world. It is world's third most important pulse crop after beans and peas with India accounting for approximately 65% of area and 64% of production of the world (F.A.O 1993, F.A.O. 2008) [8, 6]. The overall productivity of chickpea in India is comparatively low due to various biotic and abiotic stress, since most of soil is going to depleted against the nutrients because of continuous use of chemical fertilizer and not use of organic sources of nutrients. Inorganic fertilizer alone can not sustain the soil productivity as well as the large scale use of only chemical fertilizers as a source of nutrients has less efficient (Kumar *et al* 2003) [5] In recent years bio fertilizers, viz. Rhizobium and P.S.B. that are ecofriendly and low cost inputs, have emerged as an important and integral component of integrated plant nutrient supply system for pulse crop production. Hence, to combat this problem and to sustain production the present investigation was carried out to find out appropriate integrated nutrient management including inorganic fertilizers, vermicompost and biofertilizers for chickpea.

Materials and Methods
A field experiment was conducted during rabbi season of 2011-12 and 2012-13 at Students' Instructional Farm of Chandra Shekhar Azad university of Agriculture and Technology, Kanpur. The soil of the experimental field was sandy loam in texture. Low in available nitrogen and medium in available phosphorus and potassium with 7.6 soil pH. Twelve treatments comprises; R.D.F (20 kg N and 45 kg P_2o_5), 125% RDF, RDF + Vermicompost @ 3.0 t/ha, RDF+ Vermicompost @ 3.0 t/ha, RDF+ Vermicompost @ 3.0 t/ha + Rhizobium culture, RDF + Vermicompost @ 5.0 t/ha + P.S.B, RDF + Vermicompost @ 3.0 t/ha + Rhizobium culture + PSB, RDF + Vermicompost @ 5.0 ton/ha + Rhizobium culture + PSB, R.D.F. + Vermicompost @ 3.0 t/he + Rhizobium culture + PSB + Trichoderma and Control

were tested in Randomized Block Design with three replications. The chickpea variety KPG-59(Udai) was sown on November, 4-6 and harvested on April, 20-22 in both the years.

Results and Discussion

Effect of Vermi Compost and Bio- fertilizer with RDF Doses

Effect on growth Paramers: The plant height (table-1) was recorded significantly highest in 100% RDF f+ @ 5 ton/ ha V.C. + Rhizobium culture + PSB than control and alone application of classical levels of RDF. It may be due to more availability of nutrients in early stage of crop. Dry weight/ plant of chickpea at maturity stage was also significantly higher in RDF + @ 5.0 ton/ ha V.C.+ Rhizobium culture + P.S.B, then control and alone application doses of RDF but at par with RDF + @ 3.0 ton/ha V.C. + Rhizobium culture + PSB + Tricoderma and also other combine application of RDF + V.C. Bio+ fertilizer. Number of branches/plant was also maximum in RDF+ @ 5.0 ton/ha V.C. + rhizobium culture + PSB followed by RDF + @ 3.0 ton/ha V.C. + rhizobium culture + PSB + PSB+ Tricoderma. It was properly due to positive effect of vermicompost by increasing the nodulation resulted higher fixation of atmospheric nitrogen and ultimately increased the growth characters. The similar findings were also reported by Abdul *et al*. (2008) [1].

Effect on yield attributes: It is evident (Table-1) that number of pods/plant weight of pods. Plant (g) number of seeds/ pod and weight of 100 seeds (g) were maximum in RDF + @ 5.0 ton/ha V.C. + Rhizobiom culture + PSB and significantly superior than control and RDF alone and other combine doses but at par with RDF + @ 3.0 ton/ha V.C. + Rhizobium culture + PSB + tricoderma. It may be due to increase in availability of nutrient by vermicompost and Bio-fertilizer, resulted better growth and yield attribute the similar results was also reported by Ashoka *et al*. (2008) [2].

Effect on chickpea yield and quality: It is obvious (Table-2) that the biological yield (q/ha),Grain yield (q/ha) and straw yield (q/ha) and Harvest index (%) were significantly higher in RDF+@5.0 ton/ha V.C.+ Rhizobium culture +PSB but at par with RDF+@3.0 ton/ha V.C.+ Rhizobium culture +PSB and RDF+@3.0ton/ha V.C.+ Rhizobium culture + PSB +Tricoderma while significantly superior than control and RDF alone as well as without bio fertilizer as reduced dose of V.C. also. Protein content (%) and protein yield q/ha were also significantly superior in RDF+@5.0 ton/ha V.C. + Rhizobium culture +PSB followed by RDF+@3.0 ton/ha V.C. + Rhizobium culture + PSB + Tricoderma and also at par with others increased level of vermicompost. The increased in protein content (%) and protein yield may be due to more uptake of nutrient with combine application of nutrient sources. The results are also supported by Tewar *et al*. (1996) [3] and Abdul *et al*. (2008) [1].

Effect on economics: It is clear (Table-2) that highest gross income, Net profit and B:C ratio was obtained in RDF +5.0 ton/ha V.C. + Rhizobium culture +PSB followed by RDF+3.0/ha V.C.+ Rhizobium culture +PSB + Tricoderma and RDF +3.0 ton/ha V.C. + Rhizobium culture + PSB which were at par, but significantly superior than control, RDF alone and rest of the treatments.

The increase in gross income, Net income and B.C. ratio may be due to higher production because more availability of nutrient with combine application of nutrient sources. Similar results was also reported by Kushwaha (2008) [4].

Table 1: Effect of treatments on plant population, growth, yield attributes of chickpea (Pooled data of two years)

Treatments	Plant Population At maturity	Plant Height (cm)	Plant/Dry Weight at Maturity (g)	No of Branches / plant		No of pods /plant	Weight of Pods/plant (g)	No. of Seeds/pod	Weight of 100 Seeds (g)
				Primary	Secondary				
T_1- Control	18.24	28.25	23.21	3.21	6.35	30.72	6.30	1.37	16.24
T_2-RDF(20 kg N,46 kg P_2O_5, &20kg k_2O/ha	18.69	28.69	24.62	3.28	6.12	32.52	6.84	1.47	16.42
T_3-125% RDF	19.85	30.36	25.98	3.48	6.95	34.28	7.52	1.57	16.93
T_4RDF+@3.0 ton/ha V.C.	20.52	30.72	26.58	3.59	7.21	35.82	7.92	1.60	17.28
T_5-RDF + @ 5.0 ton/ha V.C.	21.72	31.11	27.48	3.72	7.92	39.62	8.38	1.63	17.52
T_6-RDF + 3.0 ton/ha V.C. + Rhizobium culture	23.97	32.14	27.75	3.95	8.18	39.69	8.58	1.67	17.69
T 7-RDF + 3.0 ton/ha V.C. + PSB	27.12	32.69	28.69	4.23	8.62	42.52	8.84	1.70	17.98
T_8 RDF + @ 5 ton/ha Rhizobium culture	26.84	32.72	29.57	4.52	8.92	44.56	9.94	1.77	18.32
T_9-RDF + 5.0 Ton/ha V.C. + PSB	27.72	33.24	30.58	4.62	9.21	48.78	11.82	1.80	18.63
T_{10}RDF + 3.0 t/ha V.C. + Rhizobium culture + PSB	29.32	34.32	31.48	4.78	9.69	51.62	12.54	1.80	18.98
T_{11}-RDF + 5.0 t/ha V.C.+ Rhizobium culture + PSB	30.42	35.16	33.67	4.92	10.27	54.62	14.62	2.80	19.98
T_{12}RDF+3 t/ha V.C.+ Rhizobium culture + PSB + Tricodcrma	29.95	34.92	31.79	4.81	10.08	53.59	13.69	1.87	19.52
SE + (d)	0.80	0.77	0.68	0.64	0.69	0.71	0.70	0.11	0.76
CD at 5%	1.62	1.61	1.42	1.34	1.43	1.48	1.42	0.24	1.60

Table 2: Effect of treatments on yield, quality and economics of chickpea. (Pooled data of two years)

Treatments	Biological yield (q/ha)	Gain yield (q/ha)	Straw yield (q/ha)	Harvest index (%)	protein content (%)	Protein yield (q/ha)	Gross income (Rs./ha)	net profit (Rs./ha)	B:C ratio
T_1- Control	36.16	14.98	21.18	36.98	17.68	2.52	67425.00	40328.25	1.49
T_2-RDF(20 kg N,46 kg P_2O_5, &20kg k_2O/ha	40.60	18.36	22.24	44.56	20.22	2.92	82650.00	52832.11	1.77
T_3-125% RDF	42.42	19.58	22.84	44.82	20.48	3.14	88110.00	57611.70	1.89
T_4RDF+@3.0 ton/ha V.C.	46.74	2169	25.04	44.88	20.32	3.08	97635.00	64817.11	1.98
T_5-RDF + @ 5.0 ton/ha V.C.	48.09	22.62	25.47	44.89	20.38	3.62	101805.00	66987.11	1.92
T_6-RDF + 3.0 ton/ha V.C. + Rhizobium culture	51.48	22.87	28.61	44.92	20.40	3.82	102945.00	70097.11	2.13
T 7-RDF + 3.0 ton/ha V.C. + PSB	51.53	23.68	27.85	44.92	20.40	4.18	106560.00	73722.11	2.25
T_8 RDF + @ 5 ton/ha Rhizobium culture	54.86	24.49	30.37	45.32	21.34	4.32	11.235.00	75387.11	2.16
T_9-RDF + 5.0 Ton/ha V.C. + PSB	55.61	24.77	30.84	45.72	21.36	4.36	111465.00	76627.11	2.20

T_{10}RDF + 3.0 t/ha V.C. + Rhizobium culture + PSB	56.97	25.63	31.34	46.12	21.48	4.52	115350.00	82482.11	2.51
T_{11}-RDF + 5.0 t/ha V.C.+ Rhizobium culture + PSB	58.52	26.60	31.92	46.88	22.14	5.84	119715.00	84847.11	2.43
T_{12}RDF+3 t/ha V.C.+ Rhizobium culture + PSB + Tricodcrma	57.52	26.01	31.51	46.32	21.98	5.58	117060.00	84172.11	2.56
SE + (d)	1.18	1.08	0.88	0.77	0.79	0.70	4865.81	4865.11	0.14
CD at 5%	2.47	2.26	1.83	1.60	1.65	1.45	10156.19	10156.19	0.29

Conclusion

On the basis of experimental results it may be concluded that better growth, yield attributes and yield along with harvest index and highest gross income, net income and B.C. ratio was achieved in RDF + @ 5.0 ton/ha V.C. + Rhizobium culture+ PSB which was at par with T_{12} and T_{10}significantly superior than control and RDF alone it is also clear that combine application of chemical and organic sources prove to better than increasing dose of RDF.

References

1. Abdul Baser, Zanier Shat, Muhammad Naeem, Fehan Bakht, Hfan ZH. Effect of phos pharos and farm yard manure an agronomic traits of chickpea (*Aicer arietinum* L) Sarhad Journal of Agriculture. 2008; 24(4):567-572.
2. Ashoka P, Mudalagiri Yappa M, Pufari Hugar PS, Besai BK. Effect of Micro Nutrients with or without Organic Manures on Yield of Baby Car (*Zea mays* L.) chickpea (*Cicer arietinum* L) sequence, Kornataka Journal of Agricultural to Ciences. 2008; 21(4):485-487.
3. Tewari O, Pand Tripathi RS. Effect of planting date, irrigatiov and phosphorus on chickpea (*Aicer arietinum* L.) Grownon Clay Loam Soil, Mdion Journal of Agronomy. 1996; 30(4):504.
4. Kushwaha HS. Impact of F.y.m, PSB and Phosphorus on Sustainable Probuctivity of Chickpea *Aicer arietinam* L. Under Rainfed Contion. Indian Jowenal of Dry land Agricultural Research and Development. 2008; 20:92-96.
5. Kumar S, Singh RC, Kadian VS. Performance of Mungbean as Influenced by Seed Inoculation with Rhizobium and Levels of Organic and Inorganic Sources of Nutrient. Indian Journal of Pulses Research. 2003; 16(1):67-6.
6. FAO. Tapes about statistics of food crops. Food and Agriculture organization, Rome, Italy, 2008.
7. FAO. FAO year book production, 1992, 46.
8. FAO. Rome. Italy, 1993, 105-15.