



# Effect of Integrated Use of Inorganic and Organic Manures on Uptake of Nutrients and Soybean Productivity in Inceptisol.

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**Abstract :** A field experiment was conducted during *kharif* season of 2012 -2013 to study the effect of integrated use of inorganic fertilizer coupled with organic manure, phospho compost and crop residue i.e. cotton stalk on yield, nutrient uptake and their residual effect on soil fertility in Inceptisol of Akola Maharashtra.

The result revealed that the application of 100% Recommended dose fertilizer DF + 5 t of FYM ha<sup>-1</sup> recorded highest NPK uptake as well as fertility status by use of 100% organics in the form of FYM showed higher results for yield, uptake and availability of nutrient status. Integrated use of organic along with optimum doses of chemical fertilizers not only produce highest crop yield but also enhance uptake and fertility status of experimental soil.

**IndexTerms** – FYM, Phosphocompost, Cotton stalk..

## I. INTRODUCTION

Soil organic matter is the key component that regulates the available nutrient status and reflects the overall state of soil fertility and quality. Arresting the fall in organic matter is the most important weapons to fight soil degradation and ensure sustenance of soil quality and agricultural productivity. This dependency of soil quality on soil organic matter from the fact that, soil organic matter contains plant nutrients buffers the effect of pH and exerts favourable effects on soil properties.

Soybean (*Glycine max L*) is an important pulse and oilseed crop grown extensively on large scale in India. The area under soybean in India is 103.34 million ha and production is 119.39 lakh ton where as in Maharashtra 30.61 million ha and 38.46 lakh tones.

Deterioration of soil health is considered as main cause for decline soybean crop yield (Reddy *et al.* 2005). The result of intensive cropping system revealed that use of chemical fertilizer in balance form not only sustained productivity at higher level but also improves soil quality. Deterioration in soil quality especially soil organic carbon and its associated nutrient supply to soil has been cited one of the major factor for yield decline or stagnation under intensive cropping system (Dawe *et al.* 2000) keeping this in

view the present investigation was conducted to monitor the effect of application of inorganic and organic sources on carbon fractions nutrient uptake and their residual effect on soil fertility status.

## II. Material and Methods:

The field experiment was superimposed on going experiment of “Integrated plant nutrient supply on soil fertility and productivity under soybean cropping system” initiated in 2010-11, at Research Farm, IFSR, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola during 2012-2013.

The experimental soil was clayey having pH 7.8, organic carbon 4.8 g/kg<sup>-1</sup> alkaline KMNO<sub>4</sub> extractable N 158 kg ha<sup>-1</sup> available P 9.5 kg / ha<sup>-1</sup> NH<sub>4</sub>OAC extractable K 320 Kg ha<sup>-1</sup> and available S 10.8 mg kg<sup>-1</sup>.

The experiment was laid out in randomised complete block design with three replication and eight treatments as follows

Treatment	Soybean ( <i>Kharif</i> )	(Chickpea <i>Rabi</i> )
T <sub>1</sub>	Absolute control	Absolute control
T <sub>2</sub>	100% RDF	100% RDF
T <sub>3</sub>	100% RDF + FYM @ 5t/ha	75% RDF
T <sub>4</sub>	100% RDF + FYM @ 5t/ha	100% RDF
T <sub>5</sub>	50% RDF + 50% P through phosphocompost	75% RDF + in situ soybean straw
T <sub>6</sub>	50% RDF + 50% P through phosphocompost	100% RDF + in situ soybean straw
T <sub>7</sub>	75% RDF + 25% N through cotton stalk	50% RDF + 50% P through phosphor-compost
T <sub>8</sub>	100% RD – N – through FYM and remaining P will be added through phosphocompost	In situ soybean straw + Remaining N and P will be applied through phosphocompost.

**III. Table: Treatments details**

\*RDF- Recommended dose fertilizer.

Organic manures such as FYM ,Phosphocompost and crop residue i.e. Cotton stalk were applied 15 days before sowing in Kharif season .Chemical fertilizer N and P were applied at the time of sowing.

High yielding variety of soybean (JS-335) was used, all cultural practises were followed to raise a good crop and the seed and straw yield was recorded .The soil samples were collected at initial , at 50 % flowering stage and at harvest stage. Soil and plant samples were analysed for N, P, K, S and total nutrients using standard methods.

**IV .Results and Discussion:****Table 1: Effect of various treatments on yield and total uptake of nutrients by soybean**

Treatments	Yield (q ha <sup>-1</sup> )		Uptake (kg ha <sup>-1</sup> )		
	Grain	Straw	N	P	K
T1	18.37	19.77	114.19	11.38	36.24
T2	25.60	29.37	164.59	17.59	54.66
T3	27.60	32.17	180.49	20.43	64.04
T4	27.93	32.33	186.37	21.32	65.08
T5	24.80	28.57	162.77	18.60	59.66
T6	24.90	28.67	166.71	20.12	60.42
T7	22.00	25.73	149.08	18.55	52.17
T8	21.17	24.83	139.26	17.23	49.38
SE (m±)	1.17	1.35	8.09	1.00	3.08
CD at 5 %	3.07	3.55	21.27	2.65	8.11
CV	8.43	8.47	-	-	-

**1) Seed and straw yield :**

It is evident from the data (Table 1) the seed yield ranged from 18.37 q ha<sup>-1</sup> to 27.93 q ha<sup>-1</sup> where as the straw yield ranged from (19.77 q ha<sup>-1</sup> to 32.33 q ha<sup>-1</sup>) The significantly highest seed yield of Soybean (27.93 q ha<sup>-1</sup> ) was recorded in treatment of 100%RDF+FYM@ 5t/ha (with 100% RDF to chickpea ) followed by 100%RDF+FYM@ 5t/ha (with 75% RDF to chickpea ) statically similar yield was recorded in T<sub>6</sub> treatment where 50%RDF+50%P through phosphocompost (75%RDF + *in situ soybean* straw to chick pea) was applied.The lowest seed yield was recorded in treatment (Absolute control). The integrated nutrient supply N,P,K,S and micronutrients in addition to the recommended dose of fertilizer ( Dixit and Khatik 2002 ,Sharma 2002)

These findings indicate that integrated use of optimal dose of fertilizer and organic manure treatment is superior to sub-optimal dose.Thus ,the balanced use of fertilizer either alone

or in combination with organic manure is necessary for sustaining soil fertility and productivity of crops. (Tiwari *et al* 2002) this findings are similar with Muneshwar Singh (2008).

## 2) N,P,K Uptake

Results in Table (1) on uptake of N,P,K by soybean revealed that the highest uptake of nitrogen  $186.37 \text{ kg ha}^{-1}$ , P uptake ( $21.32 \text{ kg ha}^{-1}$ ) and k uptake ( $65.08 \text{ kg ha}^{-1}$ ) were recorded in treatment of 100%RDF+FYM@ 5t/ha (with 100% RDF to chickpea) the higher uptake might be due to incorporation of organic matter during kharif season this findings are in conformity with Santhy (1998), Chaturvedi and Chandel (2005).

**Table 2: Effect of various treatments on available nutrient status of soil after harvest of soybean**

Treatments	Total nutrient		Available nutrient			
	N(%)	P(%)	N ( $\text{kgha}^{-1}$ )	P ( $\text{kgha}^{-1}$ )	K <sub>2</sub> O ( $\text{kgha}^{-1}$ )	S ( $\text{mg kg}^{-1}$ )
T1	0.037	0.023	154.82	25.06	376.83	12.25
T2	0.047	0.028	209.22	29.00	452.99	15.82
T3	0.045	0.031	221.77	29.24	466.4	16.76
T4	0.048	0.032	223.86	29.24	490.41	16.76
T5	0.046	0.029	192.48	26.81	421.63	14.70
T6	0.045	0.028	196.66	27.37	417.6	15.10
T7	0.047	0.031	192.48	27.37	421.63	13.82
T8	0.041	0.032	190.39	25.17	420.03	14.41
SE (m±)	0.0012	0.0014	13.43	0.64	11.89	1.64
CD at 5 %	0.0036	0.0046	35.28	1.94	36.09	4.99

## Soil fertility

The total N,P content of soil was significantly increased with integrated application and N,P,K and different organic matter. This could be attributed to N-minerlizable pattern of this organics. The highest total N and P was recorded in T4 treatment the lowest was recorded in control.

Incorporation of organics along with 100 % N,P,K improved available nutrient were recorded in the treatment where inorganic fertilizer from 50 to 75 % with organics in the form of phosphocompost and cotton stalk were applied. The results are in conformity with the findings of Ravankar (2003) and Muneshwar Singh (2008).

Thus it may be concluded that integrated use, balanced chemical fertilizer and organic sources improve uptake of nutrient, fertility status yield and there by soil health in Inceptisol.

## References

- Banger .K., Toor. G. S. Biswas .A.sidhu S.S.sudhir .K.2010 Soil organic carbon fractions after 16-years of applications of fertilizers and organic manure in a Typic Rhodalfs in semi –arid tropics. Research Article ,Nutr Cycl Agroecosyst 86 :391-399.
- Chaturvedi, Sumit, and A. S. Chandel. 2005. Influence of organic and inorganic fertilization on soil fertility and productivity of soybean (*Glycin max*). Indian J of Agronomy,50 (4) : 311-313.
- Dawe ,D.,Dobermann,A.,Moya P.,Abdulrachman, S.andBijay –Singh (2000).How widespread are yield declines in long –term rice experiments in Asia ?Field Crops Research 66,175-93.
- Dixit ,P.R. and S.KKhatik.2002.Influence of organic manure in combination with chemical fertilizer on production quality and economic feasibility of soybean in typichaplustert of Jabalpur.Legume Res,25(1) :53-56.
- Mishra,B.Sharma,A..Singh, S.K Prasad, J.And Singh B.P. (2008)Influence Of Continuos Application Of Amendment To Maize-Wheat Cropping Sequence On Dynamics Of Soil Microbial Biomass In Alfisol Of Jharkhand. J. of Indian Soc. Soil Sci. 56(1): 71-75
- Ravankar, H.N., Rathod, P.K. Sworup, P.A., Pathore, S.V., Jadhav, V.D. and Rathod, D.R. 2003. Dynamics of major nutrients in vertisols under long term fertilization to sorghum-wheat sequence. Agric. Sci. Digest. 23 (2) : 73-79.
- Reddy ,K.S.,Kumar ,N.,Sharma,A.K.,Acharya,C.L.andDalal ,R.C.(2005) Biophysical and sociological impact of farmyard manure and its potential role in meeting crop nutrient needs :A farmers survey in Madhya Pradesh ,India .Australian Journal of Experimental Agriculture 45 ,357-367.
- Santhy, P., P. Mathuvel, V. Murugappan and D. Selvi. 1998. Long-Term effects of continuous cropping and fertilization on crop yields and soil fertility status. J. Indian Society of Soil Sci. 46(3): 391-395.
- Sarode, P. B. and S. D.More, 2010. Long term effects of integrated nutrient management on active pool of soil organic carbon and nutrients. Abst.State level seminar on soil resource management for sustainable soil health and food security, January 2-3, 2010. Akola chapter of ISSS, Dept. SSAC, Dr. PDKV, Akola.pp 7
- Sharma, R.K., Shila, P.K., Sharma, R.A. andGangarde, S.K. 2002. Effect of sulphur sources on seed yield and nutrient content and uptake by soybean 2<sup>nd</sup>International Agronomy Congress. Nov. 26-30 New Delhi. India. PP : 551-55

Singh, M., Mohan Singh and B.Kumrawat,2008. Influence of nutrient supply system on productivity of soybean-wheat and soil fertility of Vertisol of Madhyapradesh. J.IndianSoc.Soil Sci. 56 (4) 436-441.

Tiwari, Alok, Dwivedi, A.K. and Dixit, P.R. 2002. Long term influence of organic and inorganic fertilization on soil fertility and productivity in vertisol. J. Indian Soc. Soil. Sci. 50 (4) : 472-475

Verma, G. and A. K. Mathur, 2009.Effect of integrated nutrient management on active pools of soil organic matter under maize wheat system of typic haplustept. J. Indian Soc. Soil Sci. 53(3) : 317-322.)

