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Effect of organic sources and inorganic nutrients on yield of *kharif* soybean

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Abstract
An experiment was conducted on sandy clay loam soil of Western Ghat region to study the Effect of organic sources and inorganic nutrients on growth of *kharif* soybean during *kharif* 2016 and 2017 at Post Graduate Research Farm, Mahatma Phule Krishi Vidyapeeth, Rahuri, Ahmednagar (M.S.). The experiment was laid out in randomized block design with three replication. The treatments consists of T_1- Farmyard manure @ 10 t ha^{-1}; T_2- Farmyard manure @ 5 t ha^{-1}; T_3- Vermicompost @ 5 t ha^{-1}; T_4- Vermicompost @ 2.5 t ha^{-1}; T_5- Poultry manure @ 5 t ha^{-1}; T_6- Poultry manure @ 2.5 t ha^{-1}; T_7- GRDF (50: 75: 40 kg N: P_2O_5: K_2O ha^{-1} with 5 t FYM ha^{-1}); T_8- Absolute control. Grain and stover yield noticed significantly higher when crop was fertilized with (50: 75: 40 kg N: P_2O_5: K_2O ha^{-1} with 5 t FYM ha^{-1}) during both the years.

Keywords: Soybean, organic sources, inorganic nutrients, yield

Introduction
Soybean (*Glycine max* L.) is known as Chinese pea and Manchurian bean which belongs to the family fabaceae, subfamily fabiodeae. It is major oil seed crop in world, accounting for nearly 50 per cent of total oil seeds acreage as well as production. It ranks third in vegetable oil economy in India, after groundnut and rapeseed. It is miracle crop and has witnessed phenomenal growth in production and also called as gold of America. India has revolutionized rural economy and improved socio-economic status of farmers since last five years. Soybean has not only gained vital importance in Indian agriculture, but also plays a decisive role in oil economy of India.

Use of chemical fertilizers in imbalanced and indiscriminate manner has created many problems like decline of soil organic matter, increase in salinity and sodicity, deterioration in the quality of crop produce, increase in hazardous pests, diseases and soil pollutant problems. Continuous use of inorganic fertilizers has not only brought loss of vital flora and fauna but also resulted in loss of secondary and micro-nutrients (Chakarborti and Singh, 2004) [4]. Therefore, integrated use of all the sources such as chemical fertilizers and organic manures are needed to check the depletion of soil health. Though enhanced yield levels can be obtained within a short period through the use of inorganic fertilizers, but the greater importance of organic manures in improving soil health and better plant nutrition has started receiving much recognition in the world complementary use of organic manures along with chemical fertilizers, besides improving physico–chemical properties of soil also improves the nutrient use efficiency of applied fertilizers.

Material and Methods
The field experiment on Soybean (*Glycine max* L.) was conducted during *kharif* season of 2016 and 2017 at the Post Graduate Institute Research Farm, Mahatma Phule Krishi Vidyapeeth, Rahuri, Dist. Ahmednagar (M.S.). The soil of experimental plot was sandy clay loam in texture and alkaline in reaction (pH 8.19) with organic carbon (0.52 %). It was low in available nitrogen (179.58 kg ha^{-1}) and medium in available phosphorus (19.63 kg ha^{-1}) and very high in available potassium (354.13 kg ha^{-1}). The experiment was laid out in randomized block design with three replication. The treatments consists of T_1- Farmyard manure @ 10 t ha^{-1}; T_2- Farmyard manure @ 5 t ha^{-1}; T_3- Vermicompost @ 5 t ha^{-1}; T_4- Vermicompost @ 2.5 t ha^{-1}; T_5- Poultry manure @ 5 t ha^{-1}; T_6- Poultry manure @ 2.5 t ha^{-1}; T_7- GRDF (50: 75: 40 kg N: P_2O_5: K_2O ha^{-1} with 5 t FYM ha^{-1}); T_8- Absolute control. The gross plot size was 4.2 x 3.6 m^2 and net plot sizes was 3.00 x 2.80 m^2.The crop was sown at spacing of 30 cm X 10 cm.

Healthy, unbroken and well developed seeds of soybean of variety Phule Agrani (KDS-344) were treated with fungicide and inoculated with biofertilizer (Rhizobium and PSB @ 25 g kg^{-1} seeds) before sowing of the seeds. The periodical growth observations were recorded at an interval of 28 days and crop was harvested at physiological maturity and data on yield were recorded.

Result and Discussion

Effect of various nutrient sources on yield of *kharif* soybean

Application of general recommended dose of fertilizer (50:75:40 N: P_2O_5: K_2O kg ha^{-1} + FYM @ 5 t ha^{-1}) to soybean recorded significantly higher grain yield (28.90, 30.65 and 29.7 q ha^{-1}, respectively) during both the years and on pooled mean. Whereas, treatment absolute control recorded significantly lowest grain yield of soybean (18.01, 16.71 and 17.36 q ha^{-1}, respectively) as compared to other treatments during first, second year and on pooled mean.

The grain yield obtained under general recommended dose of fertilizer was 5.90, 10.70 and 14.98 per cent higher than application of poultry manure @ 5 t ha^{-1}, vermicompost @ 5 t ha^{-1} and farmyard manure @ 10 t ha^{-1}. Whereas among organic sources, application of poultry manure @ 5 t ha^{-1} produced maximum grain yield (27.55, 28.70 and 28.12 q ha^{-1}) than rest of the organic sources during first year, second year and on pooled mean, respectively. The application of vermicompost @ 5 t ha^{-1} was found the next best treatment among organic sources. This might be due to significantly improvement in growth and yield attributes *viz.*, number of pods $plant^{-1}$, weight of pods $plant^{-1}$ and weight of grains $plant^{-1}$ resulting into higher seed yield of soybean. Similar results were reported by Maheshbabu *et al*. (2008) [7], Bandopadhyay *et al.* (2010) [3], Khaim *et al.* (2013) [6], Arbad *et al*. (2014) [1], Mehetre (2015) [8] and Gupta (2016) [5].

Data presented in Table 1 implicated that application of general recommended dose of fertilizer (50:75:40 N: P_2O_5: K_2O ha^{-1} + FYM @ 5 t ha^{-1}) resulted in maximum stover yield of 33.24, 35.32 and 34.28 q ha^{-1} during respective years, being significantly higher than among all the treatments. Application of poultry manure @ 5 t ha^{-1} recorded maximum stover yield followed by application of vermicompost @ 5 t ha^{-1} which were at par with each other and superior over other treatments when compared within organic alone. However, significantly minimum stover yield was observed under absolute control treatment during both the years and pooled mean. Increase in stover yield of soybean might be due to supply of essential mineral nutrients in balanced amount which resulted in better growth and development of plants i.e., maximum height, more number of branches, leaves and leaf area indirectly influenced the stover yield . These results are in conformity with findings of Narayana *et al.* (2009), Khaim *et al.* (2013) [6], Arbad *et al.* (2014) [1], Ransing (2016) [9] and Aziz *et al*. (2016) [2].

Table 1: Grain and stover yield of *kharif* soybean as influenced by different treatment

Tr. No.	Treatment	Yield (q ha^{-1})					
		Grain			Stover		
		2016	2017	Pooled	2016	2017	Pooled
T_1 :	FYM @ 10 t ha^{-1}	25.36	26.44	25.90	29.65	31.00	30.33
T_2 :	FYM @ 5 t ha^{-1}	22.28	23.05	22.67	27.20	28.36	27.78
T_3 :	VC @ 5 t ha^{-1}	26.57	27.22	26.90	30.72	31.94	31.33
T_4 :	VC @ 2.5 t ha^{-1}	23.43	24.20	23.81	28.16	29.37	28.76
T_5 :	PM @ 5 t ha^{-1}	27.55	28.70	28.12	31.23	32.89	32.06
T_6 :	PM @ 2.5 t ha^{-1}	24.80	25.23	25.01	29.05	30.51	29.78
T_7 :	GRDF	28.90	30.65	29.78	33.24	35.32	34.28
T_8 :	Absolute control	18.01	16.71	17.36	21.00	19.87	20.44
	S. Em. ±	0.38	0.37	0.46	0.49	0.51	0.61
	C.D. at 5 %	1.17	1.13	1.35	1.48	1.56	1.78
	General mean	24.61	25.28	24.94	28.78	29.91	29.34

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