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RESEARCH ARTICLE

Quality, Yield and Economics of Summer Soybean as Influenced by Interaction Effect of Integrated Nutrient Management and Potassium Levels.

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ABSTRACT

A field experiment entitled "Effect of integrated nutrient management and potassium levels on summer soybean (*Glycine max* L. Merill.)" was conducted during *summer* season, 2013-2014 at P. G. Research Farm, Agronomy Section, College of Agriculture, Dhule. The field experiment was laid out in a split plot design with sixteen treatments and three replications. The main plot treatment comprises of four treatment of integrated nutrient management *viz.*, 25 % N through fertilizer + 75 % N through vermicompost (F_1), 50 % N through fertilizer + 50 % N through vermicompost (F_2), 75 % N through fertilizer + 25 % N through vermicompost (F_3), GRDF 50:75:00 kg N:P:K ha^{-1} (F_4) and the subplot treatment comprises of four treatment of potassium levels *viz.*, application of potassium 0 kg ha^{-1} (K_1), 15 kg ha^{-1} (K_2), 30 kg ha^{-1} (K_3), 45 kg ha^{-1} (K_4), . The recommended dose of fertilizer was applied as per treatments. The sowing was done by dibbling. The sowing of *summer* soybean under application of 75 % N through fertilizer + 25 % N through vermicompost (F_3) significantly increased important grain, stover yield and quality character i.e. protein, oil content as well as protein, oil yield as compared to other and again it was being at par with (F_2) 50 % N through fertilizer + 50 % N through vermicompost. The gross (₹ 80885.45 ha^{-1}) and net monetary returns (₹ 50010.45 ha^{-1}) and B:C ratio was more under application of 75 % N through fertilizer + 25 % N through vermicompost (F_3) with application of potassium 45 kg ha^{-1} (K_4).

Keywords- Soybean, Integrated nutrients, Potassium.

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INTRODUCTION

Soybean (*Glycine max* L. Merrill) is an important pulse as well as oilseed crop. It is believed to be originated in china in around 2838 B.C. It belongs to the family *leguminoceae* and sub family *papilionaceae. T*he estimates of India soybean production, for 2013 and 2014 are respectively 94.76 and 104.36 lakh metric tonne, it is increased by 10.12 % in 2014. In maharastra production is about 30.72 lakh metric tonne. In India, soybean has emerged as main oil seed crop in a short span of time. It is termed as wonder bean because it contains 40 per cent good quality protein rich lysine and 20 per cent oil high in essential fatty acid (Omega-6 and Omega-3). Additionally, 26 per cent carbohydrates, 4 per cent minerals and 2 per cent phospholipids soybean are very good source of vitamin B complex and minerals. It also contains phyto-chemicals known as isoflavones which protect human body against chronic diseases such as cancer, diabetes, osteoporosis, blood pressure, coronary heart disease etc. Soybean has occupied first rank among oil seed in India since 2005 onwards. The role of organic fertilizers in plant nutrition is now attracting the attention of agriculturists throughout the world. Chemical fertilizers no doubt have boosted the crop growth and yield, but to larger extent they have contributed to soil deterioration. Integration of different sources of nutrients has a promising efficient soil health management and sustained productivity. Integrated nutrient management (INM) involves the use of vermicompost and chemical fertilizers to achieve sustained crop production and maintain better soil health again INM is best approach for better utilization of resources and to produce crops with less expenditure. Integration of organic and inorganic sources of nutrients along with biofertilizers is found to give higher productivity and monetary returns in soybean (Singh and Rai, 2004; Bhattacharyya *et al*., 2008). Further the organic sources unlike inorganic ones have substantial residual effect on succeeding crops (Duraisami and Mani, 2001; Shivakumar and Ahlawat, 2008).

MATERIAL AND METHODS

The experiment was carried out at Agronomy farm, college of Agriculture, Dhule, Mahatma Phule Krishi Vidyapeeth, Rahuri in Maharashtra during the *summer* season, 2013-2014 in split plot design with three replication having sixteen treatments. The main plot treatment comprises of four treatment of integrated nutrient management *viz.*, 25 % N through fertilizer + 75 % N through vermicompost (F_1), 50 % N through fertilizer + 50 % N through vermicompost (F_2), 75 % N through fertilizer + 25 % N through vermicompost (F_3), GRDF 50:75:00 kg N:P:K ha^{-1} (F_4) and the subplot treatment comprises of four treatment of potassium levels *viz.*, application of potassium 0 kg ha^{-1} (K_1), 15 kg ha^{-1} (K_2), 30 kg ha^{-1} (K_3), 45 kg ha^{-1} (K_4), .

RESULTS

Quality characters *viz*; oil and protein yield, seed (3405 Kg ha^{-1}) and stover (6338 Kg ha^{-1}) yield of soybean were significantly higher in application of 75 % N through fertilizer + 25 % N through vermicompost (F_3) with application of potassium 45 Kg ha^{-1} (k_4) in summer soybean recorded highest followed by application of 75 % N through fertilizer + 25 % N through vermicompost (F_3) with application of potassium 30 Kg ha^{-1} (k_4). The improved growth and profuse branching due to fertilization as discussed earlier coupled with increased photosynthates on

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one hand and greater mobilization of photosynthates toward reproductive parts of the plants on the other hand, might have been responsible for significant improvement in quality attributes and yield of soybean. Economical point of view higher net returns and B: C ratio of *summer* soybean recorded highest under application 75 % N through fertilizer + 25 % N through vermicompost (F_3) with application of potassium 45 Kg ha^{-1} (k_4). Singh *et al.* (2013) and Arbad and Syed (2011) also proved the similar results.

CONCLUSION

The quality and yield of soybean found to be improved with the application of 75 % N through fertilizer + 25 % N through vermicompost (F_3) with application of potassium 45 Kg ha^{-1} (k_4) economically followed by the application of 75 % N through fertilizer + 25 % N through vermicompost (F_3) with application of potassium 30 Kg ha^{-1} (k_4) was found to be profitable.

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Table-1: Quality, yield and economics of summer soybean as influenced by different treatment of integrated nutrient management and potassium levels.

Treatment Details	Oil yield (kg ha^{-1})	Protein yield (kg ha^{-1})	Seed yield (kg ha^{-1})	Stover yield (kg ha^{-1})	Net returns (₹ ha^{-1})	B:C ratio
A)Main Plot Treatments (Nitrogen Levels)						
F_1 = 25 % N through fertilizer + 75 % N through vermicompost	351.63	740.02	1973.25	3667.08	26954.21	1.66
F_2 = 50 % N through fertilizer + 50 % N through vermicompost	465.92	897.67	2319.50	4195.75	43669.53	2.21
F_3 = 75 % N through fertilizer + 25 % N through vermicompost	483.27	946.91	2353.00	4623.50	50010.45	2.61
F_4 = RDF (50:75:00) N:P:K kg ha^{-1}	380.42	765.91	1986.50	3946.83	41347.28	2.53
S.E. ±	14.52	16.78	31.97	195.86	-	-
CD at 5%	43.34	50.08	96.81	587.83	-	-
B) Sub Plot Treatments (Potassium Levels)						
K_1 = 0 kg ha^{-1}	367.09	754.87	1990.33	3797.67	35779.37	2.09
K_2 = 15 kg ha^{-1}	400.76	809.77	2111.42	3951.75	39369.98	2.19
K_3 = 30 kg ha^{-1}	438.81	860.33	2210.50	4294.58	42339.71	2.25
K_4 = 45 kg ha^{-1}	474.59	924.91	2320.00	4389.17	44492.42	2.26
S. E.(m) ±	10.90	22.17	39.76	145.41	-	-
C. D. at 5 %	31.84	65.17	118.96	433.21	-	-
Interaction						
S.E. ±	21.81	36.80	79.53	289.83	-	-
CD at 5%	63.68	110.35	237.99	866.43	-	-
General Mean	420.31	837.47	2158.06	4108.29	40495.37	2.22