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Integrated Approach in Nutrient Management of Greengram on Nutrient Uptake and Economics

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ABSTRACT

A field experiment was conducted during season of February – April 2013 on clay soil at Experimental Farm, Annamalai University, to evaluate the post harvest soil available nutrients, nutrient uptake and economics as influenced by integrated nutrient management in irrigated greengram. The field experiment was conducted with recommended dose of fertilizer along with rhizobium and phosphobacteria (seed inoculation) @ 600 g ha^{-1} with foliar application of DAP @ 2% and NAA @ 40 ppm ha^{-1} and combined with salicylic acid @ 100 ppm ha^{-1} at 30 and 45 DAS. Integrated nutrient management not only increased the yield of greengram but also increased the nutrient uptake besides improving the physico-chemical and biological properties of soil which provide better soil environment for growth. The N, P and K uptake in system was higher when the crop was given under above said treatment combinations. Use of biofertilizer source helped in maintaining soil fertility in terms of available nutrients.

Key words: *Greengram, Biofertilizer, Growth regulator, Nutrient uptake, Foliar nutrition and Economics.*

INTRODUCTION

Pulses are the main source of protein particularly for vegetarians and contribute about 14% of the total protein of average Indian diet. Production of pulses in the country is far below the requirement to meet even the minimum level per capita consumption[5]. Greengram is an important summer season pulse crop of Tamil Nadu. Being a grain leguminous plant, greengram requires phosphorus for a number of metabolic functions. The importance of phosphorus application by using organic sources like organic manures, phosphate, solubilizing bacteria to greengram crop has been recognized since long. It promotes plant growth and enhances the yield and also helps in root development, nodule production and there by it increases nitrogen fixation.

The basic concept of integrated nutrient management is the supply of the required plant nutrients for sustaining the desired crop productivity with minimum deleterious effect on soil health environment.

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Integrated nutrient management intended for four major goals to be achieved. Maintenance of soil fertility, to ensure sustainable agriculture, to prevent soil erosion and to reduce the expenditure on the cost of inorganic fertilizers[2].

Balanced fertilizer application is one of the import factor for increasing crop yield. Excess and imbalanced use of nutrients has caused nutrient leaching from the soil, reduced yield of the crop. Judicious combination of organic and inorganic nutrients has a direct effect on soil health and crop production. By keeping in view all the factors related to soil fertility and productivity are applied soil to maintain soil stands and crop production.

Integration of organic manure and inorganic fertilizer materials has been found to be promising not only in maintaining higher productivity of crops and for providing stability in crop production, besides improving soil physical conditions[6].

MATERIAL AND METHODS

The experiment was conducted during February – April 2014. The treatment consisted of twelve treatments. The Treatment schedule were T_1 – Control, T_2 – RDF (25:50:25) NPK + 20 kg S ha^{-1}, T_3 – Rhizobium (Seed inoculation) @ 600 g ha^{-1}, T_4 – FA of DAP @ 2% at 30 and 45 DAS, T_5 – FA of NAA @ 40 ppm ha^{-1} + Salicylic acid @ 100 ppm ha^{-1} at 30 and 45 DAS, T_6 – RDF + 20 kg S ha^{-1} + Rhizobium + (Seed inoculation) @ 600 g ha^{-1}, T_7 – RDF + 20 kg S ha^{-1} + FA of DAP 2% at 30 and 45 DAS, T_8 – RDF + 20 kg S ha^{-1} + FA of NAA @ 40 ppm ha^{-1} at 40 and 45 DAS + Salicyclic acid @ 100 ppm at 30 and 40 DAS, T_9 – RDF + 20 kg S ha^{-1} + Rhizobium + Foliar application of DAP @ 2%, T_{10}–RDF + 20 kg S ha^{-1} + Foliar application of DAP @ 2% at 30 and 45 DAS + Foliar application of NAA @ 40 ppm ha^{-1} + Salicylic acid @ 100 ppm ha^{-1} at 30 and 45 DAS, T_{11}– RDF + 20 kg S ha^{-1} + Foliar application of NAA @ 40 ppm ha^{-1} + Salicylic acid @ 100 ppm ha^{-1} at 30 and 45 DAS + Rhizobium (seed inoculation) and T_{12}– RDF + 20 kg S ha^{-1} + Rhizobium + Foliar application of DAP @ 2% + NAA @ 40 ppm ha^{-1} + Salicylic acid @ 100 pm ha^{-1} at 30 and 45 DAS. The field trial was laid out in a randomized block design with three replications. The plot size was 5 × 4 m for raising beds. Inorganic and biofertilizers were applied as per recommended dose. The seeds were treated with Rhizobium and phosphobacteria as seed treatment @ 600 g/kg of seed. The inoculated seeds were dried under shade and sown immediately after drying. Agronomic management techniques were followed out uniformly to raise the crop. Biometric observations were taken at 30, 45 and at maturity stage. Nutrient uptake, post harvest soil available nutrients and economics were given in Table 1.

RESULTS AND DISCUSSION

The results given in Table 1 were nutrient uptake indicated that application of chemical fertilizer with biofertilizers and growth regulator gave higher uptake of N, P and K than RDF treatment alone. This might due to increased dry matter production. Easy availability and absorption of foliar nutrients in the plant system enhanced the growth of the crop thereby leading to better uptake of nutrients. Foliage applied nutrients play a vital role in acceleration the root growth, contributing to better abortion of nutrients from the soil. The results of the present findings are in agreement with the report of Shashikumar *et al.*[3], Kuttimani and Velayutham[1] and Shivesh *et al.*[4].

Table 1: Influence of INM practical on post harvest soil available, nutrient uptake and economics of greengram

Treatments	Post harvest available nutrients (kg ha^{-1})			Crop uptake (kg ha^{-1})			Return $rupee^{-1}$ invested
	N	P	K	N	P	K	
T_1	210.09	15.63	242.88	46.21	10.76	48.39	1.57
T_2	206.26	13.81	237.03	58.19	11.81	53.53	1.87
T_3	209.08	15.13	241.36	48.01	11.06	49.72	1.66

T_4	207.25	14.29	238.53	51.42	11.51	52.21	1.99
T_5	208.16	14.71	239.94	49.73	11.29	50.96	1.80
T_6	205.28	13.33	235.52	54.97	12.09	54.86	1.93
T_7	204.07	12.49	232.67	58.38	12.53	57.34	1.99
T_8	202.12	12.91	234.10	56.68	12.32	56.121	1.92
T_9	201.04	11.59	229.76	61.84	13.04	59.91	2.10
T_{10}	199.21	11.17	228.34	63.54	13.27	61.15	2.08
T_{11}	204.29	12.00	231.14	60.15	12.82	58.66	2.03
T_{12}	201.48	10.69	226.85	65.32	13.56	62.47	2.13
S.Ed	11.02	0.60	11.21	2.65	0.54	2.48	
CD (P = 0.05)	22.04	1.20	22.42	5.30	1.08	4.96	

Table 2:

Treatments	
T_1 – Control	
T_2 – RDF (25:50:25) NPK + 20 kg S ha^{-1}	
T_3 – Rhizobium (Seed inoculation) @ 600 g ha^{-1}	
T_4 – FA of DAP @ 2% at 30 and 45 DAS	
T_5 – FA of NAA @ 40 ppm ha^{-1} + Salicylic acid @ 100 ppm ha^{-1} at 30 and 45 DAS	
T_6 – RDF + 20 kg S ha^{-1} + Rhizobium + (Seed inoculation) @ 600 g ha^{-1}	
T_7 – RDF + 20 kg S ha^{-1} + FA of DAP 2% at 30 and 45 DAS	
T_8 – RDF + 20 kg S ha^{-1} + FA of NAA @ 40 ppm ha^{-1} at 40 and 45 DAS + Salicyclic acid @ 100 ppm at 30 and 40 DAS	
T_9 – RDF + 20 kg S ha^{-1} + Rhizobium + Foliar application of DAP @ 2%	
T_{10}–RDF + 20 kg S ha^{-1} + Foliar application of DAP @ 2% at 30 and 45 DAS + Foliar application of NAA @ 40 ppm ha^{-1} + Salicylic acid @ 100 ppm ha^{-1} at 30 and 45 DAS	
T_{11}– RDF + 20 kg S ha^{-1} + Foliar application of NAA @ 40 ppm ha^{-1} + Salicylic acid @ 100 ppm ha^{-1} at 30 and 45 DAS + Rhizobium (seed inoculation)	
T_{12}– RDF + 20 kg S ha^{-1} + Rhizobium + Foliar application of DAP @ 2% + NAA @ 40 ppm ha^{-1} + Salicylic acid @ 100 pm ha^{-1} at 30 and 45 DAS	

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