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Influence of INM on Nutrient Uptake of Cotton in Dry Land Condition

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A B S T R A C T

An experiment "Nutrient dynamics and productivity of Cotton in Vertisols under integrated nutrient management" was conducted during *kharif* 2014 at Research field of AICRP for Dryland Agriculture, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola to study the effect of integrated nutrient management on Yield of cotton and Nutrient uptake by cotton. The experiment was conducted with ten treatments and three replications laid out in a randomized block design. The result of present experiment revealed that the integrated application of 50% N through gliricidia + 50 % N through inorganics + biofertilizers+ 100% P+ 25 kg K ha^{-1} resulted in improvement in soil fertility, nutrient uptake and yield of cotton grown in Vertisols under rainfed conditions.

Introduction

Cotton is one of the most important cash crops which play a key role in economy and social affairs. The nutrients removal by crops is generally more than that supplied through chemical fertilizer and this negative balance over the years led to low fertility status of soil, which resulted in decline in the crop yields and also the heavy use of chemical fertilizers which are increasing day by day. The indiscriminate use of these chemical fertilizers is prone to several environmental problems like deterioration of soil heath and contamination of natural resources.

Adequate and timely application of organic and also inorganic fertilizer is most essential for proper growth of the crop. Nutritional stresses and imbalance affect vegetative as well as reproductive growth that ultimately lower down the average seed cotton yields as well as fibre and seed quality.

Materials and Methods

With a view to study the "Nutrient Dynamics and Productivity of Cotton in Vertisols under Integrated Nutrient Management", a field experiment was initiated on the research field of AICRP for Dryland Agriculture, Dr. PDKV, Akola. The present study was undertaken during 2014-15 with the cotton crop.

This experiment was conducted with ten treatments and three replications laid out in a randomized block design, treatment details are as follows T_1- Control, T_2-100% NP (50:25:00 NPK kg ha^{-1}), T_3-100% NP + biofertilizers, T_4-100% N through FYM + biofertilizers, T_5-100% N through gliricidia + biofertilizers, T_6-100% NP + 25 kg K ha^{-1} ,T_7-100% NP + 25 kg K ha^{-1} + biofertilizers , T_8-50% N through gliricidia + 50% N through inorganics + 100% P, T_9-50% N through

gliricidia + 50% N through inorganics + biofertilizer + 100% P. The seed was sown @ 10kg/ha with the recommended dose of fertilizer i.e. 50:25:0 NPK kg/ha.

Full quantity of the recommended dose of phosphorus was applied as a basal dose through single super phosphate. Nitrogen through urea in two-spilt application, half at the sowing and half at 35 DAS to cotton. The spacing was 60cm for row to row and 30cm for plant to plant. The seed treatment given was Azotobacter and PSB @25 g kg^{-1} seed. The soil samples were collected plot wise after harvest of cotton crop and analyzed for various physical and chemical properties of the soil. Similarly plant samples were also collected at harvest stage, the seed cotton and cotton stalk yield was also recorded.

Results and Discussion

The data indicated that the significantly higher N uptake (28.05 kg ha^{-1} and 10.31 kg ha^{-1}) by cotton seed and stalk was observed with the application of 50% N through gliricidia + 50% N through inorganics + biofertilizers+ 100% P + 25 kg K ha^{-1} (T_{10}) and also significantly highest total N uptake (38.36 kg ha^{-1}) by cotton was observed in treatment T_{10}. The lowest N and P uptake by cotton seed and stalk (6.35 kg ha^{-1} and 2.58 kg ha^{-1}) was observed in treatment T_1 *i.e.* control.

Table.1 Effect of INM on nitrogen uptake by cotton

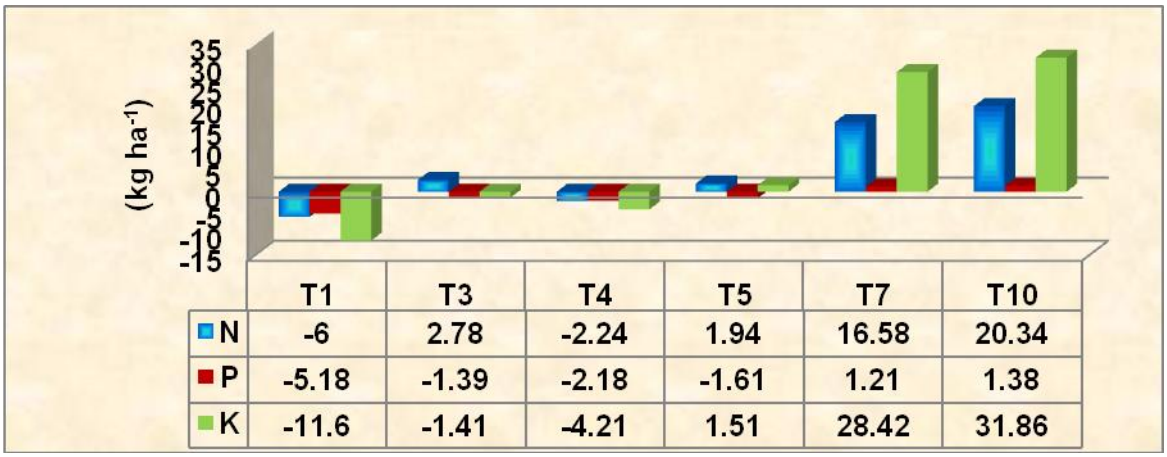
Treatments		Nitrogen uptake (kg ha^{-1})		
		Seed	**Stalk**	**Total**
T_1	Control	6.35	2.58	8.93
T_2	100% NP (50:25:00 NPK kg ha^{-1})	10.73	4.16	14.88
T_3	100% NP + biofertilizers	11.58	4.87	16.45
T_4	100% N through FYM + biofertilizers	8.58	2.81	11.39
T_5	100 % N through gliricidia+ biofertilizers	8.67	3.18	11.85
T_6	100% NP+ 25kg K ha^{-1}	15.57	5.63	21.21
T_7	100% NP + 25kg K ha^{-1}+ biofertilizers	21.23	8.29	29.52
T_8	50% N through gliricidia + 50% N through inorganics+ 100% P	13.76	4.95	18.71
T_9	50% N through gliricidia + 50% N through inorganics+ 100% P + biofertilizers	15.10	5.96	21.06
T_{10}	50% N through gliricidia +50% N through inorganics+ 100% P + biofertilizers + 25kg Kg ha^{-1}	28.05	10.31	38.36
	SE (m) +	2.25	0.81	3.03
	CD at 5%	6.70	2.41	8.99

Table.2 Effect of INM on phosphorus uptake by cotton

Treatments		Phosphorus uptake (kg ha^{-1})		
		Seed	**Stalk**	**Total**
T_1	Control	0.95	1.31	2.26
T_2	100% NP (50:25:00 NPK kg ha^{-1})	1.66	2.51	4.17
T_3	100% NP + biofertilizers	1.79	2.81	4.59
T_4	100% N through FYM + biofertilizers	1.14	1.65	2.80
T_5	100 % N through gliricidia+ biofertilizers	1.23	1.80	3.03
T_6	100% NP+ 25kg K ha^{-1}	2.30	3.65	5.95
T_7	100% NP + 25kg K ha^{-1}+ biofertilizers	3.17	5.27	8.44
T_8	50% N through gliricidia + 50% N through inorganics+ 100% P	2.06	3.25	5.30
T_9	50% N through gliricidia + 50% N through inorganics+ 100% P + biofertilizers	2.31	3.73	6.05
T_{10}	50% N through gliricidia + 50% N through inorganics + biofertilizers + 100% P + 25kg K ha^{-1}	4.02	6.70	10.72
	SE (m) +	0.31	0.51	0.82
	CD at 5%	0.92	1.52	2.43

Table.3 Effect of INM on potassium uptake by cotton

Treatments		Potassium uptake (kg ha^{-1})		
		Seed	**Stalk**	**Total**
T_1	Control	1.23	5.04	6.27
T_2	100% NP (50:25:00 NPK kg ha^{-1})	1.80	7.65	9.44
T_3	100% NP + biofertilizers	2.14	8.52	10.66
T_4	100% N through FYM + biofertilizers	1.48	6.31	7.79
T_5	100 % N through gliricidia + biofertilizers	1.57	6.72	8.29
T_6	100% NP + 25kg K ha^{-1}	2.46	10.02	12.48
T_7	100% NP + 25kg K ha^{-1}+ biofertilizers	3.35	13.94	17.29
T_8	50% N through gliricidia + 50% N through inorganics + 100% P	2.18	9.03	11.21
T_9	50% N through gliricidia + 50% N through inorganics + 100% P + biofertilizers	2.41	10.09	12.50
T_{10}	50% N through gliricidia +50% N through inorganics + biofertilizers + 100% P + 25kg K ha^{-1}	4.27	17.79	22.06
	SE (m) $\pm$	0.34	1.41	1.74
	CD at 5%	1.00	4.18	5.18



	T1	T3	T4	T5	T7	T10
N	-6	2.78	-2.24	1.94	16.58	20.34
P	-5.18	-1.39	-2.18	-1.61	1.21	1.38
K	-11.6	-1.41	-4.21	1.51	28.42	31.86

The uptake of N increased due to the combined application of 50% N through gliricidia + 50% N through inorganics + 100% P + 25 kg K + biofertilizers which increase the concentration of N in seed and stalk.

Similarly higher P uptake (4.02 kg ha^{-1} and 6.70 kg ha^{-1}) by cotton seed and stalk was observed with the application of 50% N through gliricidia + 50% N through inorganics + biofertilizers+ 100% P + 25 kg K ha^{-1} (T_{10}) and it was on par with the application of 100% NP + 25 kg K ha^{-1} + biofertilizers (T_7). The lowest P uptake by cotton seed and stalk (0.95 kg ha^{-1} and 1.31 kg ha^{-1} was observed in treatment T_1 *i.e.* control. The significantly higher total P uptake (10.72 kg ha^{-1}) by cotton was observed in treatment T_{10} and it was found to be on par with the treatment T_7 *i.e.* 100% NP + 25 kg K ha^{-1} + biofertilizers. The lowest P uptake by cotton was observed in treatment T_1 *i.e.* control (2.26 kg ha^{-1}).

Significantly higher K uptake (4.27 kg ha^{-1}, 17.79 kgha^{-1} and 22.06 kg ha^{-1}) by cotton seed, stalk and cotton was observed with the application of 50% N through gliricidia + 50% N through inorganics + biofertilizers+ 100% P + 25 kg K ha^{-1} (T_{10}) and it was found to be on par with application of 100% NP + 25 kg K ha^{-1} + biofertilizers (T_7). The lowest K uptake (1.23 kg ha^{-1}, 5.04 kg ha^{-1} and 6.27 kg ha^{-1}) by cotton seed, stalk and cotton was observed in treatment T_1 *i.e.* control.

In conclusion the significantly higher N uptake (28.05 kg ha^{-1}) by cotton seed was observed with the application of 50% N through gliricidia + 50% N through inorganics + biofertilizers+ 100% P + 25 kg K ha^{-1} (T_{10}). Similar trend was also observed in case of N uptake by cotton stalk and it was also found to be on par with the treatment 100% NP + 25 kg K ha^{-1} + biofertilizers (T_7).

The significantly higher P uptake (4.02 kg ha^{-1}) by cotton seed was observed with the application of 50% N through gliricidia + 50% N through inorganics + biofertilizers + 100% P + 25 kg K ha^{-1} (T_{10}) and it was on par with the application of 100% NP + 25 kg K ha^{-1} + biofertilizers (T_7). Similar trend was also observed in case of P uptake by cotton stalk.

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