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Response of cotton to foliar application of nutrients under rainfed condition

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ABSTRACT : A field experiment was conducted during *kharif* 2007-2008 at College of Agriculture, Nagpur. The field experiment was laid out in randomized block design with 10 treatment replicated to find out the response of cotton to foliar application of nutrient under rainfed condition. Ten treatments comprised of control, foliar application of nutrients spray at 50 per cent flowering (60-65 DAS) and boll development stage (80-90 DAS). Foliar application of urea (2%) and DAP (2%) at significantly increased seed cotton yield, number of open bolls/plant, boll weight, N, P, and K nutrient content, uptake, fibre quality parameters *i.e.* ginning percentage, staple length, fibre strength, elongation and oil per cent were also improved with foliar application of nutrients.

Key words : Foliar application, nutrient content and uptake, quality parameters

The genus *Gossypium* belongs to the family Malvaceae and is a multipurpose crop that produces lint (Fiber), oil, seed meal and hulls. Lint is the most important source of fiber currently being used in the textile industry. Cotton is grown in tropical countries like United States of America, China, India, Pakistan, Uzbetisthan, Turkey, Brazil, Greece, Argentina, Australia and Egypt. These countries contribute about 85 per cent of the global production, this indicates importance of this crop. Maharashtra, Gujrat, Andhra Pradesh, Karnataka, Tamil Nadu, Rajasthan, Haryana and Madhya Pradesh are the major cotton growing states in India. Vidarbha is the largest cotton growing region of Maharashtra accounting 13.60 lakh ha average with a production of 24.00 lakh bales and productivity of 300 kg lint/ha. There is a growing need to increase the production of cotton.

The experiment was conducted during the *kharif* 2007-2008 at College of Agriculture, Nagpur. The soil of the experimental site was dark brown in colour, clay in texture with considerable amount of smectite clay minerals 0-30 cm depth. According to soil taxonomy, the soil was classified under group haplustert, subgroup typic haplustert, family fine, montmorillionitic hyperthermic, slightly alkaline P^H (7.38) and low amount of salt content EC (0.20/dsm) was determined. Medium in organic carbon (4.65 g/kg) and free calcium carbonate (6.32 %). The soil was low in available nitrogen (282.32 kg/ha) and medium in available phosphorus (29.09 kg/ha) and very high in available potassium (378.72 kg/ha). The field experiment was laid out in randomized block design with 10 treatment replicated thrice. The *hirsutum* cotton varity AKH 8828 was sown by dibbling 2-3 seeds/hill at a spacing of 60 x 60 cm on 29 th June 2007. Half dose of nitrogen and full dose of phosphorus was applied at the time of sowing and remaining half does of nitrogen was top dressed at first irrigation (16 July) The concentrated macro and micro nutrient sprayed with treatment was T_1 : RDF (100%) (50:25:25), T_2 : RDF (75%) + 2.5 t FYM, T_3 : RDF (75%) + 2.5 t FYM + Urea spray (2%), T_4: RDF (75%) +2.5 t FYM + DAP (2%) spray, T_5: RDF (75%) + 2.5 t FYM + urea spray (2%) + DAP (2%) spray, T_6: RDF (75%) +2.5 t FYM + $MnSO_4$ spray (0.3%), T_7: RDF (75%)

+2.5 t FYM + $MgSO_4$ spray (0.3%), T_8: RDF (75%) +2.5 t FYM + KNO_3 spray (1%), T_9: RDF (75%) +2.5 t FYM +$ZnSO_4$ spray (0.3%) and T_{10}: RDF (75%) +2.5 t FYM + $MnSO_4$ (0.3%) + $MgSO_4$ (0.3%) + KNO_3 (1%) + $ZnSO_4$ spray (0.3%). Foliar application was given by 50 per cent flowering and boll development stages. Five samples were randomly selected from each treatment at 50 per cent flowering and boll development stages of crop. The leaves, stem, fruiting bodies were first dried in shade and then in an oven at 65^0C. These plant samples were ground in Willey Mill and stored in labeled brown paper bags for further analysis for determination of nutrient content and uptake of 50 per cent flowering and boll development stages. At the time of first picking five randomly selected plants were taken for the observation on the plant growth characters *viz.,* boll weight and number of bolls/plant. Seed cotton yield and plant stand were also recorded. The data collected were analysed statistically for representing the results.

Nutrients concentration and uptake of cotton plant : The major nutrients (N, P and K) content and uptake of plant at 50 per cent flowering and boll development stage were studied the result obtained are given in Table 1 and 2.

Nitrogen content and uptake of plant at various growth stages : Nitrogen content and uptake in plant was decreases from 50 per cent flowering to boll development stage in all treatments. The highest N content and uptake 1.65 and 7.474 was observed in treatment T_1 at 50 per cent flowering stage followed by treatment T_5 and T_2. The content and uptake of N was significantly increase due to the application of fertilizer N and foliar sprays. The increase in N content as response of N fertilizer was also reported.

Phosphorus content and uptake of plant at various growth stages : Significantly highest P content was observed in treatment T_1 at 50 per cent flowering stage. The lowest P content and uptake were observed in T_2 and T_6 it is observed that the nutrient spray might have improved the photosynthesis activity and influenced the P content of plant during 50 per cent flowering and boll development stages. Similar responses were by reported Katkar *et al.,* (2002).

Potassium content and uptake of plant at various growth stages : Potassium content was significantly influence due to different treatment and 50 per cent flowering and boll development stages at cotton. the highest content and uptake of (1.60 and 7.248) recount in treatment T_1 at 50 per cent flowering stage followed by T_8 potassium content and uptake were decreases from 50 per cent flowering to boll development stage. As it is transacted from plant to seed N, P and K content in cotton were reported in ratio of 3:1:3 any division from this ratio indicated on unbalance content on account of the relative in sufficient of any one of three nutrients the higher ratio indicated in sufficiently of phosphorus were as lower ratio indicates decreases insufficient of potassium.

Productivity of cotton : The data on effect of various treatments on yield of seed cotton is presented in Table 1. Treatment T_5 produces highest seed cotton yield (1266 kg/ha) followed by treatment T_1 (1250 kg/ha), T_4 (1210 kg/ha) and T_{10} (1204 kg/ha) which were *at par*. This suggests that supply of nitrogen and phosphorus through foliar sprays in lateral growth stages were beneficial. The variation in other treatment of foliar application was non-significant. These findings are in conformity with findings of Raskar *et al.,* (2001). Treatment T_5 showed highest boll/plant (32.8) and also mean weight of boll (3.7 g). Treatment T_2 produces lowest boll/plant (23.8). The highest mean boll weight was observed in treatment T_5 followed by T_1, T_4 and T_{10}. The lowest boll weight was

Table 1. Effect of foliar application of nutrients on productivity and quality of rainfed cotton

Tr. No.	Treatment details	Nutrient contents (%)						Productivity of cotton		Quality of cotton	
		Flowering (50%)			Boll development stage						
		N	P	K	N	P	K	Seed cotton yield (kg/ha)	Hallow length (mm)	Gin-ning (%)	Oil (%)
T_1	RDF (100%) (50:25:25)	1.65	0.56	1.60	1.65	0.56	1.60	1250	25.30	38.6	20.05
T_2	RDF (75%) + 2.5 t FYM	1.60	0.51	1.37	1.60	0.51	1.37	1158	24.90	37.1	19.60
T_3	T2 + Urea (2%) spray	1.54	0.52	1.35	1.54	0.52	1.35	1196	25.29	37.5	19.56
T_4	T2 + DAP (2%) spray	1.55	0.53	1.33	1.55	0.53	1.33	1210	25.29	37.7	19.73
T_5	T2 + Urea (2%) + DAP spray (2%)	1.61	0.54	1.36	1.61	0.54	1.36	1266	25.31	38.9	20.90
T_6	T2 + $MnSO_4$ spray (0.3%)	1.54	0.51	1.32	1.54	0.51	1.32	1164	25.20	38.2	19.30
T_7	T2 + Mg SO_4 spray (0.3%)	1.55	0.52	1.33	1.55	0.52	1.33	1172	25.20	38.5	19.50
T_8	T2 + KNO_3 spray (1%)	1.57	0.53	1.40	1.57	0.53	1.40	1192	25.28	37.9	19.40
T_9	T2 + $ZnSO_4$ spray (0.3%)	1.55	0.52	1.33	1.55	0.52	1.33	1167	25.15	38.3	19.53
T_{10}	T2 + $MnSO_4$ (0.3%) + $MgSO_4$ (0.3%) + KNO_3 (1%) + Zn SO_4 (0.3%) spray	1.56	0.53	1.36	1.56	0.53	1.36	1204	25.29	38.4	19.90
	SE ±	0.011	0.013	0.012	0.011	0.013	0.012	22.38	0.21	0.46	0.07
	CD (p=0.05)	0.03	0.039	0.038	0.03	0.039	0.038	66.50	0.63	1.38	0.22

observed in treatment T_2 and T_9 which were received lower N and P supply Table 2.

Quality of cotton : The data on quality parameters as affected due to various treatments were depicted in Table 1. It was observed that ginning and oil per cent were significantly influenced whereas hallow length of fibre was not significant.

Ginning per cent : Highest ginning per cent (38.9) was observed in treatment T_5. The treatment T_1 and T_7 were *at par*. The lowest ginning per cent was noticed in T_2 which receives low RDF and no foliar application.

Table 2. Effect of foliar application of nutrients on uptake of rainfed cotton

Tr. No.	Treatment details	Nutrient uptake (%)							
		Flowering (50%)			Boll development stage				
		N	P	K	N	P	K	Boll/ plant	Boll weight/ plant
T_1	RDF (100%) (50:25:25)	7.474	2.537	7.248	14.17	4.986	14.04	31.9	3.6
T_2	RDF (75%) + 2.5 t FYM	8.544	2.723	7.316	11.34	3.888	11.23	23.8	2.7
T_3	T2 + Urea (2%) spray	7.900	2.668	6.926	11.65	3.742	11.22	28.3	3.2
T_4	T2 + DAP (2%) spray	7.952	2.719	6.823	12.14	4.159	11.69	30.7	3.5
T_5	T2 + Urea (2%) + DAP spray (2%)	8.710	2.921	7.358	12.98	4.366	12.51	32.8	3.7
T_6	T2 + $MnSO_4$ (0.3%) spray	8.008	2.652	6.864	12.13	4.007	11.68	25.4	2.9
T_7	T2 + Mg SO_4 (0.3%) spray	8.091	2.714	6.943	12.29	3.941	11.94	26.3	3.0
T_8	T2 + KNO_3 (1%) spray	6.264	2.115	5.586	13.35	4.326	13.35	27.2	3.1
T_9	T2 + Zn SO_4 (0.3%) spray	8.091	2.714	6.943	12.39	3.858	12.27	26.1	2.7
T_{10}	T2 + Mn SO_4 (0.3%)+Mg SO_4(0.3%) +KNO_3 (1%) + Zn SO_4 (0.3%) spray	8.19	2.783	7.140	12.68	4.109	12.44	29.5	3.3
	SE ±	0.006	0.011	0.010	0.011	0.011	0.013	1.06	0.13
	CD (p=0.5)	0.018	0.035	0.030	0.034	0.032	0.040	3.15	0.40

Oil content : The highest oil content (20.9%) was observed in treatment T_5 followed by T_{10}, T_4, T_1, T_2 and T_3 oil per cent were low in treatment T_7, T_8 and T_6.

Fibre strength : There were no significant influence of treatment on the fibre strength as the hallow length observed non-significant. Lokhande, *et al.,* (2004) also reported that fibre strength was not affected due to fertilizer nutrients.

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