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Short Note

Influence of Foliar Nutrition on Seed Cotton Yield and Quality of Bt Cotton

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A field experiment was conducted from August 2008 to January 2009 at Tamil Nadu Agricultural University, Coimbatore to find out the influence of foliar application of nutrition on yield attributes, yield and fibre quality of Bt cotton. The experiment was laid out in a randomized block design (RBD), replicated thrice. The treatments were T_1- Urea - (1.5 %), T_2- Diammonium phosphate (DAP) - (2 %), T_3- Potassium chloride (KCl) - (2 %), T_4- Potassium nitrate (KNO_3) - (3 %), T_5- Potassium sulphate (K_2SO_4) - (1.5 %), T_6- Polyfeed – (1.5 %) + Multi K - (1.5 %), T_7- Zinc Sulphate ($ZnSO_4$) – (0.5 %), T_8- Boron (solubar) - (0.2 %), T_9- Control. The results revealed that foliar application of Polyfeed (1.5 %) + Multi K (1.5 %) recorded significantly higher yield and better fibre quality such as ginning percentage, lint index, staple length, micronaire value, uniformity ratio, seed index, elongation percentage and tenacity at stray flowering and boll formation stages. Foliar nutrients significantly altered ginning percentage and lint index in Bt cotton.

Key words: Foliar application, polyfeed, multi k, yield, fibre quality.

Cotton is one of the most important commercial crops grown in India and it contributes 29.8 per cent of the Indian agricultural gross domestic product. India is the second largest producer of cotton in the world after China. Although India has world's largest area of 11.2 million hectares, it produces only 30.5 million bales of lint every year with a productivity of 496 kg ha^{-1} (Anon, 2011). After the introduction of Bt cotton the area under Bt cotton is increasing continuously. Among the various production constrains, unbalanced and inadequate nutrition to cotton crop is considered to be one of the important factors. Soil-applied nutrients depend on the moisture to dissolve the fertilizer, and much of those nutrients become unavailable due to strong adsorption to soil particle. To overcome these constraints, additional nutrition through foliar feeding is required over and above the normal fertilizer recommendation. This is one of the most efficient ways of supplying essential nutrients to a growing crop. In the case of foliar application of fertilizers, the nutrients are supplied directly to where they are required. Considering the above facts the experiment was conducted to find out the appropriate foliar feeding fertilizers for Bt cotton to increase the yield and quality of seed cotton.

Materials and Methods

Field experiment was conducted from August 2008 to January 2009 at Tamil Nadu Agricultural University, Coimbatore. The soil was sandy clay loam in texture with pH 8.49. The fertility status of the soil was low, medium and high in the available N, P_2O_5, and K_2O, the values are 212, 20 and 575 kg ha^{-1} respectively. The experiment was laid out in a randomized block design (RBD) with three replications. A fertilizer dose of 150:60:60 kg N, P_2O_5, and K_2O ha^{-1} was applied uniformly for all the treatments. Data on yield parameters and yield were recorded. Fibre quality parameters from whole plant samples (Ginning percentage, seed index, lint index, fibre length (2.5 per cent staple length), fibre strength (Tenacity), fibre fineness (Micronaire), uniformity ratio, elongation per cent) were also analysed at the time of last picking at Department of Cotton, Coimbatore. All parameters were estimated in High Volume Instrument user model - HVI Classic 900.

Results and Discussion

Yield Attributes

The number of sympodial branch $plant^{-1}$, Number of fruiting points $plant^{-1}$,Number of bolls $plant^{-1}$and boll setting percentage (BSP) significantly differed due to foliar feeding of nutrients (Table 1). Higher number of sympodial branches $plant^{-1}$ (22.6), fruiting points $plant^{-1}$ (53.6), bolls $plant^{-1}$ (28.7) and boll setting percentage (53.5 %) were observed in Polyfeed (1.5 %) + Multi K (1.5 %) treatment due to proper growth and development of secondary formed bolls coupled with better fiber qualities to reap its full genetic potential.

Lesser number of sympodial branches $plant^{-1}$, fruiting points $plant^{-1}$, bolls $plant^{-1}$ and boll setting percentage were observed in control plot (Table 1).

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Table 1. Effect of foliar nutrition on yield attributes and yield of Bt cotton.

Treatment	Sympodial branches plant^{-1}	No.of fruting points plant^{-1}	No.of bolls plant^{-1}	Boll weight (g)	Yield (kg ha^{-1})
T_1- Urea - (1.5 %)	18.5	49.0	25.4	5.2	2445
T_2- Diammonium phosphate (DAP) - (2%)	20.5	50.0	26.0	5.2	2506
T_3- Potassium chloride (KCl) - (2 %)	18.0	48.0	24.5	5.0	2358
T_4- Potassium nitrate (KNO3) - (3 %)	18.2	48.1	24.7	5.1	2376
T_5- Potassium sulphate (K_2SO_4) - (1.5 %)	17.7	48.5	24.0	5.0	2315
T_6- Polyfeed – (1.5 %) + Multi K - (1.5 %)	22.6	53.6	28.7	5.3	2758
T_7- Zinc Sulphate ($ZnSO_4$) – (0.5 %)	17.4	48.5	24.6	4.9	2308
T_8- Boron (solubar) - (0.2 %)	16.3	47.0	24.4	4.8	2297
T_9- Control	14.7	46.0	22.3	4.8	2269
SEd	0.9	2.4	1.2	0.25	119
CD (P = 0.05)	**1.9**	**5.1**	**2.6**	**NS**	**253**

Similar finding of higher number of bolls, numbers of open bolls per plant, weight of seed cotton per boll and lint percentage were reported in transplanted cotton with two rounds of foliar application of P at bud stage and pre flowering stage by Yaseen, (1993). The different treatments could not exert significant influence on boll weight. The higher boll weight (5.3 g) was recorded with the Polyfeed (1.5 %) + Multi K (1.5 %) application compared to other foliar applications. This was on par with DAP (2 %), urea (1.5 %) and KNO_3 (3 %) application. Mrytle Grace *et al.* (2005) also reported that the nutrient management practice of 2 per cent DAP + 1 per cent KCl foliar spray recorded higher seed cotton yield.

Yield

Foliar application had a pronounced effect on the yield of Bt cotton. Polyfeed (1.5 %) + Multi K (1.5 %) recorded the higher yield of 2758 kg ha^{-1} and was followed by DAP (2 %) (2506 kg ha^{-1}) and urea (1.5 %) (2445 kg ha^{-1}). This might be due to the reason that in foliar application of nutrients, the nutrients are supplied directly to where they are required. Makram and Shihway (1995) who has reported that the comparision of one percent

Table 2. Effect of foliar nutrition on fibre quality of Bt cotton

Treatment	Ginning (%)	2.5% span length	Lint index	Micronaire value	Uniformity ratio
T_1- Urea - (1.5 %)	39.5	30.1	7.0	3.5	46.6
T_2- Diammonium phosphate (DAP) - (2%)	39.6	31.0	7.1	3.4	47.0
T_3- Potassium chloride (KCl) - (2 %)	39.0	30.1	6.8	3.4	45.6
T_4- Potassium nitrate (KNO3) - (3 %)	38.7	29.8	6.7	3.5	46.8
T_5- Potassium sulphate (K_2SO_4) - (1.5 %)	39.0	28.9	6.6	3.4	46.7
T_6- Polyfeed – (1.5 %) + Multi K - (1.5 %)	39.7	31.6	7.2	3.5	47.1
T_7- Zinc Sulphate ($ZnSO_4$) – (0.5 %)	39.2	28.8	6.6	3.5	45.9
T_8- Boron (solubar) - (0.2 %)	38.0	29.1	6.2	3.5	45.5
T_9- Control	35.2	28.6	5.5	3.4	44.1
SEd	1.9	1.5	0.3	0.2	2.3
CD (P = 0.05)	**4.0**	**NS**	**0.7**	**NS**	**NS**

Polyfeed (N 12 per cent + P_2O_5 3 per cent) two and four weeks after flower initiation and soil application of 24 kg K_2O at 40 DAS + foliar application of one per cent K_2O as potassium sulphate of which Polyfeed revealed that the higher seed cotton yield than soil and foliar (Potassium sulphate-Polyfeed) applications of K. Four spraying of 2 per cent KNO_3 resulted in higher seed cotton yield (AICCIP, 2006). The least cotton yield was recorded in the absolute control with 2269 kg ha^{-1}. All other treatment combinations were on par with each other. Spraying $ZnSO_4$ (0.5 %) recorded the seed cotton yield of 2308 kg ha^{-1} and spraying of boron registered 2297 kg ha^{-1} of seed cotton yield. Foliar application of nutrients increased the seed cotton yield of 21.5 per cent over the control in the application of Polyfeed (1.5 %) + Multi K (1.5 %) plots. The increased seed cotton yield was due to increased plant height and LAI resulted in increased photosynthetic activity and there by increased plant DMP. Raju *et al.* (2008) stated that foliar application of DAP produced 10 per cent more seed cotton yield.

Quality parameters

Application of various foliar nutrients significantly altered the ginning percentage and lint index in Bt

cotton. The ginning percentage (39.7) and lint index (7.2) were higher in Polyfeed (1.5 %) + Multi K (1.5 %) and it was followed by foliar spraying DAP (2 %) and urea (1.5 %). The quality parameters such as 2.5 per cent staple length, micronaire, uniformity ratio, elongation percentage and tenacity were not significantly altered by the foliar nutrients application. Lint index was significantly influenced by spraying of Polyfeed (1.5 %) + Multi K (1.5 %) and DAP (2 %), urea (1.5 %) (Table 2). This is in conformity with the findings of Sawan *et al.* (1993) who reported that seed and lint indices were significantly increased by the foliar application of one per cent Cu and Mn in cotton. The quality characters are mostly governed by genetic makeup of the cotton plant and they were not changed by external application of chemicals.

Conclusion

Spraying Polyfeed (1.5 %) + Multi K (1.5 %) resulted in higher productivity and better quality of Bt cotton hybrid under winter irrigated conditions.

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