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Response of *Bt* cotton to foliar application of potassium nitrate in Tungabhadra project area

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ABSTRACT : A field trial was carried out for 3 years during *kharif*, 2008-2009, 2009-2010 and 2010-2011 to study the response of *Bt* cotton to foliar application of potassium nitrate (KNO_3) under irrigated colitions in black soils at Agricultural Research Station, Siruguppa. The experiment was laid out in randomized block design with 3 replications. The experiment consists of 10 treatments. *viz.,* control (water spray), 2 spray of KNO_3 (2%), 3 sprays of KNO_3 (2%), 4 sprays of KNO_3 (3%), 2 sprays of KNO_3 (3%), 3 sprays of KNO_3 (3%), 4 sprays of KNO_3 (1%), 2 sprays of KNO_3 (1%), split application of MOP (25% at sowing + 25% at thinning + 25% at flowering and 25% at boll development stage) and application of MOP @ 100 per cent at basal. The cotton hybrid Bunny *Bt* (NCS 145) BG II was dibbled with 90 x 60 cm spacing. The recommended fertilize dose of 150:75:75 N:P_2O_5:K_2O kg/ha was commonly applied to all the treatments and all other recommended practices were followed. Results based on 3 years pooled data revealed that foliar spray of KNO_3 (1%) each at flowering and boll development stages recorded significantly higher seed cotton yield (2178 kg/ha), net return (Rs.51182/ ha) and B: C ratio (2:50), as compared to only water spray (1903 kg/ha) and split application of MOP @ 25 per cent each at sowing, thinning, flowering and boll development stage.

Key words: B:C ratio, *Bt* cotton, net returns, potassium nitrate, seed cotton yield

Bt cotton is a major source of income for the farming community both in rainfed and irrigated conditions in Karnataka. Tungabhadra project (TBP) area is one of major irrigated cotton belt, which plays a major role in cotton production. Productivity levels of cotton in the country (544 kg/ha), is far below the world average (704 kg/ha), which indicates that, there is an ample scope to boost its productivity by adopting improved agronomic practices. The nutrient management is the key of agronomic management practice in irrigated condition. Generally, nutrients are supplied to the plant through soil application. But, plants are also showing more response to foliar application of nutrients with better absorption through foliage. Since, cotton is being a long duration crop and due to its indeterminate type of growth habit, it requires nutrients throughout the crop growth period. Besides, *Bt* cotton is retaining more number of square and bolls due to its inherent resistance capacity against the bollworm, which could leads to imbalance in the source and sink relationship. For which, plant needs more and continuous supply of nutrients at peak flowering and boll development stages. So, foliar nutrition would helps in better retention of squares, flowers and boll development would results in higher yield. But, meager information on foliar application of KNO_3 is available in TBP area. In this context, the present investigation was carried out at Agricultural Research Station, Siruguppa to study response of *Bt* cotton to foliar application of potassium nitrate in Tungabhadra project area.

MATERIALS AND METHODS

A field trial was carried out for 3 successive years during *kharif* 2008-2009, 2009-2010 and 2010-2011 to study the response of *Bt* cotton to foliar application of potassium nitrate (KNO_3) under irrigation in black soils at Agricultural Research Station, Siruguppa. The

experiment was laid out in randomized complete block design with 3 replications. The experiment consists of 10 treatments. *viz.,* control (water spray), 2 spray of KNO_3(2%), 3 sprays of KNO_3(2%), 4 sprays of KNO_3 (2%), 2 sprays of KNO_3(3%), 3 sprays of KNO_3(3%), 4 sprays of KNO_3 (3%), 2 sprays of KNO_3(1%) and split application of MOP @ 25 per cent each at sowing, thinning, flowering and boll development stages and application of MOP only at basal. The *Bt* cotton hybrid Bunny BG II (NCS 145) was dibbled with 90 x 60 cm spacing. The recommended fertilizer dose of 150:75:75 N:P_2O_5:K_2O kg/ha was commonly applied to all the treatments and all other recommended practices were followed. The gross plot size was 7.2 x 4.8 m. At harvest, 5 plants were randomly selected in each treatment for recording the growth and yield parameters. The seed cotton yield from net plot was harvested and expressed in kg/ha. The data collected from the experiment were subjected to statistical analysis. The level of significance used in 'F' and't' test was P=0.05.

RESULTS AND DISCUSSION

Seed cotton yield and yield parameters:

The results of the experiment indicated that foliar spray of potassium nitrate has greatly influenced the seed cotton yield in all the 3 years. The pooled results (Table 1) over 3 years indicated that, foliar spray of KNO_3 (1%) twice at flowering and boll development stages recorded significantly higher seed cotton yield (2178 kg/ha) as compared to water spray (1703 kg/ha) and split application of MOP @ 25 per cent each at sowing, thinning, flowering and boll development stages and application of MOP @ 100 per cent at basal (1832 kg/ha). Similarly, Kumar *et al.,* (2011), reported highest seed cotton and lint yield were observed with 4 foliar spray of KNO_3 (2%), whereas, in an another study conducted at Guntur by Narayana *et al.,*(2011), revealed that application of 100 per cent RDF based on soil test values plus 2 sprays of (2%) KNO_3 each at flowering and boll development stage recorded the highest seed cotton yield, whereas, Chellaiah and Gopalaswamy (2000) observed that foliar spray of DAP (2%) + KCl (1%) solution at 60 and 75 DAS produced the highest seed cotton yield and this might be due to better absorption and utilization of foliar applied nutrients at critical stages of cotton growth. In the present study, the yield advantage was to the extent of 14, 19 and 28 per cent over split application of MOP (25%) each basal, thinning, flowering and boll development stages, application of MOP (100%) at basal and only water sprays, respectively. In another study, carried out at Dharwad by Hosmath (2011) observed that seed cotton yield advantage was more with foliar application of KNO_3 (2%), soil and foliar application of $MgSO_4$ (25 kg/ha) and 1 per cent than recommended package. In the present study, yield observed under foliar spray of KNO_3 (1%) each at flowering and boll development stages were *on par* with other levels of KNO_3 foliar sprays. This higher yield was mainly attributed to higher seed cotton yield (121 g/plant), boll weight (4.92 g) and more sympodials (30.9/plant), as compared to only water spray and split application of MOP @ 25 per cent each at sowing, thinning, flowering and boll development stages and application of only MOP @ 100 per cent at basal. Similar results have also been reported by Mehetre *et al.*, (1990) and Pothiraj *et al.,* (1995). In another study, conducted by Sharma and Singh (2007), who reported that foliar application of 2 per cent potassium at initiation and peak boll formation increased the seed cotton yield . In the present investigation, yield and yield parameters observed during 2008-2009, 2009-2010 and 2010-2011 followed the same trend as that of pooled data. During 2009-2010, low yield was recorded as compared to other two years mainly due to heavy rains and pest infestation. Applying K fertilization at 47.4 kg/ha combined with spraying cotton plants with zinc at 57.6 g/ha and also with P @ 1 728 g/ha improved growth and yield of Egyptian cotton (Zakaria *et al.*, 2008).

Table 1. Seed cotton yield, yield parameters and economics as influenced by foliar application of KNO_3 in *Bt* cotton under irrigation

Treatments	Seed Cotton Yield (kg/ha)				Pooled over three years				
	2008-2009	2009-2010	2010 2011	**Pooled**	Boll weight (g)	Bolls/ Plant	Plant height (cm)	Net returns (Rs/ha)	B:C ratio
Control(water spray)	1970	1262	1875	**1703**	4.57	30.0	101	31932	2.01
Two spray of KNO3 (2%)	2203	1547	2288	**2013**	4.73	36.7	117	42664	2.27
Three spray of KNO3 (2%)	2142	1555	2240	**1949**	4.72	37.8	113	40291	2.17
Four spray of KNO3 (3%)	2198	1624	2368	**2062**	4.86	37.2	120	43212	2.22
Two spray of KNO3 (2%)	2127	1674	2335	**2045**	4.92	39.0	119	43041	2.25
Three spray of KNO3 (3%)	2307	1591	2389	**2095**	4.86	38.3	121	44137	2.24
Four spray of KNO3 (3%)	2170	1622	2611	**2134**	4.89	38.1	118	46568	2.21
Two spray of KNO3 (1%)	2292	1618	2625	**2178**	4.92	37.2	121	51182	2.50
Split application of MOP (25% at sowing + 25% at thinning + 25% at flowering and 25% at boll development stages)	2108	1489	2117	**1905**	4.79	36.1	111	39364	2.23
Application of MOP at basal	2053	1406	2042	**1833**	4.39	34.9	105	37657	2.20
SEm+/-	64	46	140	**53**	0.10	1.32	3.46	2713	0.06
P=0.05	191	137	416	**151**	0.28	3.76	9.80	7694	0.17

Price: Seed cotton@ Rs2500/q during 2008-2009 and 2009-2010 and Rs. 5600/q in 2010-2011

Monetary returns: The net returns and B:C ratio was presented in Table 1. Pooled results over 3 years revealed that, significantly higher net return (Rs.51182/ha) and B: C ratio (2.50) were recorded with foliar spray of KNO_3 (1%) twice at flowering and at boll development stages as compared to only water spray, split application of MOP (25%) each basal, thinning, flowering and boll development stages and application of MOP (100%) basal. However, it was *on par* with other foliar sprays of KNO_3 treatments (Table 1). Similarly Chellaiah and Gopalaswamy (2000), reported that, foliar spray of DAP (2%) + KCl (1%) (1:1) solution on 60 and 75 DAS was found to be more economical under irrigated cotton. During 2009-2010, yield levels were low compared to other years mainly due to heavy rains and pest incidences led to low monetary benefits. The similar trend in gross return, net return and B:C ratio were also noticed in all the 3 years. Least net returns and B:C ratio were noticed in water spray in 2008-2009. The similar trend was also observed both in 2009-2010 and 2010-2011.

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