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Short Communication

Effect of Nutrient Management on Yield of Bt Cotton under Dry Farming Conditions in North Saurashtra Agro-climatic Zone

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Cotton 'the king of apparel fibers' is an important cash crop and it supplies a major share of raw material for the textile industry while playing a key role in the economic and social affairs of the world (Anonymous, 2010; Hosamani *et al*., 2013). It is grown primarily for its fiber which is used in the manufacture of cloths, making of threads and extraction of oil from cotton seed (Deshmukh *et al*., 2013). It is grown throughout India under both rainfed and irrigated conditions on an area of about 9.5 million ha (Mayee *et al*., 2008; Yang *et al*., 2014). India ranks first in area but production is far below the world average of over 600 kg ha^{-1} (Gadhiya *et al*., 2009). At present acute problems of reddening of cotton are observed due to lack of proper nutrient management practices (Das *et al*., 2004). Keeping in view, an experiment was planned to study the effect of nutrient management on Bt cotton under dry farming condition, at Dry Farming Research Station, Junagadh Agricultural University, Jamkhambhalia, Gujarat.

A field experiment was conducted during kharif 2011-12 to 2015-16 at Dry Farming Research Station, Junagadh Agricultural University, Jamkhambhalia under North Saurashtra Agro-climatic Zone. The soil of the experimental field was medium black having good drainage and high moisture retention capacity. Some important characteristics of the soil were pH 8.30, EC 0.35 d Sm^{-1}, organic carbon 0.41%, available N, P_2O_5, K_2O and S were 230.3, 28.6, and 336 kg ha^{-1} and 17.8 ppm, respectively and micronutrient Fe, Mn and Zn were 10.19, 12.84 and 0.66 ppm, respectively . The experiment comprised of total 9 treatments i.e. T_1 - 80 kg N ha^{-1}, T_2 - 80 kg N ha^{-1} + 20 kg P_2O_5 ha^{-1} + 40 kg K_2O + 20 kg S ha^{-1}, T_3 - 80 kg N ha^{-1} + 20 kg P_2O_5 ha^{-1} + 40 kg K_2O ha^{-1} + 40 kg S ha^{-1}, T_4 - 80 kg N ha^{-1} + 20 kg P_2O_5 ha^{-1} + 80 kg K_2O ha^{-1} + 20 kg S ha^{-1}, T_5- 80 kg N ha^{-1} + 20 kg P_2O_5 ha^{-1} + 80 kg K_2O ha^{-1} + 40 kg S ha^{-1}, T_6 - 80 kg N ha^{-1} + 40 kg P_2O_5 ha^{-1} + 40 kg K_2O ha^{-1} + 20 kg S ha^{-1}, T_7 - 80 kg N ha^{-1} + 40 kg P_2O_5 ha^{-1} + 40 kg K_2O ha^{-1} + 40 kg S ha^{-1}, T_8 - 80 kg N ha^{-1} + 40 kg P_2O_5 ha^{-1} + 80 kg K_2O ha^{-1} + 20 kg S ha^{-1}, T_9 - 80 kg N ha^{-1} + 40 kg P_2O_5 ha^{-1} + 80 kg K_2O ha^{-1} + 40 kg S ha^{-1} in randomized block design, replicated thrice. Bt cotton variety BG-II G.Cot. Hy. 8 was sown and the 80 kg nitrogen ha^{-1} was applied in three splits i.e. 25% as basal, 50% as top dressing at 35-40 days and 25% as top dressing at 60-65 days and all the agronomic practices were adopted as per need of the crop. The growth and yield parameters, seed cotton and stalk yield of cotton were recorded. After harvest of crop, soil samples were collected and analyzed for EC, pH, OC, available NPK status in soil using standard methods (Jackson, 1973).

The pooled results presented in Table 1 revealed that significantly higher values for plant height, number of branches per plant and number of bolls per plant of cotton were recorded with treatment T_9 (80-40-80-40 NPKS kg ha^{-1}) over treatment T_1 (80 kg N ha^{-1}). This might be due to application of NPKS fertilizers at higher dose which supplied the requred nutrients for the plant growth. Similar results were also observed by Gadhiya *et al*. (2009), Sakarvadia *et al*. (2009) and Vora *et al*. (2015). On the basis of pooled results (Table 1), maximum seed cotton yield (1798 kg ha^{-1}) was recorded with T_9 (80-40-80-40 NPKS kg ha^{-1}) which was significantly higher than treatment T_1 (80 kg N ha^{-1}) and T_6 (80-40-40-20 NPKS kg ha^{-1}) and statistically at par with other treatments. The pooled results in Table 1 showed that significantly higher stalks yield (3536 kg ha^{-1}) of cotton was recorded with T_9 (80-40-80-40 NPKS kg ha^{-1}) over treatments T_1 to T_4 & T_6, and statistically at par with treatments

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Table 1. Effect of nutrient management on yield attributes, yield of Bt cotton and economics (pooled data of 3 years)

Treatments	Plant height (cm)	No. of branches/ plant	No. of bolls / plant	Seed Cotton yield (kg ha^{-1})	Stalks yield (kg ha^{-1})	Net monetary return (Rs. ha^{-1})
T_1 80 kg N ha^{-1}	86.6	13.13	26.75	1452	2569	42063
T_2 80-20-40-20 NPKS kg ha^{-1}	88.9	13.56	31.60	1754	3028	**52091**
T_3 80-20-40-40 NPKS kg ha^{-1}	91.0	14.66	29.44	1751	3141	51806
T_4 80-20-80-20 NPKS kg ha^{-1}	88.2	14.52	30.69	1705	2966	48918
T_5 80-20-80-40 NPKS kg ha^{-1}	92.3	15.32	32.32	1763	3306	51107
T_6 80-40-40-20 NPKS kg ha^{-1}	91.8	15.18	27.97	1676	3176	47695
T_7 80-40-40-40 NPKS kg ha^{-1}	92.3	15.98	32.44	1759	3402	50941
T_8 80-40-80-20 NPKS kg ha^{-1}	90.1	15.07	29.39	1696	3069	47558
T_9 80-40-80-40 NPKS kg ha^{-1}	**97.5**	**16.59**	**33.21**	**1798**	**3536**	51565
S.Em.±	2.7	0.70	2.1	40	115	
C.D. at 5%	7.9	2.04	6.1	113	337	
C.V.%	4.1	18.41	17.7	7.0	11.7	

T_5 (80-20-80-40 NPKS kg ha^{-1}) and T_7 (80-40-40-40 NPKS ha^{-1}). The minimum seed cotton yield (1452 kg ha^{-1}) and stalk yield (2569 kg ha^{-1}) were recorded under 80 kg N ha^{-1} (T_1). Thus, the results clearly indicated that combine application of NPKS at high dose resulted in increased yield. The results are in concurrence with the work reported by Hulihalli and Patil (2008), Gadhiya *et al*. (2009) and Sakarvadia *et al*. (2009). With respect to economics, higher net realization (Rs. 52091 ha^{-1}) was obtained with treatment T_2 (80-20-40-20 NPKS kg ha^{-1}). The data given in Table 2 also revealed that pH, EC and organic carbon content of soil were unaffected due to different treatments. Available status of phosphorus, potassium and sulphur in soil was significantly affected due to different treatments and maximum values were observed with T_9 (80-40-80-40 NPKS kg ha^{-1}). The minimum values for availability of all the nutrients were found under recommended dose of fertilizer i.e. 80 kg N ha^{-1} (T_1). The results are in agreement with the work of Ravikiran and Halepyati (2019), Sujatha and Vijayalakshmi (2013) and Vora *et al*. (2015).

On the basis of the findings of the present investigation, it can be concluded that the application of NPKS @ 80-20-40-20 kg ha^{-1} in cotton crop resulted in higher cotton seed yield and net realization of about Rs. 10,000 ha^{-1} more than from recommended dose for the Bt cotton under dry farming conditions in North Saurashtra Agroclimatic Zone.

Table 2. Effect of different treatments on post harvest soil fertility (at harvest 2015-16)

Treatment	pH	EC (d Sm^{-1})	Org. C. (%)	Avail. P_2O_5 (kg ha^{-1})	Avail. K_2O (kg ha^{-1})	Avail. S (ppm)
Initial	8.30	0.35	0.411	28.6	366	17.8
T_1 80 kg N ha^{-1}	8.29	0.39	0.416	27.79	360	16.7
T_2 80-20-40-20 NPKS kg ha^{-1}	8.23	0.35	0.428	35.66	381	21.2
T_3 80-20-40-40 NPKS kg ha^{-1}	8.20	0.33	0.432	36.83	388	23.6
T_4 80-20-80-20 NPKS kg ha^{-1}	8.24	0.34	0.434	38.70	429	25.0
T_5 80-20-80-40 NPKS kg ha^{-1}	8.22	0.33	0.441	41.16	431	27.2
T_6 80-40-40-20 NPKS kg ha^{-1}	8.25	0.35	0.447	44.96	411	25.8
T_7 80-40-40-40 NPKS kg ha^{-1}	8.20	0.36	0.452	47.79	420	28.9
T_8 80-40-80-20 NPKS kg ha^{-1}	8.26	0.38	0.468	49.76	452	26.4
T_9 80-40-80-40 NPKS kg ha^{-1}	8.24	0.36	0.471	52.17	459	30.1
S.Em.±	0.06	0.02	0.02	2.14	11.04	1.6
C.D. at 5%	NS	NS	NS	**6.43**	**33.11**	**4.7**
CV%	1.32	8.60	6.69	8.92	4.61	10.87

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