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Effect of different levels of nitrogen, phosphorus and potassium on growth, yield and quality of Bt cotton

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ABSTRACT

A field experiment was conducted at Cotton Research Sub-Station, S. D. Agricultural University, Khedbhrahma (Gujarat) in randomized block design (factorial) during the *kharif* season of 2005-06. Three levels each of N (160, 200 and 240 kg ha^{-1}), P_2O_5 (0, 20 and 40 kg ha^{-1}) and K_2O (0, 40 and 80 kg ha^{-1}) were tried. Total 27 treatment combinations were replicated three times. The results indicated that Bt cotton crop fertilizing at 240 kg N ha^{-1} significantly increased yield attributes *viz*., plant height, sympodial branches per plant, No. of bolls per plant, No. of seeds per boll and boll weight as well as seed cotton yield, quality and nutrient uptake. Fertilizing Bt cotton at 40 kg P_2O_5 kg ha^{-1} numerically increased yield attributes and seed cotton yield of 2427 kg ha^{-1} which was at par with 20 kg P_2O_5 ha^{-1}. An application of 80 kg K_2O ha^{-1} significantly increased yield attributes *viz*., plan height, sympodial branches per plant, number of bolls per plant, boll weight and seed cotton and stalk yield. However, this level was at par with 40 kg K_2O ha^{-1} in yield attributes, seed cotton and stalk yield. Application of 80 kg K_2O ha^{-1} removed higher N (53.48 kg ha^{-1}) and K (50.46 kg ha^{-1}) which was statistically at par with 40 kg K_2O ha^{-1}. Among all treatment combination numerically highest seed cotton yield (2641 kg ha^{-1}) and maximum net realization of Rs. 38704 ha^{-1} was recorded under treatment 240 kg N ha^{-1} + 20 kg P_2O_5 kg ha^{-1} + 40 kg K_2O ha^{-1} ($N_3P_1K_1$). Thus, the results of present study indicated that potential production and profit from Bt cotton crop can be secured by fertilizing the crop with 240 kg N ha^{-1}, 20 kg P_2O_5 kg ha^{-1}, and 40 kg K_2O ha^{-1} under irrigated condition.

Key words : Bt cotton, Nitrogen, Phosphorus, Potassium

Cotton (*Gossypium hirsuum*), the white gold, is one of the most important commercial and industrial crop. It plays a key role in economical and social affairs of the world. It is considered as "King" of fibers and being important cash crop of the country, benefits several million people who are engaged in its cultivation, trade, processing, manufacturing etc. India rank first in the world in respect of area (7.64 million hectares) and third next to USA and China in total annual production (13.69 million bales in 2003-04). However, the average yield being the lowest *i.e.* 307 kg ha^{-1} against world average of 600 kg ha^{-1}. The main cause of lower productivity of cotton in India is severe damage caused by boll worm complex. But after introduction of transgenic cotton, the area under cotton cultivation is increased in Gujarat and other cotton growing states, which helped farmers in the country to earn and additional income of Rs. 770 crores during 2004 (Annual Report, 2005). The production potential of cotton crop is the resultant of a number of interacting factors contributing its shares. Major nutrients (N, P and K) are important for increasing the crop production. The literature available shows that optimum requirement of major nutrients (NPK) for maximum yield of Bt cotton varies considerable from place to place on account of variation in soil moisture, temperature, cropping pattern followed and crop variety. With increased trend of intensive cultivation and introduction of high yielding varieties, the linear response of applied fertilizer are observed. Bt cotton is now released high yielding variety, which required high amount of fertilizer. So far there is paucity of information on the response of N, P and K application in Bt cotton crop, the present investigation was studied.

MATERIALS AND METHODS

A field experiment was conducted during 2005-06 at Cotton Research Sub-Station, S. D. Agricultural University, Khedbhrahma (Gujarat). The soil of the experimental field was medium black having good drainage and high moisture retentive capacity. Some important characteristics of the soil were as follows: pH 7.40, EC 0.22 dSm^{-1}, Organic carbon 0.31 per cent, CEC 31.5 c mol(p^+) kg^{-1}, available N, P_2O_5 and K_2O were 230.3, 25.4 and 210.0 kg ha^{-1}, respectively. A total of 27 treatment combinations of 3 units each of having 3 levels replicated three times were executed in randomized bloc design. Different treatments involved application of nitrogen (160, 200 and 240 kg ha^{-1}), phosphorus (0, 20 and 40 kg P_2O_5 ha^{-1}) and potassium (0, 40 and 80 kg K_2O