

A CASE STUDY

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Application of fertilizer based on soil testing for better production of cotton

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ABSTRACT : The field experiment was conducted on cotton during three consecutive *Kharif* seasons of the year 2011 to 2013 in order to develop fertilizer prescriptions for the desired yield targets with three treatments *viz.*, farmers practice, recommended practices and soil testing based fertilizer application. For taking higher production of crop a viable approach is needed to supply the crop with nutrients that limit its production. The present study deals with this issue. In this experiment application of chemical fertilizer along with biofertilizer based on soil testing increased 15.90 per cent in economic yield than the farmers practice during all the years. The net return also showed an increase of Rs. 17732/- per ha under soil testing based fertilizer application than farmer practices during three years.

KEY WORDS : Cotton, Fertilizer application, Production, Soil testing

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Cotton is the most important crop as well as a commodity plays an important role in the agrarian and industrial activities of the nation and has a unique place in the economy of our country. Area under Bt cotton is increasing tremendously and at present 85 to 90 per cent of cotton cultivated area in India is with Bt cotton hybrids (Mohanasundaram and Saravanan, 2013). Maximum yield potential of Bt cotton can be realized by adopting new and high yielding Bt cotton hybrids is associated with balance nutrient and consequently its availability in the soil. Fertilizer may affect the vegetative and reproductive growth resulting decline in seed cotton yield due to Imbalance use.

Soil testing is a scientific technique used for assessing external nutrient need of crops to achieve profitable response. It provides current qualitative information on the nutrient and the nutrient supplying capacity of soil. It is the basis for making scientifically sound and

management decision about the requirement of specific kind of fertilizers and soil amendments. In general, a simple soil test determines the EC, pH, organic carbon, phosphorus and potassium status of soil. Based on the estimated value, soils are categorized into three classes, *viz.*, low, medium and high with respect to a particular nutrient.

Indiscriminate use of fertilizers in cotton crop tilting mostly towards nitrogenous fertilizers becomes a major threat to sustainable farming. Under such circumstances, nitrogen is simply used as a shovel to mine the other nutrients from soil and deteriorate its productive quality. Higher nitrogen application may be able to raise the yield upto a certain level but it removes 2 to 5 times more phosphorus, potassium and sulphur from soil than the normal limit. The specific yield equation based on soil health besides ensuring sustainable crop production also steers the farmers towards economic use of costly

Parameters	Result	Category
pH	7.16	Neutral
Electrical conductivity (dSm-1)	0.37	Neutral
Organic carbon (%)	0.61	Medium
Available P (kg/ha)	21.00	Low
Available K (kg/ha)	605.00	High

Treatments	Treatment details
T ₁ - Farmers practice	Farmers practices (300 : 30 : 30 kg. NPK/ha)
T ₂ - Recommended practices	240 : 00 :00 kg. NPK/ha
T ₃ - Soil testing based fertilizer application	240 : 40 :00 kg. NPK / ha + liquid <i>Azotobacter</i> and <i>phosphate</i> culture as seed treatment and foliar spray of <i>Azotobacter</i> at 30, 45 and 60 DAS

fertilizer inputs depending on their financial status and prevailing market price of the crop under consideration (Bera *et al.*, 2006). The continuous over mining of these nutrients without adequate external supply leads to deterioration of inherent fertility status of soil and fails to produce the desired yield. The situation is much critical under cotton production system as the amount of nutrient removed by cotton is quite high. In this context, use of fertilizers based on soil testing might be able to play a vital role in ensuring balanced nutrition to crop and also preventing wasteful expenditure on the use of costly mineral fertilizers (Benipal *et al.*, 2001).

RESEARCH PROCEDURE

An on-farm testing was conducted at three locations in Sankheda taluka of Vadodara district of Gujarat state during 2011 to 2013. Cotton cv. 'RCH-2' was grown under the irrigated conditions. Soils of the experimental sites were tested and rated as per the data given in Table A. In general the soils were neutral in reaction. Organic carbon content was found medium in all the locations. Available phosphorus fell under low rating and available potassium status of the soil was estimated as high. In all the locations the availability of phosphorus and potassium were low and high, respectively.

Generally farmers were utilized more NPK

fertilizers than recommendation, which resulted into high cost of cultivation and also affected the soil health. Therefore the treatments were finalized based on the scientific analysis of soil. Three treatments were compared in these trials in order to check the performance of existing production practices with the soil testing based fertilizer application technique. The details of the treatment are given in Table B.

RESEARCH ANALYSIS AND REASONING

The results presented in Table 1 indicated that cotton yields were influenced due to different treatments. The increasing trend in yield was observed under different treatment. Treatment T₃ recorded higher yield of cotton (27.15 q/ha) as compared to treatment T₂ and T₁. The same trend of results is also found by Kodmelwar *et al.* (1979) who reported that the use of non-symbiotic nitrogen fixing *Azotobacter* seed inoculation increased crop yields to the tune of 26 per cent in cotton in different locations. Similarly, Verma and Bhattacharya (1990) also observed increased in yield of wheat and cotton with the application of organic manure in combination with *Azotobacter*. The higher yield under T₃ treatment may be due to adequate and correct supply of nutrients exhibited a positive impact on the economic yield. Further, it was observed that farmers practices (T₁)

Treatments	Cotton yield (q/ha)	Cost of cultivation (Rs.)	Gross return (Rs.)	Net return (Rs.)	B:C Ratio
T ₁	22.83	34160	101750	67590	2.98
T ₂	24.67	33493	109850	76357	3.28
T ₃	27.15	35467	120788	85322	3.41

recorded lower yield than that of recorded under existing recommended practices. Kalaichelvi and Chinnusamy (2005) also found increment in yield attributes of cotton with application of 100 per cent STCR recommended level rather than 75 and 50 per cent STCR recommended level. Soil testing based fertilizer application (T_3) recorded higher yield to the tune of 9.15 and 15.90 per cent, over treatment T_2 and T_1 , respectively. With regards to economics, again T_3 treatment recorded maximum gross return (Rs. 120788/ha), net return (Rs.85322/ha) and B:C ratio (3.41) as compared to treatment T_1 and T_2 (Sangshetty and Babalad, 2011).

Conclusion :

Application of fertilizers on the bases of soil testing, possibly increased the net return by Rs. 17732/ - per ha. Fertilizer is the key factor to enhance productivity. However, without efficient management of this costliest input, it may reduce the farmer's profitability as well as also adversely affect the soil quality. Several well established soil testing laboratories are operating in the state under various organizations. This facility can be affectively utilized with a systematic approach for location specific fertilizer recommendation.

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