SOIL AND CROP SPATIAL VARIABILITY IN COTTON GROWN ON DEEP BLACK COTTON SOILS

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Cotton is an important commercial crop and forms principal raw material for a textile industry. Nutrient management in cotton is complex due to simultaneous production of vegetative and reproductive structures during the active growth phase. Bt. cotton retains relatively more number of bolls and synchronous boll development and hence it needs higher nutrients compared to Non Bt cotton. In view of this an experiment was conducted to study the spatial variability in soil with respect to soil properties and their effect on seed cotton yield.

The experimental site distributed from latitude: 15^o 27.58'' to 15^o 27.55 N and longitude 75^o 2.82 to 75^o 2.95 East. Totally, 73 soil samples were drawn up to 15 cm depth from 4 hectare area at 20 m grid. The location of the sample was recorded using GPS. The soil spatial variability for major, secondary and micro nutrients are assessed as per the criteria given by (Arora, 2002) by following standard analytical techniques (Jackson, 1973). Based on the soil fertility status, a field experiment on precision nutrient management was carried out by fixing 4 target yields (25, 30, 35 and 40 q/ha) by delineating 5 management zones based on major soil nutrient status (LLM, LMM, LMH, LLH and Soil test crop response (STCR) (Fig.1 and 2). The required soil nutrient maps were generated based on site specific nutrient management (SSNM) concept and the target yield. Variable rate of nutrients were applied to each grid manually.

Soil spatial variability observed with respect to all chemical properties within the 4 hectare of cotton growing soil. The soil pH varied from 7.36 to 8.82, EC varied from 0.06 - 0.28 dS/m, organic carbon from 0.19 and 1.44 %. Similarly, major nutrients also varied widely ranging from 100.8 to 756 kg N/ha, 0.81 to 52.2 kg P/ha and 102 to 1245 kg K/ha with an average value of 153.8, 7.63 and 218 kg available N, P and K /ha, respectively. Further, soil fertility status shows

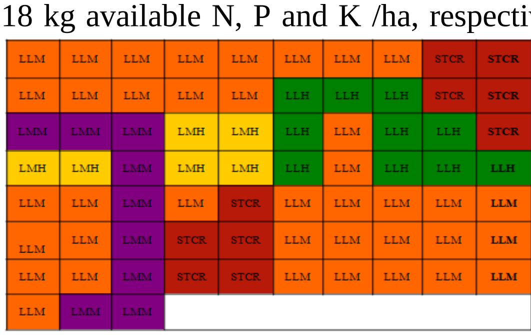

Fig1. Management zone created based on soil fertility status for N, P and K

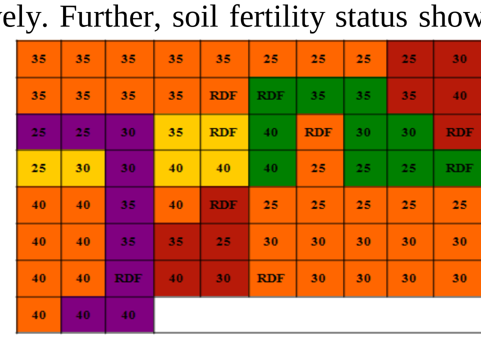

Fig 2. Target yield q/ha assigned to different management zone

Index: L= Low, M= medium and H=High, Letter positions depicts N, P and K, resp.

that, 98 and 2 per cent of the soil samples were low and high in available N. Nagaraj (2001) observed a similar trend of nutrient status in black soils of North Karnataka. With respect to P, 79 and 18 per cent of the samples were low and medium respectively. However, in majority of the grids, available K status was medium (81%) to high (19%).

Similar to N, 95 percent of the grids shown low in available S status as compared to medium (4%) and high level (1%). Micronutrient status was not different from major nutrients. Most of the soil samples were below the critical level in available Fe (100%), Mn (97%), and Zn (95%) status. However, only Cu status was above the critical limit .In black soils, low Fe content may be due to precipitation of Fe^{2+} by $CaCO_3$. Since, the soils are alkaline and rich in $CaCO_3$, zinc may be precipitated as hydroxides and carbonates under alkali pH range (Ravikumar et al., 2007). The observations on crop spatial variability revealed that, all the growth (plant height, Monopodium and Sympodial branches) and yield parameters (Number of squares and green bolls/plant) were higher with 40 quintal target yield grids in LMH management zone (Low in N, Medium in P and High in K) wherein it received maximum inputs. The crop was infested by flower bud maggot (Midge) in all the grids at peak square formation stage and creates hurdle in reaching the targeted yields. The seed cotton yield levels varied from 17.17 q/ha to 31.94 q/ha with an average yield of 25.80 q/ha. Higher seed cotton yield of 31.94 and 31.56 q/ha recorded with the application of nutrients required to achieve 35 quintal target yield in LLM management zone. However, the seed cotton yields were higher in LMH management zone at all targets. The seed cotton yield was higher with the application of nutrients required to achieve 40 q/ha target yield than 25 q/ha.

Keywords: *Cotton, Management zone, Precision nutrient management, SSNM, Spatial variability, Target yield*

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