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Yield and Fiber Qualities of Cotton (*Gossypium hirsutum*) as Influenced by long-term Manures and Fertilizers on Cotton Mono-Cropping

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ABSTRACT

Field experiment was carried out on medium black soils at Regional Agricultural Research Station, Lam, Guntur,Andhra Pradesh during 2013-14 under rainfed conditions to study the effect of manures and fertilizers on seed cotton yield (SCY)and fibre qualities of cotton. Influence of manures and fertilizers on fiber length, fibre strength, fibre fineness, uniformity ratio and maturity ratio value was found non significant. Highestseed cotton yield of (2181kg ha^{-1}) was recorded with RDF + FYM @ 10 t ha^{-1}.

Key words: *Fibre quality paramaters, FYM, Seed cotton yield.*

Cotton today is the most used textile fiber in the world. Its current market share is 56 percent of all fibers used for apparel and home furnishings. Another contribution is attributed to nonwoven textiles and personal care items. It is generally recognized that most consumers prefer cotton personal care items to those containing synthetic fibers. Cotton is an important commercial crop extensively grown in India and Andhra Pradesh. India has the largest acreage (10.5 m.ha) under cotton and ranks second in production (310 lakh bales) after China. India ranks second in cotton productivity (553 kg lint/ha) as against a world average of 733 kg lint/ha. Cotton is growing in an area of 21.42 lakh hectares in Andhra Pradesh, with an average productivity of571 kg lint/ha.

MATERIAL AND METHODS

Field study was carried out at Regional Agricultural Research Station, Lam Farm, Gunturunder rainfed conditions during 2013-14. The soil was medium deep black having slightly alkaline pH (8.2) with low available N (180 kg/ha) and P_2O_5(45 kg/ha), and high in available K_2O (600kg/ha).The experiment was laid out in a randomized block design with three replications.The experiment consisted of eleven treatments *viz.,* T_1- control; T_2 - 50% RD of NPK; T_3–100% RD of NPK; T_4–150% RD of NPK ; T_5–100% RD of NP; T_6 – 100% RD of N; T_7 – T_3+FYM @ 10 t ha^{-1}; T_8- T_3+$ZnSO_4$ @ 50 Kg ha^{-1}; T_9 – T_3 + $MgSO_4$ @ 50 Kg ha^{-1}; T_{10}- T_3+200% RD of NPK and T_{11}- T_3+Gypsum @ 5 q ha^{-1}. A rain fall of 1035mm was received in 59 rainy days during crop growth period. Cotton seed was dibbled at 105 cm x 60 cm spacing on 13th August, 2013. Nitrogen was applied through urea in three equal splits (1/3rd basal+1/3rd at 45 DAS+1/3rd at 90 DAS). Phosphorus was applied through single super phosphate as basal and potassium in two splits (1/2 as basal+1/2 at 45 DAS). FYM (Farm yard manure) was applied 10 days before sowing in the respective treatment. Recommended crop management practices includingplant protection remained common to all the treatments. Seed cotton from each treatment plot (300g)was ginned forworking out ginning out turn (GOT) and the lint was analysedfor its fiber qualities by premier HFT 9000 V 2.1.3 SP high volume instrument (at RARS, Lam).Data was recorded on yield and quality parameters.

RESULTS AND DISCUSSION

Yield attributing characters

The results presented in table 1 revealed that highest number of bolls (34.7) per plant were observed in T_7 (100% RD of NPK+FYM @ 10 t ha^{-1}) followed by T_4 (150% RD of NPK) with 33.5 and T_{10} (200% RD of NPK) with 31.3. These treatments were found to be on par with each other. The highest boll weight (4.36 g) was observed in T_7 treatment imposed with 100% RD of NPK+FYM @ 10 t ha^{-1} followed by 150% RD of NPK (T_4) with 4.28 g and 200% RD of NPK (T_{10})

Table 1. Effect of long-term use of manures and fertilizers on yield and yield attributes of Cotton.

Treatments	Boll number plant^{-1}	Boll weight (g)	Seed cotton yield kg ha^{-1}	% in-crease over control	% increase (or) decrease over T_3	Stalk yield	Biological yield	HI (%)
						kg ha^{-1}		
T_1: Control	23.0	3.37	939	-	-45.9	1836	2775	33.8
T_2: 50% RD of NPK	25.0	3.55	1370	46.0	-21.0	2696	4066	33.7
T_3: 100% RD of NPK	28.0	3.77	1735	84.8	-	3434	5169	33.5
T_4: 150% RD ofNPK	33.5	4.28	2135	127.4	23.0	4228	6363	33.5
T_5: 100% RD of NP	27.3	3.64	1527	62.6	-11.9	3026	4553	33.5
T_6: 100% RD of N	25.7	3.49	1399	49.0	-19.4	2765	4164	33.6
T_7: T_3 + FYM @10tha^{-1}	34.7	4.36	2181	132.3	25.7	4330	6511	33.5
T_8: T_3+$ZnSO_4$ @50 kg ha^{-1}	29.3	3.87	1806	92.3	4.0	3586	5393	33.5
T_9: T_3+$MgSO_4$ @50 kgha^{-1}	28.7	3.79	1797	91.4	3.6	3560	5359	33.5
T_{10}: 200% RD of NPK	31.3	4.14	1980	110.9	14.1	3913	5893	33.6
T_{11}: T_3+gypsum @ 5 q ha^{-1}	30.0	3.93	1862	98.3	7.3	3686	5548	33.5
SEm±	1.45	0.11	104.9	-	-	173.8	260.7	0.02
CD (0.05)	4.3	0.3	316	-	-	512	769	NS
CV (%)	8.8	5.0	11.2	-	-	8.9	8.9	0.08

Table 2. Effect of long-term use of manures and fertilizers on quality of cotton.

Treatments	Fibre length (mm)	Fibre strength (g tex^{-1})	Fibre fineness (ig inch^{-1})	Uniformity ratio	Maturity ratio(%)
T_1: Control	30.53	21.00	3.30	50.80	0.60
T_2: 50% RD of NPK	30.63	21.37	3.27	50.33	0.59
T_3: 100% RD of NPK	30.50	21.40	3.24	50.67	0.61
T_4: 150% RD ofNPK	29.80	20.90	3.34	50.90	0.61
T_5: 100% RD of NP	30.63	21.50	3.28	49.53	0.61
T_6: 100% RD of N	31.07	20.57	3.36	50.03	0.62
T_7: T_3 + FYM @10tha^{-1}	30.47	21.07	3.32	50.93	0.60
T_8: T_3 + $ZnSO_4$ @ 50 kg ha^{-1}	30.73	21.47	3.22	50.17	0.59
T_9: T_3 + $MgSO_4$ @50 kg ha^{-1}	30.70	21.27	3.26	50.93	0.61
T_{10}: 200% RD of NPK	31.13	21.03	3.21	50.47	0.61
T_{11}: T_3 + gypsum @ 5 q ha^{-1}	30.40	21.27	3.37	51.07	0.61
SEm±	0.95	0.70	0.10	1.83	0.02
CD (0.05)	NS	NS	NS	NS	NS
CV (%)	5.4	5.7	5.0	6.3	5.1

with 4.14 g. However, these treatments were on par with one another. The highest boll number plant^{-1} and boll weight were observed in T_7 treatment. It may bedue to continuous supply of nutrients from FYM and balanced recommended dose of fertilizer application, which leads to set more number of bolls and higher weight of bolls. The results were in confirmation with the findings of Sahadevareddy and Aruna (2008) and Uday*et al.* (2013).

Seed cotton yield (kg ha^{-1})

The data represented in table 1, among the treatments FYM treated plots showed a significant increase in seed cotton yield in T_7 (RDF+FYM @ 10 t ha^{-1}) and T_4 (150% of RDF) over T_3 (100%

RDF). The comparison of treatment T_3 (100% RDF) with T_8 (100 per cent RD of NPK+$ZnSO_4$ @ 50 kg ha^{-1}), T_9 (100% RD of NPK+$MgSO_4$ @ 50 kg ha^{-1}) and T_{11}(100% RD of NPK+gypsum @ 5 q ha^{-1}), did not show any marked effect on seed cotton yield. The yield reduction was 11.9 and 19.4 per cent in T_5 and T_6, respectively over T_3.

The highest seed cotton yield was observed in T_7 treatment, due to the use of organic manures like FYM increases the microbial activity which in turn helps in transformation of nutrients making them more available to plants. Similar observations were reported by Devraj*et al*. (2008) and Lalithakumari*et al.* (2010).

Stalk yield and biological yield (kg ha^{-1})

The dataPertaining intable 1 revealed thatdifferent source and levels of nutrient significantly influenced the stalk yield of cotton crop.Control plot (T_1) showed a drastic reduction in the stalk yield due to the removal and depletion of nutrients with continuous cropping without fertilization(Bharadwaj and Omanwar, 1994).The treatments T_8, $T_9$and T_{11} were on par with each other and recorded significantly lower stalk yield than T_7. The highest stalk yield in T_7 due to better nutrition of crop plants due to FYM application which might have increased the photosynthesis rate which was reflected in significant increase in the stalk yield at all the stages of observation (Rajarajan *et al.,* 2005).

The biological yield (table 1) (Kapasyield+Stalk yield) was significantly influenced by application of 100% RD of NPK+FYM @ 10 t ha^{-1} (T_7) over control. The highest biological yield was observed in T_7 followed by T_4 and T_{10}. Overall, the highest biological yield recorded in combined treatment was attributed to the synergistic interaction between FYM and inorganic fertilizers. FYM (Farm yard manure) might have acted as a source of additional nutrients and moisture supplying agent.

Quality parameters

The data presented in table 2 revealed that the sole application or combined application of FYM and Magnesium, Zinc and gypsum did not showed much influence on seed cotton quality expressed as fibre length, fibre strength, fibre fineness, uniformity ratio and maturity ratio. However, the fibre length values ranged from 29.80 to 31.13 mm, while fibre strength values varied from 20.57 to 21.50 g tex^{-1} among different treatments. The values for fibre fineness, uniformity ratio and maturity ratio were 3.21 and 3.37 ìg $inch^{-1}$, 49.53 to 51.07 and 0.59 to 0.62 per cent, respectively. Similar findings related to cotton quality were reported by Solunke*et al.* (2010) and Uday*et al*. (2013).

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