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INFLUENCE OF GENOTYPE, CANOPY MANAGEMENT PRACTICES AND NUTRIENT MANAGEMENT ON FIBER QUALITY OF *BT* COTTON

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ABSTRACT

The experiment was laid out in split-split plot design with 16 treatment combination replicated thrice.A field experiment was conducted at Cotton Research Unit, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola during the season *kharif* 2021-2022 and *kharif* 2022-2023.Akola is situated in the Western Zone of Maharashtra at 20^{0}North latitude and 77° East longitude with an altitude of 307.42 m above mean sea level. Among the different genotype PDKV-JKL-116 recorded significantly higher UHML staple length (31.11 mm and 31.83), Uniformity ratio (84.83 and 84.20 %), micronaire value (4.17 and 4.14 10^{-6} g $inch^{-1}$), Bundle strength (30.25 and 30.13 g tex^{-1}) at 3.2 mm and Elongation (5.70 and 5.75 %) over PKV Hy-2. There is no significant effect of nutrient management and canopy management on fibre properties of cotton.

Key words: Bundle strength, canopy management, cotton genotype, elongation, fertigation, micronaire value, staple length, uniformity ratio.

Introduction

Cotton is an important cash crop in India. Cotton is an important fiber source for textile production and cotton contributes significantly to global textile production. Also, the oil obtained from cotton seeds is also a major source of edible oil and the cotton cake remaining after extracting oil from the seeds can be used as animal feed. The history of cotton cultivation is very ancient. Cotton is mainly grown in regions with warm climates. The quality of cotton fiber plays an important role in textile production. The staple length, strength, micronaire value, strength, fineness, uniformity and elongation of cotton all these fiber parameters have a great impact on the quality of cotton. Soil health, environmental conditions and some agronomic practices play an important role in improving the fiber quality of cotton. Also, by using cotton breeding and cotton biotechnology, we can select the right type of genotype with good fiber parameters. In this paper, we studied various fiber parameters and the factors affecting them. To understanding these fibre parameters is important for producing high quality textiles and ensuring sustainability in the cotton industry.

Materials and method

The field experiment was conducted during 2021-22 and 2022-23 at Dr. Panjabrao Deshmukh Krushi Vidypeeth, Akola (MH) on Effect of different genotype, canopy management practices and nutrient management on fiber quality of *Bt*cotton. The soil of experimental site was slightly saline in texture with pH (8.2), organic carbon (0.52%), electric conductivity (0.34 dSm^{-1}), Available nitrogen (170 kg ha^{-1}), Available phosphorus (19.18 kg ha^{-1}) and Available potassium (308 kg ha^{-1}) during two years of experiment (rabi 2021-22 and rabi 2022-23). The present experiment was laid out in split-split plot design with 16 treatment combination replicated thrice. The treatment detail was, in main plot (factor A) two cotton genotype is used i.e V_1-PKV Hy 2 and V_2- PDKV JKL 116, in Factor B, two nutrient doses was used i.e N_1

-100% Recommended dose of N and K ha^{-1} in four unequal splits and 125% Recommended dose of N and K ha^{-1} in four unequal splits. Application of 100% recommended dose of Phosphorus at the time of sowing. In sub plot four canopy management treatment is used namely, C_1- Control, C_2- Monopodia removal of at 60 DAS and detopping at 75-80 DAS, C_3- Monopodia removal at 60 DAS and spraying of mepiquat chloride 5% w/w at 75 DAS and C_4- Spraying of mepiquat chloride 5% w/w at 75 DAS.

Result and discussion

Fiber quality studies

The increase in the productivity alone could not benefit the cotton growers as quality of cotton fiber is primary concern for fetching higher price. The genetic makeup of the cotton plant regulates these fiber traits, but the growing conditions determine whether the quality of the fiber reaches the genetic potential. Mineral nutrition is one of the growing conditions that can affect fiber quality. The quality parameters of seed cotton are by and large heritable. However, environmental and crop management practices can influence the quality parameters to some extent.

HMUL staple length (mm)

The mean value of 2.5 % staple length as influenced by different treatments are presented in Table 1. The mean staple length of *Bt.* cotton was 29.63 and 30.21 mm during 2021-22 and 2022-23. The *Bt*cotton hybrid PDKV JKAL-116 numerically showed maximum staple length (31.11 and 31.83 mm) as compared to other genotype PKV Hy-2 (28.15 and 28.58) during both the year. Ban *et al.* (2015) obtained similar results with different genotypes. Treatments of various fertigation levels of N and K tried under study did not reach to the level of significance in affecting 2.5% staple length. Numerically higher 2.5 % staple length was recorded 29.81 and 30.40 mm at N_2 (125 per cent fertigation of RDNK ha^{-1} given in four splits) over N_1 (100 percent fertigation levels) (29.45 and 30.01 mm) during both years. The present result support the findings of Bhalerao *et al*. (2011), Reddy and Aruna (2010), Bhati and Manpreet Singh (2015) and Deepa and Aladakatti (2016). The staple length of cotton did not differ significantly due to different canopy management treatments. Span length (mm) was significantly highest 29.93 and 30.48 mm in C_2 (Monopodia removal at 60 DAS and detopping at 75-80 DAS) followed by C_3 (monopodia removal at 60 DAS and spraying of mepiquat chloride 5% w/w at 75 DAS) (29.89 and 30.46 mm). These results are corrugated with the findings of Hallikeri *et al.* (2010).

Uniformity ratio (%)

The cotton genotype PDKV JKAL-116 numerically showed maximum uniformity ratio (84.83 and 84.20%) as compared to other genotype PKV Hy-2 (82.67 and 82.33) during both years. It might be due to genetic makeup of genotype. Ban *et al.* (2015) obtained similar results with different genotypes. Effect of different fertigation levels had no significant effect. Each increment in fertigation of N and K numerically increased the values of uniformity ratio. The higher uniformity ratio was recorded (83.83 and 83.24%) at N_2 (125 per cent fertigation treatment) as compared to lower levels of fertigation (83.67 and 83.29%) *i.e* N_1 (100 per cent RDNK ha^{-1}). Kagde (2000) and Biwalkar *et al*. (2005) also reported the similar trend in respect of uniformity ratio.The uniformity ratio of *Bt*cotton did not differ significantly due to different canopy management practices. These results are corrugated with the findings of Hallikeri *et al.* (2010).

Micronaire value (10^{-6} g $inch^{-1}$)

The data pertaining to micronaire value as influenced by different fertigation treatments are presented in Table 1. Mean values of micronaire fineness were 4.13 and 4.10 g $inch^{-1}$ during both year of study. Among the fibre characters in cotton, fibre fineness (micronaire value) usually ranges from 2.6 to 5.6. The cotton genotype PKV Hy-2 and PDKV JKAL-116 did not exhibit any significant influence on micronaire value. But numerically highest value occurs in genotype PDKV-JKL-116 (4.17 and 4.14) during both year of study. In the present investigation, different levels of N and K given through fertigation and soil application did not exhibit any significant influence on micronaire value. The finer fibre was resulted in the N_1 (application of 100 per cent RDNK ha^{-1}) compared to other higher levels of fertilizer application *i.e* N_2 (125 % RDNK in four splits) during both year of study. Decrease in fibre fineness with increase in nitrogen levels was also observed by Sathyaprakash (2007), Patil *et al*. (2009), Reddy and Aruna (2010) also reported the finer fibre at lower levels of N and K given through fertigation in *B*t cotton. The micronaire value of *Bt*cotton did not differ significantly due to different canopy management practices. These results are corrugated with the findings of Hallikeri *et al.* (2010).

Bundle strength/Tenacity (g tex^{-1}) at 3.2 mm

The cotton genotype PDKV JKAL-116 had significantly highest tenacity 30.25 and 30.13 mm over PKV Hy-2 (27.76 and 27.51) during both year of study.Bundle strength did not differ significantly due to fertigation levels during both the years of study.

Table 1: Fibre properties (staple length, uniformity ratio, micronaire value, bundle strength and elongation) of cotton influenced by different fertigation levels and canopy management practices During 2021-22 and 2022-23.

Treatments	2021-22					2022-23				
	UHML staple length (mm)	Uniformity ratio (%)	Micronaire value (10^{-6} g inch^{-1})	Bundle strength (g tex^{-1}) at 3.2 mm	Elongation (%)	UHML staple length (mm)	Uniformity ratio (%)	Micronaire value (10^{-6} g inch^{-1})	Bundle strength (g tex^{-1}) at 3.2 mm	Elongation (%)
Varieties										
V1- PKV Hy 2	28.15	82.67	4.10	27.76	5.44	28.58	82.33	4.06	27.51	5.19
V2- PDKV JKAL 116	31.11	84.83	4.17	30.25	5.70	31.83	84.20	4.14	30.13	5.75
SE (m)±	0.20	0.09	0.03	0.16	0.02	0.14	0.14	0.03	0.31	0.09
CD at 5 %	0.69	0.32	NS	0.57	0.08	0.49	0.20	NS	1.06	0.31
Nutrient management										
N1- 100% RDNK in 4 splits	29.45	83.67	4.11	28.73	5.60	30.01	83.29	4.07	28.48	5.32
N2- 125% RDNK in 4 splits	29.81	83.83	4.15	29.29	5.54	30.40	83.24	4.13	29.17	5.62
SE (m) ±	0.20	0.09	0.03	0.16	0.02	0.14	0.14	0.03	0.31	0.09
CD at 5%	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Canopy management practices										
C1- Control	29.38	83.50	4.15	28.81	5.52	30.04	83.24	4.13	28.73	5.53
C2- Monopodia removal at 60 DAS and detopping at 75-80 days	29.93	83.83	4.09	29.20	5.53	30.48	83.35	4.05	29.03	5.59
C3- Monopodia removal at 60 DAS and spraying of mepiquat chloride 5% w/w at 75 DAS	29.89	83.50	4.18	29.33	5.59	30.46	83.82	4.14	29.17	5.48
C4- Spraying of mepiquat chloride 5% w/w at 75 DAS	29.31	84.17	4.11	28.68	5.64	29.84	83.66	4.08	28.35	5.27
SE (m) ±	0.20	0.27	0.06	0.19	0.05	0.21	0.25	0.06	0.34	0.11
CD at 5%	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Interaction (V X N X C)										
SE (m) ±	0.41	0.54	0.12	0.38	0.09	0.42	0.51	0.11	0.69	0.23
CD at 5%	NS	NS	0.35	NS	NS	NS	NS	NS	NS	NS
GM	29.63	83.75	4.13	29.01	5.57	30.21	83.27	4.10	28.80	5.47

Numerically higher values of bundle strength were observed in treatment 125 recommended dose of N and K kg ha^{-1} in four splits) (29.29 and 29.17) as compared to treatment 100% recommended dose of N and K in four splits (28.73 and 28.48) during 2021-22 and 2022-23. Biwalkar *et al*. (2005), Bandopadhyay *et al*., (2009), Bhalerao *et al*., (2011) and Gokila (2012) documented the absence of any relationship between fibre bundle strength and the fertigation levels.The bundle strength of *Bt*cotton did not differ significantly due to different canopy management practices. Similar results were reported by Hallikeri *et al.* (2010).

Elongation (%)

The data in respect of elongation percentage are presented in Table 1. The mean elongation per cent was (5.57 and 5.47) during both years. Fibre elongation is specified as a percentage of starting strength. The elastic elongation is of decisive importance, since textile products must be able to deform in order to withstand high loading but they must also return to shape. Higher elongation is neither necessary nor desirable for processing in spinning mill drawing operations. The genotype PDKV JKAL-116 showed the maximum elongation (5.70 and 5.75%) value as compared to other genotype PKV Hy-2 (5.44 and 5.19) during both years. In the present study, fibre elongation is not greatly influenced due to varying levels of fertigation significantly. Negative and linear relationship was observed between elongation percentage and fertilizers (N and K) levels. Lower level of recommended dose of N and K ha^{-1}fertigation recorded higher values of elongation percentage as compared to higher fertilizer dose given through fertigation. Significant reduction in elongation percentage beyond 100 per cent RDF was also reported by Halemani *et al*., (2004).The fibre

elongation of *Bt*cotton did not differ significantly due to different canopy management practices. Similar results were reported by Hallikeri *et al.* (2010).

Interaction

The interaction effect of different *Bt*cotton hybrids, fertigation levels and different canopy management practices were found to be nonsignificant with respect to all fibre parameter.

Conclusion

All fibre parameter like HMUL staple length, Uniformity ratio, Micronaire value, Bundle strength or Tenacity and Elongation were found significantly highest in cotton genotype PDKV-JKL-116 than PKV-Hy-2 and there is no significant effect of nutrient management and canopy management practices on fibre quality of cotton.

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