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Evaluation of Brown Coloured Cotton Genotypes by Genetic Studies (*Gossypium hirsutum* L.)

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A B S T R A C T

The present study was conducted on genetic variability, correlation coefficient analysis for seed cotton yield and its component traits in 18 brown coloured cotton genotypes collected from CICR, Nagpur, which was carried out during *kharif*2018 at the Main Agricultural Research Station, UAS, Raichur, Karnataka. Observations on traits *viz.*, plant height at harvest, number of sympodia, number of monopodia, sympodial length at ground level, sympodial length at 50% plant height, number of bolls per plant, lint index, boll weight, internodal distance, seed index, seed cotton yield per plant, ginning out turn, fibre length, fibre strength and micronaire were recorded. The results showed that highest GCV for number of monopoodia per plant and sympodial length at 50% plant height. Highest heritability was observed for number of sympodia, plant height, fibre length ginning out turn and seed index. Plant height at harvest, number of monopodia per plant, number of sympodia per plant, sympodial length at ground level, intermodal distance were positively correlated with seed cotton yield and the traits *viz.*, seed index and fibre length exhibited negative correlation.

Introduction

Cotton (*Gossypium hirsutum L.*) referred as "White gold" is a premier cash and fibre crop cotton, the world's most important non-food agricultural commodity used for textile purpose, is an important commercial crop grown all over the world which is mainly grown for its fibre. It is a soft, staple fibre that grows around the seed of cotton plant and some writers fabricated stories of lamb sitting inside the fruit. The lint colour of cotton under commercial cultivation is often white. In the cultivated species, brown and green colours are most common. Some of the genotypes in germplasm collection of USA

and Russian Republics are reported to have coloured lint with shades of pink, red, blue, green and also black. In recent years coloured cottons are receiving increasing importance in view of their eco-friendly character. The awareness about the toxicity and pollution caused by synthetic dyes have revived the interest in cultivation of organic cotton. The urge for eco-friendly cotton can only be fulfilled preferably by organically grown coloured cotton, dispensing harmful chemicals in dying and processing. The estimated total area under naturally coloured cotton is around 200 acres with a total production of 330 quintals. With the modernization of spinning industry and quality conscious consumers, there is an increased emphasis on the production of superior quality of cotton. Development of cotton varieties and hybrids having greater yield potential with acceptable fibre characteristics is the main objective of cotton breeders. Seed cotton yield, its components and fibre quality characters of a plant are heritable in nature and thus genetic improvement in all these characters through selection and breeding is possible. Correlation coefficient analysis measures the magnitude of relationship between various plant characters and determines the component character on which selection can be based for improvement in seed cotton yield and fibre quality. Hence, the present investigation was carried out to find the variability, heritability and nature of correlation among various characters, influence on seed cotton yield of *Gossypium hirsutum* L.

Materials and Methods

During *kharif*2018-2019, 18 hirsutum coloured cotton genotypes along with two checks SCS-793, BGDS-1063 were raised in the field at Main Agricultural Research Station, Raichur, Karnataka in augmented design with a spacing of 75x30 cm. Five plants were taken at random in each entry and data recorded on plant height at harvest, number of sympodia, number of monopodia, sympodial length at ground level, sympodial length at 50% plant height, number of bolls per plant, lint index, boll weight, internodal distance, seed index, ginning out turn, fibre length, fibre strength and micronaire. Observations of the above traits were recorded in each genotype and subjected to a statistical analysis by using windostat. The data was analysed for variability, heritability, genotypic component of variation, genetic advance and correlation.

Results and Discussion

In the table-1, highest GCV and PCV was recorded for number of monopodia per plant (54.31%), sympodial length at 50% plant height (30.82%) and moderate for number of bolls per plant (17.66%) similar was reported from (Ali *et al.,* 2010), lowest was observed for boll weight, fibre quality parameters, lint index and seed index it reveals a lowest genetic base for all the above mentioned traits. Heritability showed highest for number of sympodia (98.65%), sympodial length at 50% plant height (99.99%), seed cotton yield per plant (96.33%) and fibre length (91.88%). Heritability estimate is important because genotypic coefficient of variation doesn't give the idea of total variation heritable. Heritability and genetic advance estimation give an idea about relative amount of heritability and give an idea about the effectiveness with which selection can be practiced for genetic improvement of a particular character based on phenotypic performance. High heritability coupled with high genetic advance observed for plat height, sympodial length at ground level and seed cotton yield per plant. Genetic advance ranged from 0.4003 to 32.41for the traits *viz.*, lint index and plant height respectively.

Table.1 Estimation of variability parameters for yield, yield attributing and fibre quality traits in colour Cotton (*Gossypium hirsutum* L.) genotypes

Sl. NO.	Character	Mean	Range		Coefficient Variation		h^2 (%)	GA (%)	GAM (%)
			Minimum	Maximum	GCV (%)	PCV (%)			
1	Plant height (cm)	83.55	45.7	115.7	19.939	21.113	89.19	32.41	38.79
2	Number of monopodia per plant	1.09	0.0	2.7	54.31	73.99	53.88	0.8988	82.12
3	Number of sympodia per plant	11.03	5.7	16.8	19.37	19.50	98.65	4.37	39.64
4	Sym length at ground level (cm)	22.07	10	32.3	23.66	27.29	75.21	9.33	42.28
5	Sym length at 50% plant height (cm)	14.77	5.0	22.3	30.823	30.825	99.99	9.38	63.49
6	Inter nodal distance (cm)	4.58	3.0	6.0	13.36	15.39	75.38	1.09	23.89
7	Number of bolls/plant	14.52	4.0	25	17.66	33.58	27.67	2.78	19.14
8	Boll weight (g)	2.96	2.4	3.8	4.2	12.79	11.11	0.0869	2.9287
9	Upper Half Mean Length (mm)	27.46	26.1	29.5	4.03	4.206	91.88	2.18	7.96
10	Fibre strength (g/tex)	23.03	21.7	24.6	4.06	5.863	49.44	1.34	5.82
11	Micronaire (µg/inch)	4.22	3.7	4.9	8.325	9.578	75.55	0.6294	14.90
12	Ginning outturn (%)	32.22	26.7	36.3	8.409	8.422	99.7	5.57	17.29
13	Seed index (g)	8.82	8.2	10.1	6.052	7.681	81.24	1.47	19.43
14	Lint index	4.23	3.0	5.8	8.74	16.65	27.56	0.4003	9.45
15	Seed cotton yield per plant (g)	41.1	19	60	24.92	25.39	96.33	20.71	50.39

GCV - Genotypic coefficient of variance PCV - Phenotypic coefficient of variance h^2- Broad sense heritability
GA - Genetic advance GAM- Genetic advance as per cent of mean

Table.2 Phenotypic correlation among 15 yield, yield attributing and fibre quality traits in colour cotton genotypes

	PH	NM	NS	SLG	SLFPH	IND	NOB	BW	GOT	SI	LI	FL	MIC	FS	Y/PL
PH	**1.00**	0.62**	-0.08	0.15	0.15	0.45	0.52	0.02	0.18	-0.26	-0.02	-0.37	0.10	0.32	0.3909
NM		**1.00**	-0.07	-0.19	-0.32	-0.24	0.11	0.32	0.04	0.13	0.09	0.06	0.24	0.02	0.2386
NS			**1.00**	0.31	0.04	-0.007	0.40	-0.05	0.01	0.14	0.06	0.46	0.19	-0.10	0.2913
SLG				**1.00**	0.88***	0.70**	0.72***	-0.09	-0.14	-0.24	-0.24	-0.39	0.26	0.58*	0.052
SLFPH					**1.00**	0.78***	0.58*	-0.05	0.01	-0.21	-0.10	-0.41	-0.00	0.56*	-0.0254
IND						**1.00**	0.59**	-0.15	0.02	-0.55*	-0.28	-0.63**	0.10	0.69**	0.0571
NOB							**1.00**	-0.03	0.17	0.27	-0.04	-0.33	0.17	0.47	0.2556
BW								**1.00**	0.05	0.11	0.08	-0.14	-0.14	-0.13	0.4245
GOT									**1.00**	0.15	0.82***	0.14	-0.02	-0.08	-0.0069
SI										**1.00**	0.67**	0.56*	0.03	-0.33	-0.0996
LI											**1.00**	0.41	0.03	-0.24	-0.1171
FL												**1.00**	0.02	-0.56*	-0.0834
MIC													**1.00**	0.24	-0.1668
FS														**1.00**	0.0423

* Significant at 5% (p = 0.05) ** Significant at 1% (p = 0.01)

PH- Plant height (cm) NM- Number of monopodia NS- Number of sympodia SLG- Sympodial length at ground level (cm)
SLFPH- Sympodial length at 50% plant height (cm) IND- Inter nodal length(cm) NOB- Number of bolls per plant BW- Boll weight (g) FL- Upper half mean length (mm) FS- Fibre strength (g/tex) MIC- Micronaire (µg/inch) GOT- Ginning outturn (%)

SI- Seed index (g) LI- Lint index (g) Y/PL- Seed cotton yield per plant (g)

Figure.1 Phenotypic & genotypic coefficient of variability parameters for yield and fibre quality traits for colour cotton

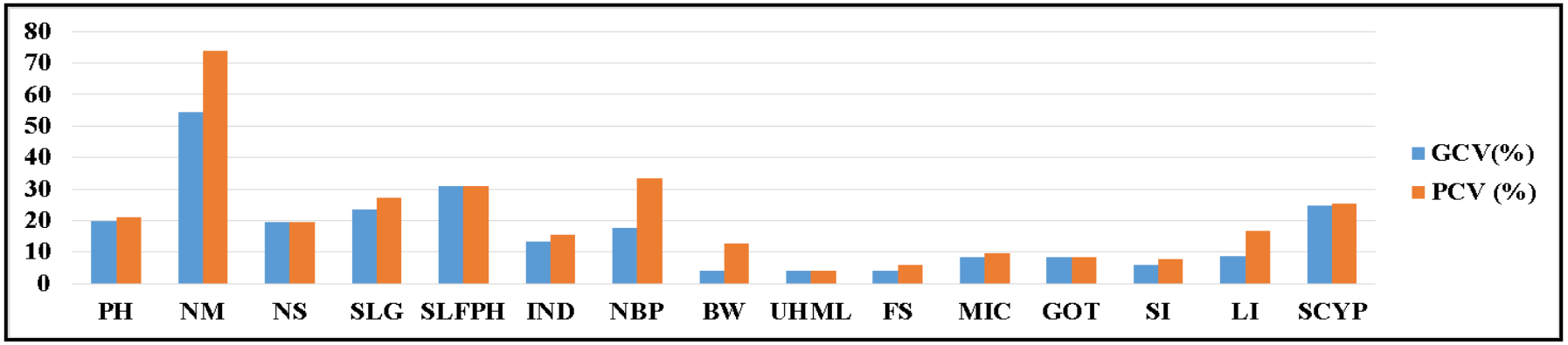
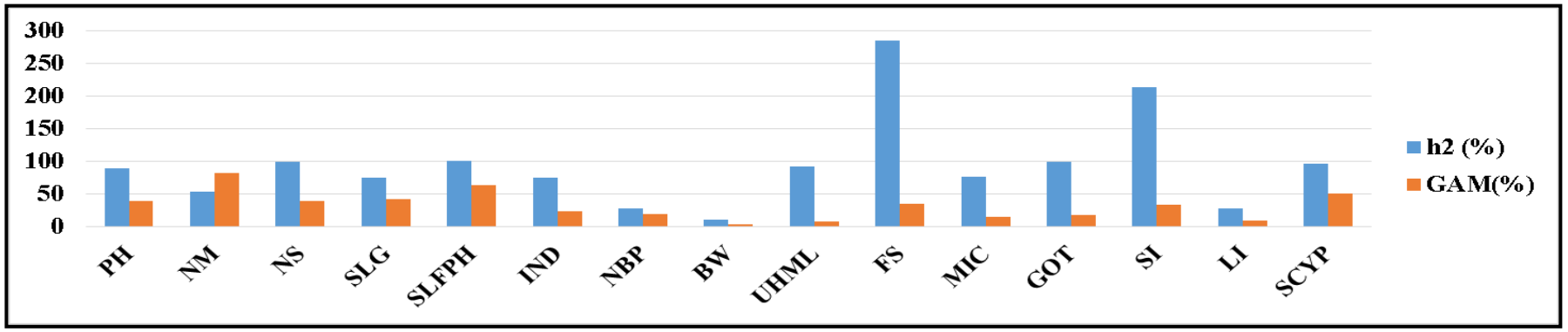
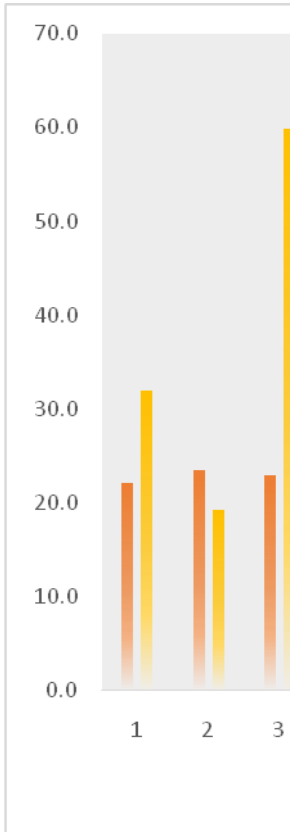


Figure.2 Heritability and genetic advance as percent of mean for yield attributing and fibre quality traits for colour cotton



PH- Plant height (cm), NM- Number of monopodia per plant NS- Number of sympodia per plant, SLG- Sympodial length at ground level (cm)
SLFPH- Sympodial length at 50% plant height (cm) IND- Inter nodal distance (cm) NBP- Number of bolls/plant, BW- Boll weight (g),
UHML- Upper Half Mean Length (mm), FS- Fibre strength (g/tex) MIC- Micronaire (µg/inch), GOT- Ginning outturn (%)
SI- Seed index (g), LI- Lint index, SCYP- Seed cotton yield per plant (g)

Figure.3 fs – fibre strength (g/tex)y/pl – yield per plant (g)



In the fig-1 highest GCV and PCV was recorded for number of monopodia per plant (54.31%), sympodial length at 50% plant height (30.82%) and the trait seed cotton yield per plant shown there is no difference between the GCV & PCV, this given an anticipated result to next generations. In fig-2 heritability shown highest for number of sympodia (98.65%), sympodial length at 50% plant height (99.99%), seed cotton yield per plant (96.33%) and fibre length (91.88%). Fibre length and seed cotton yield per plant were important in the breeding of a cotton plant both in the terms of qualitative and quantitative manner. Genetic advance percent mean ranged from fibre strength to number of monopodia are 5.82% and 82.12% respectively. Fibre strength is low in colour cotton in comparison with white cotton genotypes and to indulge this trait in colour cotton is an important breeding aspect in colour cotton breeding. Even-though it shown higher heritability (49.44%) but its genetic advance is very less (1.34%). In the table-2, positive correlation was observed by plant height, number of monopodia (Ranjan *et al.*, 2014) number of sympodia, intermodal distance, boll weight and bolls per plant on yield and positively correlated with seed cotton yield (Khan *et al.*, 2009). Among all the traits, boll weight (0.4245), plant height (0.3909) and number of sympodia (0.2913) shown highest positive correlation towards yield improvement. Fibre strength (0.0423) contribution towards yield component was very less. Lint index (-0.1171) shown highest negative correlation and traits *viz.*, sympodial length at 50% plant height, ginning out turn (Shao *et al.*, 2016), seed index, fibre length and micronaire similar finding was reported by (Pujer *et al.*, 2014). Plant height significantly correlated with number of monopodia and its contribution towards yield is also higher, simultaneous improvement of both of these traits to rise the yield and similar results are reported from (Abbas *et al.*, 2013). Positive correlations among independent variables to the dependent variable it bring light to improve cotton yield and quality. In the fig-3, out of 18 brown coloured genotypes genotypes *viz.*, 10 and 11 shown highest fibre strength 24.4 g/tex, 24.6 g/tex respectively. Genotypes like 2, 8, 9 and 16 shown more than 23.0g/tex. Even-though genotype -2 shown lesser yield but it possess higher fibre strength compared to the other high yielders. Coloured cotton genotypes are normally soft in texture and they possess lesser fibre strength, selection of 10 and 11 genotypes to next generation gives promising results towards the fibre strength and it is one of the most important qualitative trait in the cotton breeding.

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