



Cotton Germplasm Screening for Qualitative Nutrient Source

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Abstract : *Gossypium hirsutum* (upland cotton) is the world's leading fiber crop and one of the most important oilseed and proteinaceous crops. The main goals of cotton genetic enhancement have been fiber yield and quality. However, there is an increased interest and demand for enhanced cottonseed traits, including protein and oil content and lower gossypol for broad food, feed and biofuel applications. As a byproduct of cotton production, cottonseed is an important source of edible oil in many countries and could also be a vital source of protein for human consumption. The focus of cotton breeding on high yield and better fiber quality has significantly reduced the natural genetic variation available for effective cottonseed quality improvement within Upland cotton. However, genetic variation in cottonseed oil, protein and gossypol content exists within the genus of *Gossypium* and cultivated cotton. Genetic engineering in cotton has achieved considerable progress in altering the relative levels of protein, oil, and gossypol composition in cottonseed for enhanced nutritional value and expanded industrial applications. The objective of this study was to screen the cotton varieties for cottonseed oil, protein, and gossypol content, and a significant difference between many varieties was recorded for the aforementioned traits.

Keywords: Gossypol, Mono gastric animals, Oilseed, Protein, Ruminants

Cotton is a major crop in the world (Yu *et al.*, 2012). A cotton plant produces about 1.6 kg of seed for every kg of lint. After ginning the seeds are either used as animal feed or processed for production of oil, hull, meal and short linter fibers (O'Brien *et al.* 2005). Cottonseed a major source of protein and edible oil is considered a nutritious source of energy for animal feed and human food products (Liu *et al.*, 2009). Owing to its high content of oil and protein in seed (about 17-27 per cent oil and 12- 32 per cent protein) (Dowd *et al.*, 2010; Yu *et al.*, 2012), cotton is the fifth largest oil crop and the second largest potential source of plant protein in the world. However, cotton seed contains a hepatotoxic terpenoid called gossypol which renders cotton seed unsafe for mono-gastric animals and human beings. Cotton seed and its by products are mostly used to feed adult ruminants, because of their relative tolerance to gossypol. It can be a good source of nutrients for mono gastric animals provided that the content of gossypol is taken into account (Chiba 2001). The present study was designed to screen the advanced

genotypes in terms of seed quality for higher amount of oil and protein and lesser quantity of gossypol.

Seeds of forty three *Gossypium hirsutum* genotypes received in AICCIP trials, conducted during 2013-2014 at Cotton Research Area, Cotton Section, Department of Genetics and Plant Breeding, CCS Haryana Agricultural University, Hisar, were used for this study. The seed samples were oven dried to reduce the moisture level to meet the accuracy of the results. Ten gram whole cotton seed were ground to powder by using coarse grinding and then defatted for further analysis. Protein content was determined by Micro-kejdahl method of AOAC (1970). The oil content was estimated by the method of AOAC (1970) using solvent extractor system (SOCS PLUS SCS 08AS DLS, PELICAN). In this method, extraction of oil was done using non polar solvent petroleum benzene (40-60°C). The gossypol was estimated by using phloroglucinol reagent (Bell, 1967). The samples were analysed in triplicates. The data was statistically analyzed in CRD design with the help

Table 1. Protein, oil and gossypol contents in seeds of different cotton genotypes

Sr. No.	Genotype	Protein (%)	Oil (%)	Gossypol (%)
1	ARBH-1301	21.68	17.95	0.44
2	ARBH-1302	21.18	18.3	0.25
3	Bihani 301	17.81	18.9	0.28
4	BPPI-537	22.52	15.65	0.71
5	BS 1	25.04	18.25	0.21
6	BS 51-1	18.32	13.8	0.7
7	CCH 13-1	22.52	17.6	0.61
8	CCH 13-2	21.51	15.1	0.35
9	CNH 19	21.34	18.5	0.2
10	CNH 1116	21.84	12.8	0.24
11	CPD-1301	20	13.75	0.18
12	CPD-1302	24.72	21.05	0.45
13	CSH-2931	21.18	21.05	0.6
14	CSH-3175	19.83	16.15	0.33
15	F 2164	19.5	16.8	0.5
16	F 2451	21.01	21.2	0.52
17	F 2454	21.68	16.2	0.52
18	GJHV-511	20.17	17.7	0.38
19	GJHV-516	23.55	14.25	0.2
20	GSHV-164	21.18	15.8	0.27
21	GSHV-169	22.19	16.45	0.51
22	H 1098 i	20.17	14.7	0.57
23	H 1300	18.82	23.85	0.35
24	H 1476	19.83	18.8	0.33
25	HS 292	22.19	17	0.52
26	HS 293	18.49	16.9	0.53
27	KH-1301	20	20.95	0.2
28	L-1011	20.73	22.3	0.19
29	L-804	22.68	22.55	0.19
20	LH 2255	24.71	17.05	0.46
31	LH 2307	22.35	16.15	0.55
32	NDLH 1975	19.66	18.2	0.34
33	NDLH 1976	22.19	17.5	0.54
34	P 5629	18.66	19.15	0.59
35	RS 2728	24.03	16.15	0.19
36	RS 2733	24.71	19	0.69
37	SCS 1210	21.85	17.1	0.57
38	SCS 1211	22.18	20.95	0.48
39	SCS 1213	20.5	18.9	0.57
40	SCS 1214	22.35	20.8	0.68
41	TCH 1742	21.34	16.55	0.28
42	TCH 1777	15.32	21.8	0.49
43	TSH 04/115	21.76	18.95	0.57
Mean		21.24	17.97	0.43
C.D.		3.11	3.27	0.01
SE(m)		1.09	1.14	0.01
SE(d)		1.54	1.61	0.01
C.V.		7.24	8.98	1.69

of on line statistical programme OPSTAT of CCS HAU, Hisar.

Forty three genotypes of cotton were studied for their nutritional quality characteristics. Results on protein, oil and

gossypol contents in cotton seeds of different genotypes are presented in Table 1. The protein, oil and gossypol content ranged from 15.32 to 25.04, 12.80 to 23.85 and 0.18 to 0.71 per cent, respectively. Further, the gossypol concentration

is also influenced by method of oil extraction from cotton seed. Low gossypol content (0.08 %) in cotton seed was reported by Renuka *et al.*, (2005). Mean protein, oil and gossypol contents of the genotypes tested during the present investigation were 21.24, 17.97 and 0.43 %, respectively. Highest protein content (25.04%) was recorded in BS 1. However, the genotypes CPD-1302, RS 2733 and LH 2255 were *at par* with the genotype BS 1. The highest oil content (23.85%) was found in H 1300 (Zonal Check) and L-804. The genotype L-1011 was found *at par* with entry L 804 for their oil content. The anti-nutrient factor gossypol content was lowest in entry CPD-1301. However, the highest gossypol was present in BPHI 537. The gossypol content present in genotypes BS 51-1, RS 2733, SCS 1214 and CCH 13-1 was *at par* with highest gossypol containing entry BPHI 537. Gossypol content of the genotype CPD 1301 (0.18%) was the least among the tested genotypes. Three genotypes *viz.*, RS 2728, L1011 and ARBH 1301 besides having nutritionally sufficient contents of protein (20 %) and oil (15 %) showed low content of gossypol (0.19 %). These genotypes can be exploited further as a good source of nutrients for the ruminants.

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