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VARIATION AMONG PLANTS FOR SEED-OIL AND LINT CHARACTERISTICS OF COTTON (*GOSSYPIUM HIRSUTUM* L.)

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ABSTRACT

Variation between plants was analysed in 3 cultivars for 7 attributes relating to oil and lint productivity. Variation among plants for fibre length, number of seeds per boll, lint per seed, seed index, and seed-oil index was highly significant. Variation for lint per seed, seed index, and seed-oil index tended to be relatively higher in the oil cultivars.

Key words: Oil content, interplant variation, *Gossypium hirsutum*.

In the absence of any conscious selection for seed quality components in the past, the levels of oil and protein in seeds of present cultivars of cotton have remained largely unchanged over decades [1]. Differences existing among cotton cultivars for seed-oil and protein content are considered natural consequences of unselected characters, which can be improved through selection [2]. Variation between plants has been shown to exert sizeable influence on oil quality and quantity in some oilseed crops [3]. Adequate information on this aspect is not available in cotton. An attempt was made to assess the patterns of interplant variation in 3 cultivated varieties of *Gossypium hirsutum*, considering 7 attributes related to oil and lint productivity. The results are presented in this paper.

MATERIALS AND METHODS

L-147, B-1007, and SRT-1 are contemporary cultivars of Central Zone of cotton, with comparable levels of yield and maturity duration (200–210 days). They were grown at Nagpur (21° 26′ N and 79° 49′ E) in Central India. Boll samples were drawn from twenty plants within each cultivar. A sample of 3 mature bolls was picked from upper, middle, and lower fruiting branches in each plant. Data were recorded from each boll individually and average values of 3 bolls from each position were used for analysis. Three seeds from each selected boll were used for estimation of halo length. Each seed was combed gently into a halo with the help of a seed comb and measured by a halo disc by the method suggested by Iyyengar [4]. Bolls were ginned with a hand-operated gin. Seeds were counted after delinting

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with commercial grade sulfuric acid. Seed weight was recorded and seed index expressed as weight in mg per seed. Difference between fuzzy and delinted seed weight was expressed as fuzz (linters) percentage. Oil was determined on a wide-line Newport Nuclear Magnetic Resonance Analyser, using delinted seeds, with a 2-ml sample assembly. Seed oil index giving weight of oil per seed was derived by the formula:

$$\frac{\text{Seed index} \times \text{Oil \%}}{100}$$

Following Mosjidis and Yermanos [3], the measurements were analysed as randomised complete blocks using plants as blocks and positions within plant as treatments. Blocks were used to indicate among plant variation.

RESULTS AND DISCUSSION

Maximum estimates of halo length, weight of lint per seed, seed index, and seed-oil index were characteristic of the bolls on the lower branches (Table 1). Maximum estimates of number of seeds per boll, fuzz percentage, and oil percentage, in contrast, were confined mostly to bolls from the upper plant positions. Between plants differences were highly significant for most attributes. In L-147 and in B-1007, which are relatively older cultivars, variation between plants for lint per seed, seed index, and seed-oil index tended to be higher, suggesting greater heterogeneity due to unselected propagation of the cultivars over years.

Table 1. Range, plant position, means and mean squares in cotton

Cultivar & parameter	Halo length (mm)	Seeds per boll	Fuzz (%)	Lint (mg/seed)	Seed index (mg/seed)	Oil (%)	Oil index (mg/seed)
L-147:							
Range	18.8–30.3	20.3–36.7	4.7–15.9	29.3–76.5	46.3–123.5	17.0–25.1	9.1–30.2
Average (upper)	22.84	29.73	8.58	52.03	85.94	22.49	19.36
Average (central)	23.76	29.33	9.44	50.21	88.26	22.53	20.00
Average (lower)	25.01	26.35	9.30	49.43	86.18	20.82	18.04
Between plants MS	20.95**	26.38**	8.36**	496.24**	721.34**	8.25**	49.19**
SE	0.44	0.56	0.38	0.98	2.03	0.31	0.58
B-1007:							
Range	19.7–28.3	16.3–35.3	6.3–13.5	38.1–76.9	48.6–128.1	12.6–26.0	7.8–29.8
Average (upper)	26.78	28.08	10.43	54.59	85.20	21.94	18.75
Average (central)	26.25	28.28	10.41	50.89	90.05	21.81	19.89
Average (lower)	26.78	25.43	9.79	53.08	92.50	21.61	21.22
Between plants MS	10.07**	22.72**	5.80	171.30**	671.54**	8.64	39.41**
SE	0.35	0.68	0.44	1.80	3.70	0.58	0.90
SRT-1:							
Range	19.0–26.7	17.0–29.0	6.0–13.5	38.1–76.9	49.4–110.4	13.4–24.3	9.6–22.2
Average (upper)	21.28	24.32	10.04	52.45	70.77	21.19	15.04
Average (central)	23.52	24.20	9.05	54.46	75.34	20.60	15.58
Average (lower)	25.15	24.47	9.15	56.22	80.09	20.02	16.43
Between plants MS	10.68**	14.61*	4.81*	105.68*	274.50**	12.58**	25.20**
SE	0.48	0.56	0.33	1.57	1.47	0.36	0.50

*, **Significant at 5% and 1% levels, respectively.

Bolls from different nodes on the same sympodial branch differ in time of flowering. Since sampling of bolls was based on plant positions rather than age, the patterns of variation observed between positions would mainly be due to differences in flowering time. Lower averages of lint per seed and seed index were similar to those reported in cotton by Turner et al. [5]. Verhalen et al. [6] observed a decrease in fibre length as the season advanced. Meredith and Bridge [7] noticed that while lint percentage was lowest in early harvests, seed index values decreased in later harvests. Turner et al. [8] obtained higher number of seeds/boll towards the end of season. Seeds from bolls set in the earlier part of the season generally show decline in quality [2]. Higher oil content in the seed can, therefore, be associated with initial harvests [9, 10]. Despite relatively lower percentages of oil, higher values of oil index in 2 out of 3 cultivars seemed consistent with bolls formed on lower and central plant positions. Kohel and Cherry [9] concluded that the use of oil content alone to characterise cottonseed composition could lead to erroneous conclusions.

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