

FLORAL CHARACTERISTICS IN *Gossypium hirsutum* AND *G. barbadense* COTTON

D. KRISHNADOSS AND M. KADAMBAVANASUNDARAM

Agricultural Research Station
Tamil Nadu Agricultural University
Kovilpatti 627 701

ABSTRACT

Flower characters viz., length of ovary, style, stigma and pistil, number of ovules and anthers and diameter of pollen in *Gossypium hirsutum* and *G. barbadense* cotton were studied. The range of variability was found to be more for pollen diameter in *G. hirsutum* and for number of anthers in *G. barbadense* while it was low for length of ovary in both the species. The length of ovary and length of stigma were more or less same in both the species. The value for length of style, length of pistil, number of anthers and pollen diameter were greater in *G. barbadense* than in *G. hirsutum*. Numbers of ovules were more in *G. hirsutum* cotton.

KEY WORDS: Cotton, Floral Characteristics

In cotton breeding programme involving intensive hybridization between types or species, study of variability on length of ovary, style, stigma and pistil, number of ovules and anthers and diameter of the pollen will be essential in planning the hybridisation programme. However, no previous study combining all these floral characteristics is available.

A detailed study on these aspects in *Gossypium hirsutum* and *G. barbadense* species of cotton, their intraspecific hybrids and interspecific hybrids may throw light on hybridisation, pollination, fertilisation and seed setting. Therefore a study on this aspect was taken up for the benefit of cotton breeders engaged in crop improvement work in tetraploid cotton.

MATERIALS AND METHODS

Ten varieties each in *G. hirsutum* and *G. barbadense* species from different geographical origin have been selected from the germplasm bank and raised at the Cotton Breeding Station, School of Genetics, Tamil Nadu Agricultural University, Coimbatore during 1989 for the study. The varieties selected for the study are listed in Table 1.

Just opened flowers in the morning were collected for recording observations. Totally, 15 flowers were examined in each variety and the data on length of ovary, style, stigma and pistil, number of anthers and ovules and diameter of pollen were recorded. From the data collected, mean, variance,

standard deviation, standard error and coefficient of variability for the different characters were estimated.

RESULTS AND DISCUSSION

The results of variability studies on length of ovary style, stigma and pistil, number of anthers and ovules and diameter of the pollen for the 10

Table 1. Varieties selected for the study of flower characters

<i>G. hirsutum</i> species	
Variety	Origin
Laxmi	Karnataka
Raba - B-50	Africa
Big Boll Triump	U.S.A.
Hancock	U.S.A.
SRT.1	Gujarat
Khandwa - 2	Madhya Pradesh
Empire	Australia
Bobdel	Australia
MCU.9	Tamil Nadu
LRA. 5166	Tamil Nadu
<i>G. barbadense</i> species	
Varieties	Origin
Egyptian - 1	Egypt
Giza - 7	Egypt
TCB. 123	Tamil Nadu
SB. 289 - E	Tamil Nadu
SB. 1085 - 6	Tamil Nadu
Sudan - G-45	Sudan
Allepo	Syria
Barbadas	West Indies
Suvin	Tamil Nadu
TNB.1	Tamil Nadu

Table 2. Variability for flower characters in *G. hirsutum* species

Characteristics	Range	Mean	Variance	S.D.	S.E.	C.V%
Length of ovary (cm)	0.70 to 0.90	0.78	0.0041	0.06	0.02	8.21
Length of style (cm)	1.00 to 1.20	1.12	0.0054	0.07	0.02	6.56
Length of stigma (cm)	0.70 to 1.00	0.85	0.0075	0.09	0.02	10.19
Length of pistil (cm)	2.40 to 3.00	2.75	0.0304	0.17	0.05	6.34
Diameter of pollen (μ)	96.60 to 104.00	99.86	4.0446	2.01	0.52	2.01
No. of anthers/flower	83.50 to 91.60	88.03	3.8544	1.96	0.51	2.23
No. of ovules/flower	28.40 to 35.20	31.15	2.2746	1.51	0.39	4.84

varieties each in *G. hirsutum* and *G. barbadense* species are presented in Table 2 and 3 respectively.

Length of ovary and length of stigma were found to be almost equal in both the species. Length of stigma was found to range from 0.70 to 1.00 cm (mean = 0.85 cm) in *G. hirsutum* and 0.60 to 1.10 cm (mean-0.88cm) in *G. barbadense* in the present study. Prasad (1923) studied the length of stigma in *G. arboreum* Egyptian and American cottons and found it to range from 18/64 to 40/64 inch (equal to 0.70 cm to 1.56cm.) He also reported a strong positive inter relationship between length of stigma and length of fibre in cotton. Neelakantan and Palaniappan (1958) measured the length of stigma from the top of the stigma to the top of the anther dome in *G. arboreum* cotton while in the present study, the distance from the upper end of the staminal column to the top of the stigma was measured as length of stigma. In *G. barbadense*, the mean length of style and pistil were found to be more i.e. they were 1.85 cm and 3.56cm respectively when compared to *G. hirsutum* where in the mean length of style and pistil were 1.12 cm respectively and 2.75 cm (Tables 2, 3).

The diameter of the pollen was found to range from 96.60 to 104.00 micron (mean=99.86 micron) in *G. hirsutum* species while the range was greater in *G. barbadense* species from 114.00 to 119.40 micron. (mean-114.98 micron) Variance was found to be more for this character in *G. hirsutum*.

Tables 2, 3) The present study falls in line with the previous study by Narayanan (1972) that the shape of cotton pollen grain is spherical and spiny with numerous point of emergence has already been reported by Baneriji (1929).

The mean number of anthers per flower was more in *G. barbadense* than in *G. hirsutum* while the mean number of ovules per flower was found to be greater in *G. hirsutum* than in *G. barbadense*. Among the different floral characters studied, variance was more for number of anthers in *G. barbadense* and it was more for pollen diameter in *G. hirsutum* (Tables 2,3). In contrast to this, Shroff *et al.*, (1982) recorded the number of anthers per flower as 120.50, 77.50 and 120.70 in *G. hirsutum* A line, B line and R line respectively and 113.70 to 119.50 in *G. barbadense* R line while it was 104.96 in *G. hirsutum* (Singh, 1987) With regard to number of ovules per ovary, it was from 31.6 to 43.1 (Turner *et al.*, 1977) and 35.14 (Singh, 1987) in *G. hirsutum* and it was 31.14 in *G. hirsutum* in the present study. It is interesting to note that in *G. hirsutum* cotton, the ovule-seed ratio was 81.8 to 94.4 per cent (Turner *et al.* 1977) and 82.79 per cent (Singh, 1987)

Among the two tetraploid cottons, *G. hirsutum* species is noted for its high yield of seed cotton, lint and seed when compared to *G. barbadense* species. The number of ovules per ovary are markedly greater (31.15) in *G. hirsutum* cotton than

Table 3. Variability for flower characters in *G. barbadense* species

Characteristics	Range	Mean	Variance	S.D.	S.E.	C.V%
Length of ovary (cm)	0.80 to 0.90	0.83	0.0015	0.04	0.01	4.66
Length of style (cm)	1.50 to 2.10	1.85	0.0275	0.17	0.04	8.96
Length of stigma (cm)	0.60 to 1.10	0.88	0.0111	0.11	0.03	11.98
Length of pistil (cm)	3.20 to 3.80	3.56	0.0231	0.15	0.04	4.27
Diameter of pollen (μ)	114.00 to 119.40	14.90	1.6300	1.28	0.33	1.11
No. of anthers/flower	85.50 to 105.90	92.69	25.0349	5.00	1.29	5.40
No. of ovules/flower	17.20 to 29.50	23.65	13.8918	3.73	0.96	15.63

in *G. barbadense* cotton (23.85) which may be a reason for high yield in *G. hirsutum* cotton because ovules will ultimately develop into seed and lint.

REFERENCES

- BANERJEE, I. (1929) Studies in cotton pollen. *Agric. J. India* 24: 332-340
- NARAYANAN, S.S. (1972) Cytogenetical investigations on amphiploids and derivatives of *Gossypium anomalum* W & P and cultivated species of cotton. M.Sc (Ag) Thesis, Tamil Nadu Agricultural University, Coimbatore.
- NEELAKANTAN, L. and PALANIAPPAN, K.K. (1958) Variation in the degree of exertion of stigma in arboreum cottons. *Ind. Cott. Gr. Rev.* 12: : 376
- PRASAD, R. (1923) Note of the probability of an interrelation between the length of the stigma and that of the fibre in some forms of the genus *Gossypium* *Agric. Res. Inst., Pusa Bull.*, 137:1-7
- SHROFF, V.N. DUBEY, S., RAJESH JULKA and PARMER, S.L. (1982) Effect on cytoplasmic and cytoplasmic nuclear interaction on petal size and anther numbers in cotton. *J. Indian Soc. Cott. Improv.*, 7:4-7
- SINGH, V.V. (1987) Note on reproductive potential in *Gossypium hirsutum* Linn and *G. herbaceum* Linn. *J. Indian Soc. Cott. Improv.*, 12: 142-143.
- TURNER, J.H. STEWART J.M. HOSKINSOW, P.E. and RAMEY, H.H. (1977) Seed setting efficiency in eight cultivars of upland cotton. *Crop Sci.*, 17: 769-772.

(Received : December 1994 Revised February 1995)

Madras Agric. J., 83(2): 84-87 February 1996

ALLELOPATHIC SIGNIFICANCE OF SIX AGROFORESTRY TREES ON *Casuarina equisetifolia* GROWTH AND NODULATION

A. BALASUBRAMANIAN AND V.K. RAVICHANDRAN

Forest College and Research Institute
Tamil Nadu Agricultural University
Mettupalayam 641 301

ABSTRACT

Allelopathic influence of six agroforestry tree species viz., *Eucalyptus tereticornis*, *Leucaena leucocephala*, *Ailanthus excelsa*, *Gliricidia sepium*, *Acacia nilotica* and *Tectona grandis* were tested. The leaf extract of six trees were used for germination test with *Casuarina equisetifolia* and the effect was measured in terms of germination, root and shoot length, dry matter production and vigour index. In another experiment different concentrations of the above mentioned tree leaves were prepared by mixing them with pot mixture at the leaf: pot mixture ratio of 1:2, 1:1 and 2:1 and is utilised as a medium for *C. equisetifolia* seedling growth. The result of both experiments explained highest deleterious effect of *E. tereticornis* and *L. leucocephala* on *C. equisetifolia* germination and nodulation. Moderate effect was found in *A. excelsa* and *Acacia nilotica*. However less depressed effect was exerted by *G. sepium*. Among the different leaf concentrations, 1:2 and 1:1 were suitable for *C. equisetifolia* seedling growth.

KEY WORDS: Allelopathy, Forestry Trees, *Casuarina equisetifolia*

Accumulated tree litters under tree farming mostly favour soil nutrient enrichment through effective nutrient cycling. But it also has the ill effect of lethalising other annual and perennial crops: allelopathy, which is defined as a chemical warfare between plants in the field (Putnam, 1983). Allelopathic effects have been exhibited by many species of perennial (Stachon and Zindahl, 1978) and annual crop plants (Rice, 1978). In field it is released by decomposition (Parker, 1962) or leaching by water from plant canopy and finally inhibits crop growth and yield (Elliot *et al.*, 1978). Though large volume of evidence are available for agricultural crops, little is known for tree allelopathy (Malkania, 1987). The present study

investigates allelopathic influence on casuarina growth and nodulation caused by six multipurpose tree species.

MATERIALS AND METHODS

Six tree species: *E. tereticornis*, *L. leucocephala*, *A. excelsa*, *G. sepium*, *Acacia nilotica* and *T. grandis* were examined for their allelopathic effect on *Casuarina equisetifolia* germination, growth and nodulation. Matured leaves of each tree species collected from the Tamil Nadu Agricultural University campus Coimbatore were used for the study.