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HETERANTHERY IN FOUR TREE SPECIES OF CASSIA

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ABSTRACT

Floral morphology, mode of anther dehiscence and percentage of pollen viability in four *Cassia* species, sensu lato, i.e. *C. fistula*, *C. siamea*, *C. renigera* and *C. javanica* has been analyzed. These species exhibit diversity in the size of stamens, mode of anther dehiscence and percentage of pollen viability. There are three types of anthers large, medium and small designated as A, B and C type respectively. These dehisce by longitudinal slit, basal or an apical pore. Pollen grains in all the three types of anthers are viable. Staminodes are absent.

INTRODUCTION

Of all the floral organs though stamens exhibit a wide range of diversity, it is perhaps least frequently considered in morphological and systematic studies. Stamen dimorphism, a phenomenon termed heteranthery, is noted in the *Cassia* species of the family Caesalpiniaceae. There are about 28 species of *Cassia* represented in India (Upadhyaya & Singh, 1990). Banerjee *et al.* (2002) have included it under the tree legumes. Tucker (1992, 1996) has summarized the mode of floral development and range of diversity of stamens in legumes. Generally these species have 10 stamens, all antheriferous and of unequal size. The present paper deals with comparative morphology, mode of anther dehiscence and pollen viability in four species of *Cassia*. A similar type of study has been

conducted in 3 other *Cassia* species (Chauhan *et al.*, 2003).

MATERIAL AND METHODS

The present investigation was carried out on four *Cassia* species namely, *C. fistula*, *C. siamea*, *C. javanica* and *C. renigera* growing in different parts of Vadodara in Gujarat. Floral morphology and the mode of the anther dehiscence have been determined. Pollen viability was checked by using acetocarmine (Janssen & Hermsen, 1976). All the four species of *Cassia* comprise of 10 stamens, 3 lowest the longest with very long curved filaments, 4 laterals with slightly curved, medium-sized filaments and remaining 3 with small filaments (Fig. 1a, c, e, and g). For

convenience the anthers have been categorized into three types, large filamented anther 'A', medium filamented anther 'B' and small filamented anther 'C'.

RESULTS AND DISCUSSION

Cassia fistula, a deciduous tree of 8-15 m height flowers during March-July. The bright yellow to golden flowers are arranged in a lax, pendent, simple or branched raceme. The anthers, A type are 0.5 cm, anthers B of 4 cm and anther C of 0.2 cm (Table 1). The anthers A and C dehisce by longitudinal slit and anthers B dehisce by means of a pore at the base of the anther lobes close to the connective (Fig. 1b). Pollens from anthers A and C show 90-98% viability and the pollen from anther B showed only 10% viability. Size of the pollen grains is 21 μ m.

C. renigera, a tree of 7-11 m height, flowering during April-August, has dark pink colored flowers which turn yellow-orange when old. The flowers have ten stamens: 3 large, 4 medium and 3 small. Anther filam-

ents in *C. renigera* are pink in colour and swollen in the middle. Anthers of A type and B type are 0.4 cm in length and C type are 1 cm in length. Anthers of A and C type splits longitudinally whereas anthers of B type dehisce by means of basal pore (Fig. 1d). Pollen viability in anthers A and C ranges from 83-87% while that of pollen grains in B type is only 19%.

Cassia siamea, a tree of 6-18 m height sometimes reaching upto 20 m, have bright yellow colored flowers in axillary and terminal panicles. Anthers A are 0.5 cm, B is of 0.4 cm and C of 0.1 cm length. Anthers A and B type dehisce by means of sub terminal apical pore (Fig. 1f), while anthers C type dehisce by means of longitudinal slit. Anthers A and B type have pollens with greater viability (86-95%) compared to C type anthers in which the viability is only 50%. The size of the pollen grains in C type anthers are smaller than A and B type anthers.

Table 1. Number, size and mode of anther dehiscence, viability and size of pollen grains.

Sr. No.	Plant Species	Number of the different types of anthers	Length of filament in cm	Length of anther in cm	Mode of dehiscence	Percentage of viability	Size in μ m
1.	<i>C. fistula</i>	A type anther 3	3.9	0.5	LS	98	0.21
		B type anther 4	1.4	0.4	BP	10	0.21
		C type anther 3	0.1	0.2	LS	90	0.21
2.	<i>C. siamea</i>	A type anther 3	1.4	0.5	AP	95	0.28
		B type anther 4	0.7	0.4	AP	86	0.28
		C type anther 3	0.4	0.1	LS	52	0.21
3.	<i>C. renigera</i>	A type anther 3	1.0	0.4	LS	87	0.21
		B type anther 4	0.8	0.4	BP	19	0.21
		C type anther 3	0.5	0.1	LS	83	0.14
4.	<i>C. javanica</i>	A type anther 3	3.5	0.5	LS	95	0.21
		B type anther 4	1.6	0.4	BP	18	0.21
		C type anther 3	0.84	0.1	LS	14	0.14

LS – Longitudinal Slit, AP – Apical Pore, BP – Basal Pore

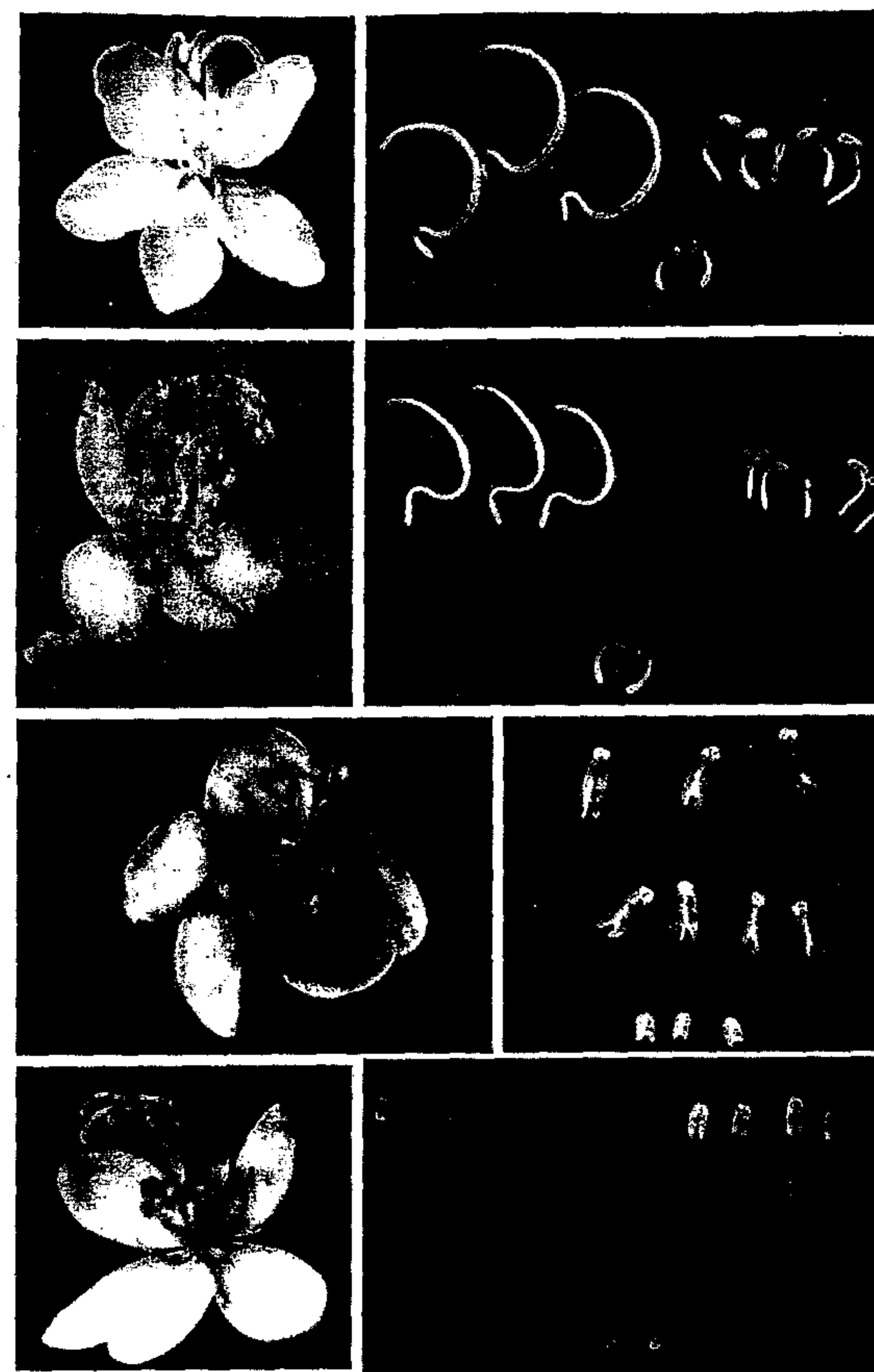


Fig. 1. Flowers and the 10 anthers of *Cassia* species : a, b - *Cassia fistula*; c, d - *Cassia renigera*; e, f - *Cassia siamea*; g, h - *Cassia javanica*

C. javanica is also a tree of 7-11 m height and flowers during April-July. It has light pink colored flowers which turn white when old. They have ten stamens, 3 large, 5 medium and two small. Anther filaments are yellow in colour and are swollen in middle. Anthers of A type are 0.5cm, B type are 0.4 cm and C type are 1 cm in length. The length of the filaments shows variations in the different species (Table 1). Anthers of A and C type splits longitudinally, whereas anthers of B type dehisce by means of basal pore (Fig. 1h). Only pollen grains from anther A type showed 95% viability, while from anthers B and C the viability was very low (Table 1).

The present study thus shows heteranthery in the four tree species of *Cassia*. Heteranthery is associated with taxa which are buzz pollinated by large bees that vibrate the flowers and dislodge the pollen out of the anther pore or slits. Vogel (1978) calls these pollen flowers which use deception as well as reward in form of attractive fodder stamens. The deception continues after pollen is completely removed since the papery yellow pollen sac walls persist and continue to attract pollinators. Buchmann (1983) noted heterantherous flowers to have a few unusually large and showy anthers that contain copious pollen for dispersal plus fodder stamens that act as food for pollinators. In the present study it is found that pollen grains are viable in all the three anther types. The mode of dehiscence in the A and B type anthers in *C. siamea* is porcidal but it differs from the other species by the pore being apical and not basal as observed in other species. Pollen grains in B type anther showed low percentage of viability in all species except in *C. siamea*.

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ADDITIONS TO THE FLORA OF MARATHWADA

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ABSTRACT

The present paper deals with addition of eighteen species of flowering plants to the Flora of Marathwada. Updated nomenclature, name of the family, locality and description are given for each species.

INTRODUCTION

Naik (1998) in the 'Flora of Marathwada' authors found that 18 taxa are not reported reported 1645 species and 73 infraspecific categories belonging to 746 genera and 155 families. After the publication of 'Flora of Marathwada, various authors such as Almeida (2003), Sonje *et al.* (2007), Kare *et al.* (2008), Rathor (2006, 2008), Rathor & Chavan (2002), Rathor *et al.* (2007) and Wadood Khan & Solanke (2008) added 15 taxa of flowering plants. Moreover, Survase *et al.* (in press) added 28 taxa of exotic flowering plants to the region.

During our field survey, many taxa were collected from the region. Specimens were brought to laboratory and processed for herbarium specimens with standard procedures. Majority of the specimens were satisfactorily identified by using pertinent literature. After critical investigations

from the region. Correct and updated citation, a short description and note on its phenology is depicted for each taxon followed by a note on ecology and taxonomic identity.

The family Cuscutaceae has appeared in the index of Flora of Marathwada (Naik, 1998), however, is not incorporated in the enumeration due to typographic error. Therefore, this family is enumerated in the paper. Almeida (2003) has reported two taxa, viz. *Cassytha filiformis* L. (Family Cassythaceae) and *Streblus asper* (Retz.) Lour. (Family Moraceae) without precise locality for the region of Marathwada. Therefore, both the taxa are also enumerated in the present paper with precise localities.

The updated statistical analysis for flora of the region reports 1703 species and 73