CYTOLOGICAL EVIDENCE ON THE STATUS OF THE GENUS CHAMAECRISTA MOENCH

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With one text-figure

THERE HAS BEEN considerable diversity of opinion concerning the generic status of certain species of the large genus *Cassia* L. Linnaeus (1737) established the genus *Cassia* and in 1753 included five species in a section "Chamaecristae foliolis numerosis." According to the International Rules of Botanical Nomenclature, 1935, it has been proposed that *Cassia fistula* L. be selected as the type species of the genus. One species of the Linnaean section Chamaecristae, *Cassia nictitans* L., and *Cassia Absus* L. of the section Sennae were later distributed among three species of a new genus *Grimaldia* by Schrank (1805, 1808). Moench (1794) described the genus *Chamaecrista* differentiating it from *Cassia* chiefly by the occurrence of 5 fertile stamens in the former and 7 in the latter.

Colladon (1816) revised the genus *Cassia* distinguishing the sections Absus and Chamaecrista from the rest of the genus by their acuminate calyces and bibracteolate pedicels. These sections were separated by the structure of the anthers. In Chamaecrista the anthers were glabrous and biporous whereas in Absus the anthers had villous longitudinal lines and dehisced by longitudinal slits. Colladon considered the sections of the genus as very distinct and of potential generic value. These sections as set forth by Colladon were maintained by DeCandolle (1825) who enumerated 6 species under Absus DC. and 80 under Chamaecrista Breyn. Both of these sections were included in the genus *Chamaecrista* Moench by Meyer (1835). Kunth (1824) considered Chamaecrista as a distinct section characterized by pinnate leaves of one to many leaflets, usually with glandular petioles, and by solitary flowers on axillary or supra-axillary, bibracteolate peduncles.

Vogel (1837) included DeCandolle's sections Absus, Baseophyllum, and Chamaecrista in a new section of *Cassia,* Lasiorhegma Vogel. This section was characterized by anthers with 2 villous clefts, dehiscent throughout part of their length, and by a dehiscent compressed pod.

Bentham (1871) distinguished three subgenera of *Cassia,* the subgenus

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Lasiorhegma being divided into three sections, chiefly on the characters of the inflorescence. Of these Chamaecrista consisted of herbs or shrubs with axillary or supra-axillary peduncles bearing 1–4 flowers. Greene (1897, 1899) re-established the section Chamaecrista as a genus which he characterized by: "(1) Flowers axillary or supra-axillary and solitary or few and fascicled, never terminally clustered as in *Cassia*. (2) Buds slender conical and acuminate (always subglobose or ovoid and obtuse in *Cassia*). (3) Sepals plane, slenderly acuminate, thin-membranous (in *Cassia* firm herbaceous, obtuse, concavo-convex). (4) Flower on a twisted pedicel, its banner and keel petals thus made to appear lateral, and one wing enlarged and placed lowermost, the other reduced and becoming uppermost. (5) Pods thin compressed, very promptly dehiscent, never subterete, and indehiscent as in most or all Cassias." Greene listed 32 species which he regarded as belonging to *Chamaecrista*.

Britton and Rose (1930) regarded the section Chamaecrista as a distinct genus of the tribe Cassieae, characterized by linear elastically dehiscent legumes, short funicles, unequal petals and usually glandular leaves. They included 111 species in this genus. Recently Standley (1937, p. 514) has again placed the species of *Chamaecrista* in the genus *Cassia*.

This group of species has thus had a varied taxonomic history being regarded either as a distinct section of the large genus *Cassia* or as a distinct but closely related genus *Chamaecrista* of the tribe Cassieae. In determining the sectional or generic status of a group of species such as this, evidence from comparative anatomy, genetics, or cytology may be of considerable value. Consequently the following chromosome number data are presented in the hope that they may be useful in further studies of the generic status of the group. Senn (in press) has pointed out that in the Leguminosae aneuploidy is frequently an intergeneric relationship. In contrast euploid series are usually found within genera. In the Cruciferae, a family with a much higher frequency of polyploidy, Manton (1932) has also found that aneuploidy is the usual relationship between genera. Long series of polyploid numbers do not commonly occur in Leguminosae, the percentage of polyploid species being remarkably low.

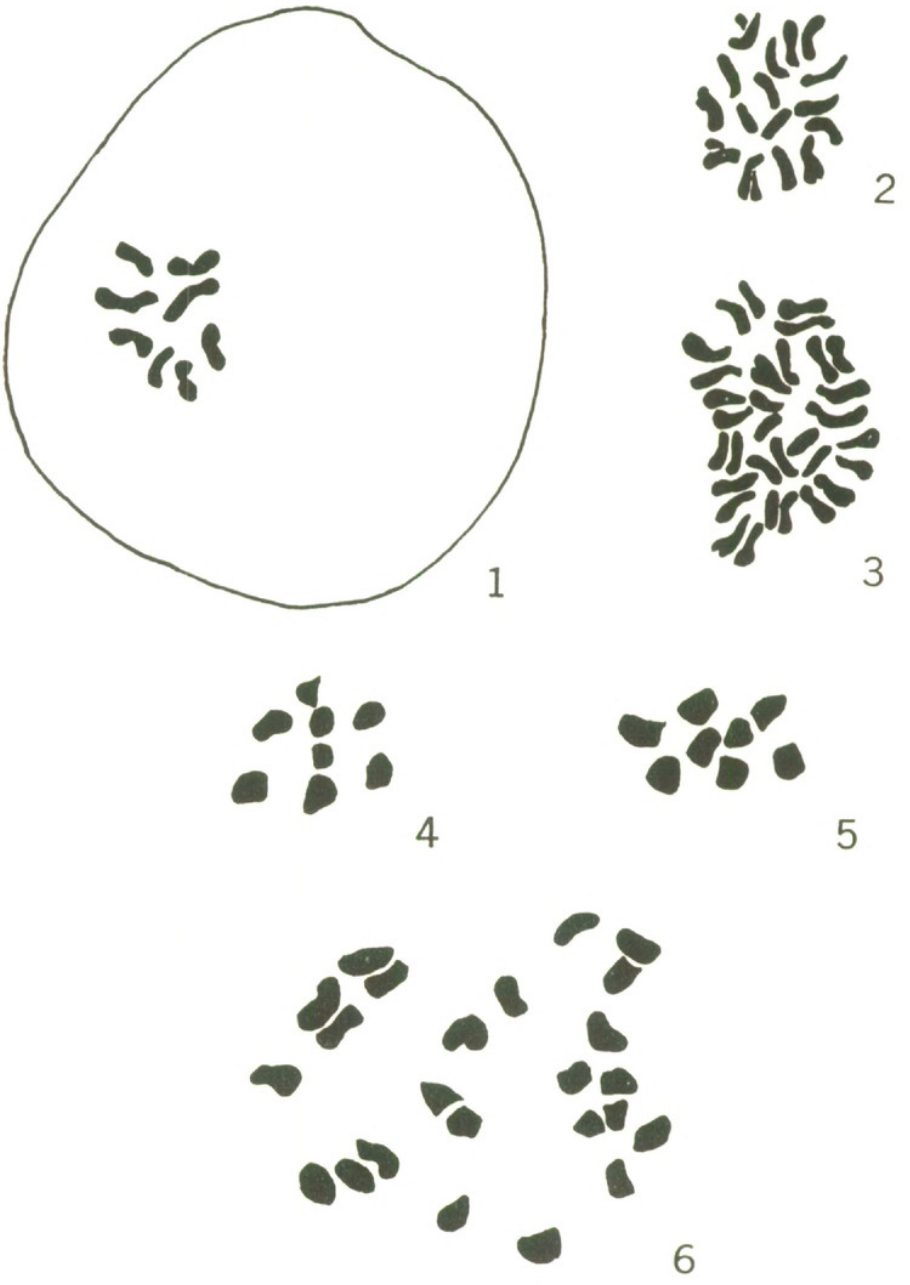
There is some disagreement concerning the numbers in certain species of *Cassia* but it is well established that the following *n* numbers occur: 6, 8, 12, 13, 14, 16, 24, and possibly 10 (Senn, in press). Of these the *n* numbers 8, 16, 24, an orthoploid series, occur only in the subsection Chamaecristae verae Benth., whereas the other numbers are distributed throughout the subgenus Cathartocarpus Pers. and the sections Onco-

lobium Vog., Prososperma Vog., and Chamaesenna DC. of the subgenus Senna (Roxb.) Benth.

Cytological material has been available for three species of the Chamaecrista group. *Chamaecrista procumbens* (L.) Greene (*Cassia nictitans* L.) collected at Charlottesville, Virginia, had $n = 8$ at IIM in pollen mother cells (figure 1). Somatic mitoses in root tip cells showed $2n = 16$ (figure 2), accompanied by somatically doubled cells in which there were 32 chromosomes (figure 3). *Chamaecrista fasciculata* (Michx.) Greene (*Cassia Chamaecrista* Walt.) from The Blandy Experimental Farm, Boyce, Virginia, also showed $n = 8$ in pollen mother cells (figure 4). Material of this species collected at Bremond, Texas (*L. O. Gaiser and P. Snure 11,* U. S. Route No. 6 near Bremond, Texas, Aug. 28, 1936) was also diploid with $n = 8$ in pollen mother cells (figure 5). *Chamaecrista Aeschinomene* (DC.) Greene (*Cassia Aeschinomene* DC.) (*H. A. Senn 113,* roadside, Soledad, Santa Clara Prov., Cuba, June 23, 1937) proved to be hexaploid with $n = 24$ at IM in pollen mother cells (figure 6). Some so-called secondary association was present in some nuclei suggestive of the polyploid nature of the species. Herbarium specimens representing the collections from which the chromosome numbers were determined have been deposited at the Gray Herbarium, Harvard University.

Chromosome numbers have also been reported for certain other species of this sectional or generic group. Kawakami (1930) listed two types of *Cassia mimosoides* L., one having $n = 8$ and the other $n = 16$. He also reported *Cassia Leschenaultiana* DC., which is regarded by Bentham (1871) as conspecific with *Cassia mimosoides* L., as having $n = 24$. This is commonly regarded as a rather polymorphic species and there may well be some correlation between the chromosomal races and the morphological variation in the species. Sugiura (1931) reported the chromosome number of *Cassia dimidiata* as $2n = 16$, thus adding another diploid species to the 8 series. The exact identity of *C. dimidiata* is not clear since no authority was given. According to Bentham (1871) *C. dimidiata* Roxb. is conspecific with *C. mimosoides* L. and *C. dimidiata* Klein with *C. Kleinii* W. et Arn. *Cassia Kleinii* W. & A. is a species closely related to *C. mimosoides* L. so that in either instance the species for which the chromosome count was reported comes within the group under consideration.

Before far-reaching conclusions are drawn many more species of *Cassia* should be examined cytologically but the above evidence indicates that a well marked polyploid series with a base number 8 in contrast to the other numbers 6, 13, 14, exists within the genus. The group of species comprising this series falls within the limits of the genus *Chamae-*



TEXT FIGURE 1

Figures 1–6. Chromosomes of *Chamaecrista* Moench (figures 1–5 × 2560; figure 6 × 2160). 1. *C. procumbens* (L.) Greene II M, second plate omitted, $n = 8$. 2. Same, somatic metaphase, $2n = 16$. 3. Same, somatically doubled nucleus, $4n = 32$. 4. *C. fasciculata* (Michx.) Greene, Charlottesville, Va., I M, $n = 8$. 5. Same, Bremond, Texas, I M, $n = 8$. 6. *C. Aeschinomene* (DC.) Greene I M, $n = 24$.

crista Moench and seems to provide some evidence in support of the maintenance of this group of species as a valid genus. The occurrence of a genus with a base number 8 in the Caesalpinioideae is also of especial interest since Senn (in press) has reported this number to be the probable base number for the subfamily Papilionatae.

The writer is grateful to Dr. Thomas Barbour, Curator of the Atkins Institution of the Arnold Arboretum, Soledad, Cuba, for the privilege of visiting the Institution in the summer of 1937 at which time material of *Chamaecrista Aeschinomene* (DC.) Greene was collected.

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