

Rhodora

JOURNAL OF

THE NEW ENGLAND BOTANICAL CLUB

Vol. 56

July, 1954

667

CONNATE ANTHERS IN GENTIANA (GENTIANACEAE)

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FEW families of angiosperms have taxa with united anthers. East of the Mississippi River, an amateur or beginning student soon learns that united anthers are characteristic of the *Compositae* (Ambrosiaceae, Carduaceae, Cichoriaceae) and certain *Campanulaceae*, especially *Lobelia*. Such a student is much less likely to learn that certain taxa in the *Solanaceae* and *Gentianaceae* may also possess united anthers. A review of the treatment of this characteristic in the *Gentianaceae* by various authors is pertinent here.

Fernald (1950) does not mention this characteristic in his synopsis of the *Gentianaceae* or of the genus *Gentiana* which has several species with united anthers. Fernald's key to the species of *Gentiana* does indicate that 12 species have or may have "anthers cohering in a ring or short tube," and that in one species "anthers not connected." For ten species, however, there are no data in regard to united anthers. Descriptions of the species add no further light except for *G. puberula* Michx. where it is stated "anthers separate or promptly separating." None of the illustrations shows anthers.

The "New Britton and Brown Illustrated Flora," Vol. 3, (H. A. Gleason, 1952) is not clear in regard to existence of united anthers in some taxa of *Gentiana*. In the synopsis of the family we find "anthers free or connate." In the synopsis of *Gentiana* we find "anthers separate, connivent, or connate." In the key to the species, as with Fernald (1950), there is nothing

concerning union of anthers for a number of species (six), two species being given as having "anthers separate and distinct," and 10 species as having "anthers connivent or coherent in ring." Descriptions of the species add nothing. In the illustrations of the 10 species (indicated by the key as having anthers connivent or coherent in a ring) stamens are not shown in two species. Stamens are shown for eight species but are illustrated as being separate.

Small (1933) gives no data on the subject in the synopsis of the *Gentianaceae*, *Gentianella* (*Gentiana*), or *Dasystephana* (*Gentiana*), but in the key to the species of the latter genus are the following: one species, "anthers separate"; seven species, "anthers cohering in a tube or ring"; and two species, no data. The illustration for each of the two genera, in so far as we are able to determine, is in each case that of a species not having united anthers. Other species are not illustrated.

In the three major manuals covering the eastern United States, therefore, there is no way to determine for a number of taxa in *Gentiana*, whether or not anthers are united. Furthermore, united anthers, which are a useful diagnostic character for several species, are nowhere illustrated.

In Deam's (1940) "Flora of Indiana" and Jones' (1945) "Flora of Illinois" there is no synopsis for the *Gentianaceae* or *Gentiana*, and there are no illustrations. In the keys, reference to union of stamens is made in case of only two and three species, respectively. These two state floras, too, lack data on union of stamens for most taxa in *Gentiana*. The same is true for western floras. From data contained in Rydberg's (1906) "Flora of Colorado," Jepson's (1939) "A Flora of California," Kearney's (1951) "Arizona Flora," and Abrams' (1951) "Illustrated Flora of the Pacific States" I am unable to determine whether any taxa have united anthers although from the illustrations in Jepson's flora it may be concluded that they were separate for all twelve species listed. The same is true for the two species that have illustrations of stamens in Abrams' flora.

A recent and most excellent book, "Taxonomy of Vascular Plants" (Lawrence, 1951), also omits reference to union of anthers in *Gentiana*. This is especially misleading since Lawrence states "stamens—epipetalous, distinct (syngenesious in

Voyria and *Leiphaimos* spp.).” The genus *Gentiana* obviously should have been included with the other two.

Britton & Brown (1897 and 1913) give for four *Gentiana* (incl. *Dasystephana*) species illustrations that show united anthers. The text of each edition includes information concerning this character for a number of species. Information concerning this character is lacking, however, for other species. Torrey (1843) has excellent illustrations of connate anthers for two species. The trend seems to have been from considerable emphasis on connate anthers in early American botanical works to very little reliance on the character in recent publications.

It would be helpful to indicate here for the eastern North American taxa of *Gentiana*, in particular, whether or not the anthers are united, and, if so, to what extent. Such is not easily possible, for the proper application of names seems impossible for us at this time. Fernald (1950) and Gleason (1952) list different taxa for the genus, and herbarium material at our disposal is not adequate for such a study.

Material of several taxa was examined, however, and in view of the lack of illustrations of connate anthers in recent, major floras or taxonomy texts, photographs were made for purposes of publication. The photographs shown (figs. 1-4) are of *Gentiana catesbaei* Walt. [*Dasystephana latifolia* (Chapm.) Small]. The prominence of the characteristic, union of anthers, is readily evident. It may be noted that the anthers dehisce outwardly, that is, away from the pistil.

From the present study it is evident that adequate morphological data are unavailable for *Gentiana*, and that in the treatments of *Gentiana* in recent floras the union of anthers is treated as a characteristic of minor repute. It seems, however, that in a detailed study of the genus, and perhaps the entire family, special attention to union of anthers might furnish important clues as to relationships of taxa of various levels. In other words, even though the character might not be useful for keys there is some evidence that it may be an important phylogenetic one. Detailed study may even amend for certain species of *Gentiana*, statements such as “anthers connate later separate” to “anthers connate in longstyled forms, separate in shortstyled (or the reverse)” for Gilg (1895) in Engler and Prantl points

out that the anthers are fastened one to another in longstyled flowers of *Hockinia* (Gentianaceae).

The authors wish to thank Mr. Haskell Venard, Atlanta, Georgia for helpful suggestions. Financial support was provided through Dr. George H. Boyd, Dean of the Graduate School, University of Georgia.

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Duncan, Wilbur H. and Brown, Claud L. 1954. "Connate Anthers in *Gentiana* (Gentianaceae)." *Rhodora* 56, 133–136.

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