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SIMILARITIES IN SECTIONAL DELIMITATION IN *TRIPSACUM* AND *ZEa* (GRAMINEAE)

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Subtribe *Tripsacinae* of the tribe Andropogoneae comprises two New World genera, *Tripsacum* and *Zea* (Clayton, 1973). These "sister" genera (terminology of Hennig, 1966) are distinct morphologically and also karyotypically, with base chromosome numbers of $n = 18$ in *Tripsacum* and $n = 10$ in *Zea*. Doebley and Iltis (1980; see also Iltis and Doebley, 1980) radically revised sectional circumscription in *Zea*, and provided the first workable taxonomy for that genus. This breakthrough in *Zea* taxonomy documented patterns of morphological variation that had not been previously apparent. The purpose of this paper is to point out similarities in sectional circumscription that emerge when we compare the new sectional taxonomy of *Zea* with sectional delineation in *Tripsacum* (Hitchcock, 1906; de Wet et al., 1982; de Wet et al., 1983; Brink and de Wet, 1983). These similarities in patterns of morphological variation suggest parallel evolutionary diversification (Maslin, 1952) in these two closely related sister genera.

MATERIALS AND METHODS

Tripsacum and *Zea* each comprise two sections. Sections of these genera were compared based on characters of the terminal inflorescence, especially inflorescence branching, thickness of rachis internodes, and morphology of outer staminate glumes. Specimens filed with the Crop Evolution Herbarium (CEL) were studied, and all *Zea* and most *Tripsacum* taxa were grown and studied in the fields and greenhouses of the University of Illinois, or in a nursery maintained at Homestead, Florida. Statistical analyses of characters important for sectional demarcation have been published for *Tripsacum* (Brink and de Wet, 1983) and for *Zea* (Doebley and Iltis, 1980; Doebley, 1980, 1983). Several qualitative character states of staminate outer glumes were not included in our previous sectional

comparisons in *Tripsacum*, so these will be described here.

RESULTS AND DISCUSSION

The characters used for segregating sections in both genera are associated with morphology of the terminal inflorescence (Table 1). *Tripsacum* section *Tripsacum* is similar to *Zea* section *Luxuriantes* in having outer glumes of staminate spikelets coriaceous, flat across the back, and with the veins at the lateral edges of the

TABLE 1. Comparison of sections in *Tripsacum* and *Zea*.

Tripsacum sect. *Tripsacum* and *Zea* sect. *Luxuriantes* (Figs. 1A, 1C, 2A, 2C).

1. Outer glume of staminate spikelets coriaceous, more or less flat on the back, stiff, lateral nerves very prominent, intermediate nerves thinner.
2. Staminate spikelets densely imbricate with relatively short, thick rachis internodes.
3. Terminal inflorescence with fewer, stiffer branches that are upright or ascending.

Tripsacum sect. *Fasciculata* and *Zea* sect. *Zea* (Figs. 1B, 1D, 2B, 2D).

1. Outer glume of staminate spikelets papery in texture, rounded on back, two lateral nerves barely or not at all stronger than those in between.
2. Staminate spikelets not densely imbricate with relatively long, thin rachis internodes.
3. Terminal inflorescence with numerous, lax branches.

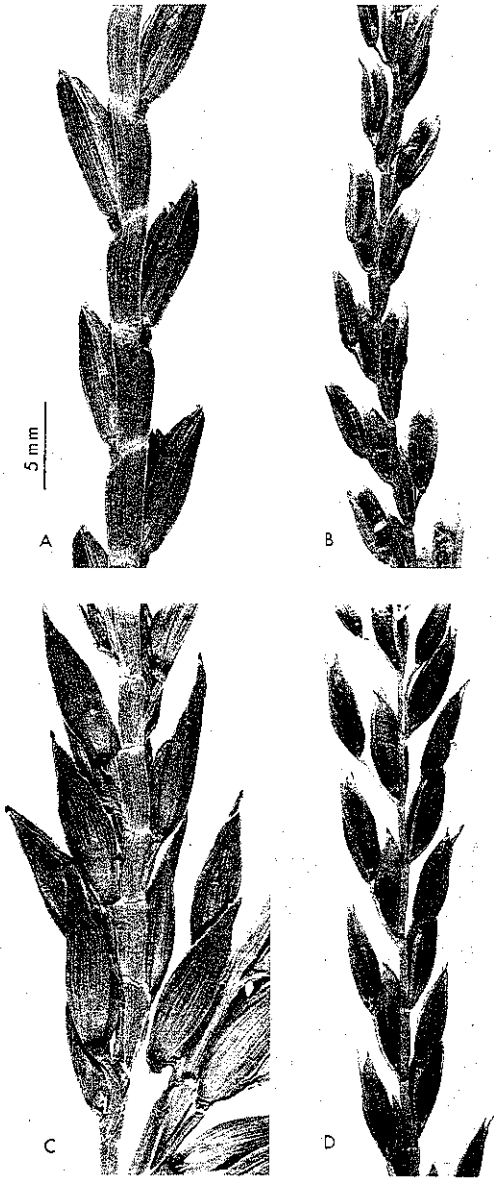


FIG. 1. Inflorescence branches. A) *Tripsacum dactyloides* (L.) L. (*Tripsacum* sect. *Tripsacum*). Illinois, Madison Co. Lambert 684. (CEL 1348). B) *Tripsacum maizar* Hern. & Randolph (*Tripsacum* sect. *Fasciculata*). Mexico, Guerrero, Aquacatales. Randolph 67-1032. Grown at Redlands, Florida. (CEL). C) *Zea diploperennis* Iltis, Doebley & Guzman (*Zea* sect. *Luxuriantes*). Mexico, Jalisco, Sierra de Manantlan. Iltis, Nee and Guzman 1190. Grown at University of Illinois. (CEL 7087). D) *Zea mays* subsp. *mexicana* (Schrader) Iltis. (Chalco race). (*Zea* sect. *Zea*). Mexico, Mexico, Ipala. Grown at University of Illinois. (CEL 2879).

glumes very prominent and often scaberulous (Figs. 1A, 1C). *Tripsacum* section *Fasciculata* is similar to *Zea* section *Zea* in having staminate outer glumes membranaceous, rounded on the back, and without prominent lateral veins (Figs. 1B, 1D).

In *Tripsacum* section *Tripsacum* and *Zea* section *Luxuriantes* there are few inflorescence branches which are stout and stiff because the internodes are wide (Figs. 1A, 1C, 2A, 2C). In *Tripsacum* section *Fasciculata* and *Zea* section *Zea* there are numerous, thin, lax inflorescence branches (Figs. 1B, 1D, 2B, 2D). These characters are summarized in Table 1, which actually defines the extremes of variation within the genera. The characters are intercorrelated, and variation in each genus extends from the extremes toward an intermediate condition. The gap is not bridged, however, and this supports sectional recognition.

This correspondence of infrageneric patterns of variation in *Zea* and *Tripsacum* lends support to the revised concept of sections in *Zea* (Doebley and Iltis, 1980). The recognition of this pattern of variation has been taxonomically useful in *Tripsacum*. In *Tripsacum* section *Fasciculata* it was possible to arrange the species in order from *Tripsacum maizar*, the most extreme member of the section, to *Tripsacum lanceolatum*, which approaches section *Tripsacum* in morphology (de Wet et al., 1983). The similarity in these patterns of variation in *Zea* and *Tripsacum* (Fig. 3) indicates that the evolutionary divergence within each genus has been canalized (Stebbins, 1974; Stanley, 1979) within a similar, restricted realm of morphological and developmental possibilities.

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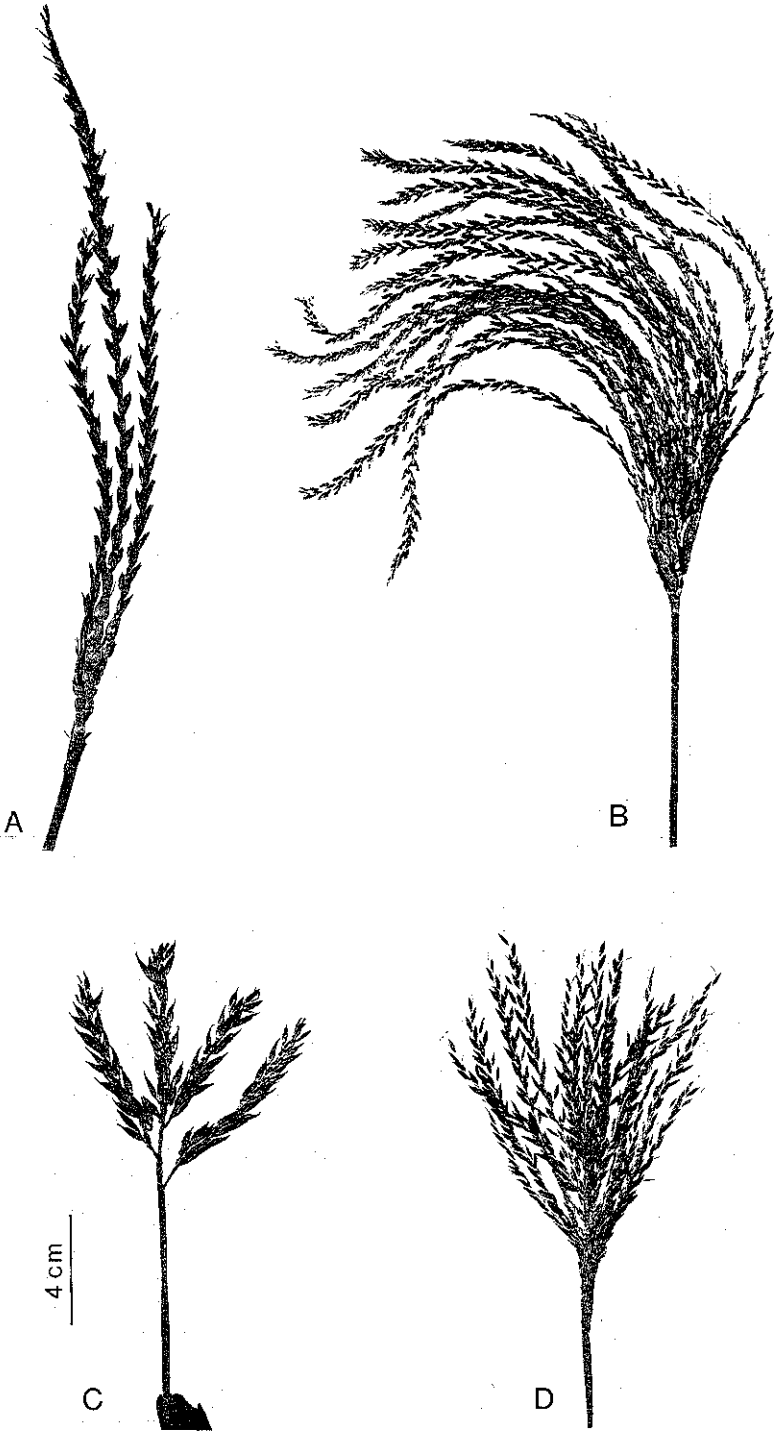


FIG. 2. Terminal inflorescences. Same specimens as in Figure 1. A) *Tripsacum* sect. *Tripsacum*. B) *Tripsacum* sect. *Fasciculata*. C) *Zea* sect. *Luxuriantes*. D) *Zea* sect. *Zea*.

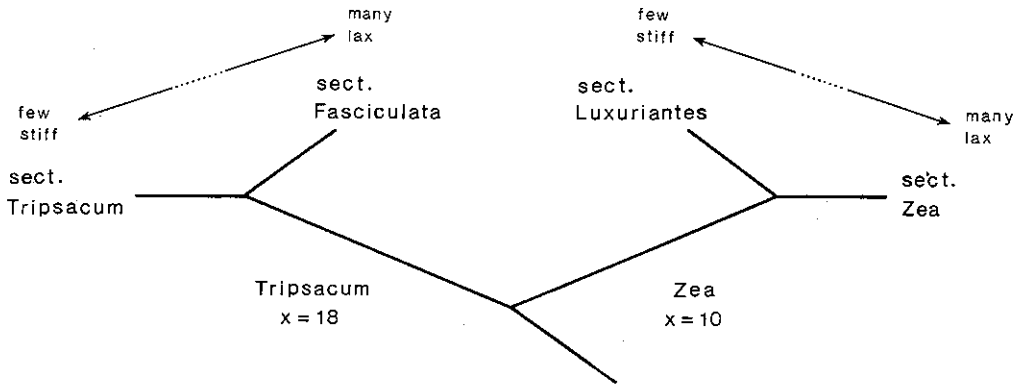


FIG. 3. Genera and sections of subtribe *Tripsacinae*. Few, stiff versus many, lax branches in the terminal inflorescence are two of several characters used for sectional delimitation in both *Tripsacum* and *Zea*.

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