

# Leaf Anatomy of Six South African Grass Genera.

By

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The significance of leaf anatomy in grass taxonomy was demonstrated by Duval-Jouve (1875), Pee-Laby (1898), Avdulov (1931) and Prat (1936). This paper deals with the genera *Entoplocamia* Stapf, *Fingerhuthia* Nees, *Lasiochloa* Kunth., *Plagiochloa* Adamson and Sprague, *Tetrachne* Nees and *Urochlaena* Nees. They are usually included in the Festuceae but appear to occupy an aberrant position in this tribe. Recently, Chippindall (1955) referred *Fingerhuthia* Nees to the tribe Chlorideae and the remaining five genera to the tribe Eragrosteae. Anatomical data may provide clues as to the true relationships of these genera.

## MATERIAL AND METHODS

The specimens investigated were made available by the National Herbarium, Pretoria. Anatomical slides were prepared as indicated by Prat (1948) and de Wet (1956). Root-tips were collected in the veld, fixed in Randolph's (1935) fluid, dehydrated using normal butyl alcohol as clearing agent and stained in Stockwell's (1934) solution.

## RESULTS

Anatomical, morphological and cytological observations are presented in Table 1. The leaf anatomy of *Fingerhuthia* Nees was first studied by Prat (1936) who indicated that the genus is chloridoid in this respect. Moffet and Hurcombe (1949) demonstrated small chromosomes and  $2n = 20$  for *Tetrachne dregei* Nees and de Wet (1958) reported small chromosomes in *Fingerhuthia africana* Lehm. ( $2n = 40$ ) and *F. sesleriaeformis* Nees ( $2n = 20$ ). The chromosomes of *Plagiochloa uniolae* (L.f.) Adamson and Sprague ( $2n = 48$ ) were found to be larger than those of the other two genera. The remaining three genera are unknown cytologically. Morphological data, although varified, are borrowed from Stapf (1900), Phillips (1951) and Chippindall (1955). The genus *Plagiochloa* was recently removed from *Demazeria* Dum. by Adamson & Sprague (1941). This new genus is closely related to *Lasiochloa* Kunth. Chippindall (1955) indicates that their distribution is similar and although the extremes in each genus are clearly distinct, there are species in both that suggest possible hybridization between them.

## DISCUSSION

The characteristics of the main subdivisions of the Gramineae have been illustrated and discussed by Stebbins (1956). It is evident that the genera studied do not belong with the tribe Festuceae. This tribe is characterized by large chromosomes, mostly in multiples of  $n = 7$ , spherical siliceous cells in an epidermis that lacks bicellular hairs and the chlorophyll tissue of the leaf is uniformly distributed throughout in the

mesophyll between the vascular bundles. The genera *Entplocamia* Stapf, *Fingerhuthia* Nees and *Tetrachne* Nees are chloroid in all respects, except that the spikelets disarticulate below the glumes, but this characteristic is present in other typically chloroid genera such as *Catalepis* Stapf and Stent and *Spartina* Schreb. For these reasons the classification of Chippindall (1955) who refers *Fingerhuthia* Nees to the Chlorideae and the other two genera to the Eragrosteae are justifiable. The genera *Lasiochloa* Kunth., *Plagiocloa* Adamson and Sprague and *Urochlaena* Nees, however, do not belong with either of the tribes Eragrosteae or Festuceae. Internal leaf anatomy is of the festucoid type and epidermal traits are panicoid. The chromosomes of *Plagiocloa uniolae* Adamson and Sprague are larger than those of the panicoid group of grasses, but smaller than those of the festucoid group. In respect of anatomical traits, chromosome size and basic chromosome number these genera resemble members of the tribe Danthoneae. The rhachilla, however, disarticulates below the glumes, a character not present in members of the Danthoneae. These genera also resemble members of the Unioleae except for the relatively large chromosomes observed in *Plagiocloa uniolae* Adamson and Sprague.

#### SUMMARY

Leaf anatomy was studied in six small South African grass genera. These data were correlated with cytology and spikelet morphology in an attempt to determine their phylogenetic position in the family Gramineae. The genera *Entplocamia* Stapf, *Tetrachne* Nees and *Fingerhuthia* Nees are chloroid in respect of leaf anatomy and spikelet morphology. Cytological data from the latter two genera point to a similar conclusion. *Lasiochloa* Kunth., *Urochlaena* Nees and *Plagiocloa* Adamson and Sprague are festucoid in respect of spikelet morphology and internal leaf anatomy, panicoid in respect of epidermal traits and the latter genus resemble members of the Danthoneae in respect of chromosome size and basic number.

#### KEY BASED ON ANATOMICAL AND MORPHOLOGICAL CHARACTERS.

1. Inner bundle sheath poorly differentiated, outer bundle sheath comprises a layer of large parenchymatous cells which contain chloroplasts, remaining chlorophyll tissue confined to a single layer of cells surrounding the vascular bundle; stomata rhomboid in shape, siliceous cells saddle-shaped, bicellular hairs club-shaped; chromosomes small,  $n = 10$ ; embryo  $\frac{1}{2}$ - $\frac{3}{4}$  as long as the grain; rhachilla disarticulates below the glumes..... 2
- Inner bundle sheath well developed, outer bundle sheath comprises a layer of small parenchymatous cells which do not contain chloroplasts, chlorophyll uniformly distributed throughout the mesophyll between the bundles; stomata rhomboid in shape, siliceous cells dumbbell-shaped, bicellular hairs linear in shape; chromosomes relatively large,  $n = 12$ ; grain enclosed by the lemma and palea; rhachilla disarticulates below the glumes; flowers all bisexual or the uppermost gradually reduced..... 4
2. Lower florets all bisexual, uppermost lemma subtending a male flower or empty; grain not enclosed by the lemma and palea, lodicules 2, cuneate, fleshy, nerved..... *Fingerhuthia*
- Lower lemmas empty florets aborted, upper bisexual, uppermost subtending a male flower or palea only; grain loosely enclosed by the lemma and palea..... 3
3. Lodicules absent..... *Entplocamia*.
- Lodicules 2, cuneate, fleshy..... *Tetrachne*.
4. Embryo large,  $\frac{1}{2}$  the length of the grain; lodicules 2, minute..... *Urochlaena*.
- Embryo small, less than  $\frac{1}{2}$  the length of the grain; lodicules 2, cuneate, ciliate... 5
5. Spikelets 3-9-flowered, placed obliquely to the central axis..... *Plagiocloa*.
- Spikelets 2-3-flowered, not placed obliquely to the central axis..... *Lasiocloa*.

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