

INTRODUCTION

THE PROBLEM

In 1929 Henrard published an excellent Monograph of the genus *Aristida* in which many of the difficulties previously encountered with the identification of the species were solved. Henrard also gave an improved subdivision of the genus into sections which facilitated the identification and gave a much clearer picture of relationships of the species. In 1936 Theron studied the anatomy of a large number of the South African species of *Aristida* and divided the genus into a number of groups based on anatomical characters. His grouping differs considerably from the sections recognized by Henrard. Schweickerdt in 1941 aligned all the available South African material of the genus with Henrard's Monograph and introduced a number of corrections and improvements. In Schweickerdt's review of the subdivisions of the genus the results obtained by Theron are discussed and it is remarked that if the anatomy leads one to put such diverse elements together, a classification based on anatomy produces "a highly artificial classification which shows no advantage over a natural classification based solely on organographic characters". In recent years practically all workers who have used anatomical characters as additional aids in producing a "natural" classification for the grasses have achieved gratifying results. Therefore, a re-assessment of the anatomical features of *Aristida* seemed to be necessary to determine whether there is a stronger correlation than is indicated by Theron between organographic and anatomical characteristics.

In the course of a previous study it was noticed that some of the species occupy an anomalous position in the sections in which they have been placed, e.g. *A. sericans* is the only species with plumose awns in the section *Chaetaria*.

Since some species of the genus *Stipa*, as treated in the Flora Capensis (Stapf, 1898) and in the recent Grasses and Pastures of South Africa (Chippindall, 1955) strongly resemble members of the genus *Aristida* except for the single awn, a fact already pointed out by Stapf (1898, p. 574) and by Chippindall (1955, p. 291), the latter on information supplied by the present author, it was decided to include the South African *Stipeae* in this study.

Hubbard and Vaughan in Grasses of Mauritius and Rodrigues (1940, p. 23) removed *Aristida* from the *Stipeae*. In order to accommodate this genus they created a new tribe, the *Aristideae*. A study of the differences between the tribes *Stipeae* and *Aristideae* has, therefore been undertaken.

In addition to the organographic features, the anatomy of the embryo and leaf-blade, as well as cytological features have been used, wherever possible, in an attempt to determine the relationships of the tribes and genera.

Reliable keys for the identification of vegetative specimens of grasses are urgently needed. The difficulties of drawing up such keys are well known. Since some of the tribes, and even genera and species, of the Gramineae can often be distinguished readily on anatomical grounds it was decided to explore the possibility of combining vegetative and anatomical characteristics in such keys.

The results of these investigations are set out in the following pages.

DELIMITATIONS

This study was limited mainly to the investigation of the South African species. However, where more information was required to establish the characteristics of taxa of higher rank, such as tribes and sections, a selection of extra-South African species was also investigated. Wherever possible the type species of genera and sections were studied. These species are not necessarily referred to in the text.

The anatomy of the leaf-blade of all the known South African representatives was examined and in addition, where desirable, also the embryo, awn and shoot.

The karyology of all species of which living material could be obtained was investigated.

DEFINITIONS

The following anatomical concepts are not in general use and for this reason are defined here.

Vascular bundle unit: the vascular bundle as viewed in cross section including the ad- and abaxial stereome strands, chlorenchyma and epidermis. The outline of these units is determined ad- and abaxially by the epidermis and laterally by imaginary vertical lines through the motor cell groups to the abaxial epidermis. In leaves where the units do not protrude the outline would be more or less rectangular.

First order vascular bundle: possessing proto- and metaxylem vessels; lysigenous cavity usually present.

Second order vascular bundle: possessing only metaxylem, with 2 large vessels, neither protoxylem nor lysigenous cavity present.

Third order vascular bundle: xylem and phloem not clearly demarcated, or at least large metaxylem vessels absent.

Silicified cell zone: longitudinal area of the leaf epidermis as seen in surface view, situated above a stereome strand, and containing silicified cells.

Stomatal zone: longitudinal area of the leaf epidermis containing stomata, and bounded laterally by silicified cell zones.

EXPLANATION OF SYMBOLS

The symbols used in the anatomical drawings to indicate different types of cells and tissues are explained in the following table. They are arranged alphabetically.

AB, abaxial epidermis	OH, one-celled hair
AD, adaxial epidermis	OS, outer chlorophyll-bearing bundle sheath
BH, bicellular linear hair	RB, retrorse barb
C, chlorenchyma	S, mechanical tissue or stereome
CC, suberized cell	SC, silicified cell
CS, constriction	SP, supporting parenchyma
ICS, inner chlorophyll-bearing bundle sheath	ST, stoma
IS, inner bundle sheath	T, multicellular epidermal gland
LC, long ripple-walled cell	1VB, first order vascular bundle
MB, bundle of the midrib	2VB, second order vascular bundle
MC, motor cell	3VB, third order vascular bundle

CITATION OF SPECIMENS

A selection of typical representatives are cited for most species. These were chosen mainly from collections made after the publication of Schweickerdt's work on *Aristida* (1941) and can be regarded as amplifying citations given in the latter work. For the species not mentioned by Schweickerdt the specimens studied are cited in full. Similarly type specimens are indicated only when information about these is not available in Schweickerdt's work. Except where indicated otherwise, specimens cited are deposited in the National Herbarium, Pretoria (PRE).

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