Leaf anatomy of the South African Danthonieae (Poaceae).

III. Merxmuellera stricta

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ABSTRACT

The anatomical structure of the leaf blade as seen in transverse section, and of the abaxial epidermis, of Merxmuellera stricta (Schrad.) Conert is described and illustrated. In this variable species four distinct anatomical "forms" are recognized viz. the typical M. stricta form, the Cathedral Peak form, the Drakensberg form and the alpine form. The alpine and Cathedral Peak forms have recently been described as M. guillarmodiae Conert (1975). The degree of anatomical differentiation of these "forms" resembles the situation described in M. disticha (Nees) Conert (Ellis, 1980). Populations of both M. stricta and M. disticha from the Drakensberg mountains display extensive anatomical diversification which appears to be correlated with environmental factors. In addition, morphological differences are exhibited as well and the anatomical "forms" of M. stricta probably warrant taxonomic recognition.

RÉSUMÉ

ANATOMIE FOLIAIRE DES DANTHONIEAE (POACEAE) D’AFRIQUE DU SUD. III.
MERXMUELLERA STRICTA

La structure anatomique du limbe foliaire en coupe transversale et celle de l’épiderme abaxial de Merxmuellera stricta (Schrad.) Conert sont décrites et illustrées. Dans cette espèce variable on reconnaît quatre "formes" anatomiques distinctes, soit la forme M. stricta typique, la forme Cathedral Peak, la forme Drakensberg et la forme alpine. Les formes alpine et Cathedral Peak ont récemment été décrites sous le nom de M. guillarmodiae Conert (1975). Le degré de différenciation anatomique de ces "formes" ressemble à la situation décrite chez M. disticha (Nees) Conert (Ellis, 1980). Dans les montagnes du Drakensberg des populations tant de M. stricta que de M. disticha montrent une large diversification anatomique qui est apparemment en corrélation avec des facteurs de milieu. En outre, des différences morphologiques sont également manifestes et il est probable que les "formes" anatomiques de M. stricta méritent d’être reconnues taxonomiquement.

INTRODUCTION

Merxmuellera stricta (Schrad.) Conert (1970) (=Danthonia stricta (Nees) Schrad.) is widely distributed in the southern mountainous areas of South Africa. It occurs fromNamaqualand in the north-west southwards to the south-western Cape, then eastwards to the north-eastern Cape mountains from where the distribution continues in a northerly direction along the Drakensberg mountains to Lesotho and the eastern Orange Free State. Together with M. disticha (Nees) Conert, M. stricta is an important constituent of the Karroid Merxmuellera Mountain Veld along all the higher mountains of the False Karoo and the Central Upper Karoo (Acocks, 1975). To the west of Beaufort West, M. stricta replaces M. disticha as the dominant grass of the Mountain Renosterbosveld (Acocks, 1975). M. stricta is also common in the fynbos communities of the south-western Cape.

M. stricta is a variable perennial, forming coarse, wiry tufts. Chippindall (1955) states that "There is considerable variation in the plants referred to D. stricta, and it is possible that they comprise more than one variety". In the north-west M. stricta may be confused with M. dura (Stapf.) Conert, but M. stricta can be recognized by the glabrous condition of the lemma at the point of insertion of the central awn and is distinct anatomically (Ellis, in prep.). In the north-east, in the Drakensberg mountains, a situation exists, similar to that observed in M. disticha (Ellis, 1980), with three additional anatomical "forms" being present.

These anatomical "forms" appear to be correlated with morphological characters and habitat differences. Certain of the spikelet differences and other morphological characters must be of considerable magnitude as Conert (1975) has independently described a new species, M. guillarmodiae Conert, from M. stricta collections from the alpine region of the Drakensberg. Unfortunately, the specimens cited by Conert (1975) as belonging to M. guillarmodiae fall into two of the anatomical categories recognized in the present study, while the remaining two "forms" fall in M. stricta as currently constituted. If the precedent created by the description of M. guillarmodiae is to be followed, it implies that a further two species require description. Similarly, by the same token, two new species, presently referred to M. disticha, also warrant description (Ellis, 1980).

In the present context M. stricta is viewed in its widest sense, and for convenience M. stricta sens. lat. has merely been sub-divided into four "forms" for descriptive purposes: the typical form (M. stricta), the Cathedral Peak form (M. guillarmodiae), the Drakensberg form (M. stricta) and the alpine form (M. guillarmodiae). Each of these "forms" exhibits characteristic leaf anatomy and epidermal structure which will be described and discussed according to the terminology of Ellis (1976; 1979).

In the anatomical descriptions which follow, the following abbreviations will be used:

vb/s—vascular bundle/s
ibs—inner bundle sheath; parenchyma sheath.
obs—other bundle sheath; parenchyma sheath.

ANATOMICAL DESCRIPTION OF MERXMUELLERA STRICTA SENS. LAT.

Leaf in transverse section

Leaf outline: infolded with an elliptical or U-shaped outline. Permanently infolded in typical and Cathedral Peak forms (Figs 1–6) but regular opening to 180°
occurs in Drakensberg form (Fig. 9) and to 45° in the alpine form (Fig. 12). Lamina symmetrical about the median vb. 9–13 vbs present in leaf section (Table 1) with the alpine form always with 9 vbs (Figs 10–12) and typical *M. stricta* with 11 or 13 (Figs 1–3). Adaxial channel an extremely narrow and deep cleft in the typical and Cathedral Peak forms and is narrower than the lamina thickness in the Drakensberg and alpine forms when infolded. Leaves narrow (<1.1 mm wide) when folded. Adaxial furrows of variable depth but constant for each of the “forms” (Table 1); narrow, cleft-like. Similar ribs over all vbs when present; rounded or flat-topped with one vb per rib. Adaxial surface smooth except in typical *M. stricta* where grooves are present on either side of the median vb (Figs 1–3). Median vascular bundle: present; indistinguishable structurally from lateral l’vbs. Vascular bundle arrangement: no 2’vbs; 3’vbs absent between lateral l’vbs. 3 or 4 l’vbs in each half of the lamina in typical form but decreasing to two in alpine form. All bundles located in centre of blade. Vascular bundle structure: vbs circular or elliptical in shape; xylem and phloem distinguishable in all vbs; phloem adjoins ms; often divided by intrusion of fibres in typical *M. stricta* (Figs 2 & 3) and the Cathedral Peak form (Fig. 5). Lysigenous cavities present. Metaxylem vessels thickened, circular and very narrow. Vascular bundle sheaths: obs circular or elliptical but normally horseshoe shaped due to wide abaxial interruptions. Adaxial extensions present but cell composition differs in each of the “forms”. Obs cell shape variable from round to elliptical but all cells in a given leaf similar in shape. Obs cells conspicuous but not larger than the...
Figs 13-24.—Abaxial epidermis of *Merxmuellera stricta* sens. lat. as seen in surface view. 13–15, typical *M. stricta* form. All with round silica bodies. (13, Roberts 2034, ×250, note absence of intercostal zones; 14, Ellis 1156, ×250, note stomatal files and intercostal zones; 15, Ellis 2317, ×640) 16–18, Cathedral Peak form. Silica bodies dumb-bell shaped. (16, Ellis 2372, ×250; 17, Galpin 10357, ×250; 18, Ellis 3289, ×400) 19–21, Drakensberg form. Dumb-bell shaped silica bodies. (19, Acocks 22069, ×160; 20, Ellis 1428, ×400; 21, Ellis 3290, ×400) 22–24, Alpine bog form. Silica bodies crescent-shaped, round or irregularly dumb-bell shaped. Macro-hairs, micro-hairs and prickles common. All ×160. (22, Du Toit 2206; 23, Ellis 3181; 24, Ellis 1393.)

mesophyll cells; without chloroplasts (Fig. 26). Ibs complete; small cells with U-shaped thickenings; adaxial cells larger than lateral cells (Fig. 26). Sclerenchyma: Adaxial sclerenchyma variable from minute strands in the Cathedral Peak form (Figs 4–6) to well-developed, inversely anchor-shaped girders in typical *M. stricta* (Figs 1–3) or the alpine form (Figs 10–12) (Table 1). Abaxial girders well developed; either trapezoidal (Fig. 1 & 7) or narrower than the vb (Figs 2 & 5). In certain specimens of typical *M. stricta* individual girders fuse forming a continuous, abaxial, hypodermal band (Fig. 1). Margin: small, triangular, sclerenchyma caps developed. Mesophyll: not radiate; composed of regular, small, isodiametric, tightly packed cells (Fig. 26). Tall, narrow groups of sclerenchyma tissue between consecutive vb's separated by sclerenchyma girders. No colourless cells. Adaxial epidermis: bulliform cells poorly developed; basal cells of furrows may be slightly enlarged to form small, fan-shaped groups (Table 1). Epidermal cells inflated with outer wall slightly thickened. Macro-hairs and prickles absent; hooks occur irregularly. Cells variously papillate; one papillus per cell. Adaxial papillae best developed in typical *M. stricta* (Fig. 1). Abaxial epidermis: no bulliform cells developed. Hooks, prickles, macro-hairs and papillae lacking. Outer tangential wall flattened with smooth, continuous cuticle.

Abaxial epidermis in surface view

Intercostal zones: differentiated except in typical *M. stricta* specimens with continuous hypodermal sclerenchyma layer (Figs 1 & 13). Long cells medium to elongated with parallel, slight to moderately undulating, side walls. Silico-suberose couples between successive long cells. No bulliform cells. Stomata: absent in alpine form (Figs 22–24) and in those typical *M. stricta* specimens with hypodermal sclerenchyma layer (Fig. 13). Low dome-shaped, 1–2 files of stomata in centre of each intercostal zone; files adjacent to one another. One interstomatal cell between successive stomata. *Intercostal short cells*: silico-suberose couples; cork cell tall and narrow to crescentic; occur between most intercostal long cells. *Papillae*:
TABLE 1.—The differences in leaf anatomy and spikelet morphology between the different forms of *Merxmuellera stricta*

| Character                          | Typical *M. stricta* form | Cathedral Peak form | Drakensberg form | Alpine form |
|-----------------------------------|---------------------------|---------------------|------------------|-------------|
| 1. Outline of lamina              | 1. Permanently infolded   | 1. Infolded but regularly opens to 180° | 1. Infolded but opening to 45° possible | 1. Infolded but opening to 45° possible |
| 2. Number of vbs in leaf section | 2. 13 (sometimes 11)      | 2. 11 (sometimes 9) | 2. 9 vbs         | 2. 9 vbs    |
| 3. Adaxial furrows                | 3a. Slight to medium >½ leaf thickness | 3a. Absent       | 3a. Medium >½ leaf thickness | 3a. Medium >½ leaf thickness |
| 4. Abaxial furrows                | 4. Single furrow on either side of median vb | 4. No furrows present | 3b. A single furrow on either side of median vb only | 3b. Present between all vbs |
| 5. Phloem                         | 5. Usually divided into groups by intrusive fibres | 5. Sometimes exhibit sclerosed phloem | 5a. No intrusive fibres |
| 6. Adaxial extensions of outer bundle sheath | 6a. Parenchymatous grading gradually into fibres | 6a. Thin-walled colourless parenchyma | 6b. Thick-walled parenchyma abruptly becoming sclerosening parenchyma |
| 7. Adaxial sclerenchyma           | 7. Inversely anchored with long, thin stem | 7. Minute strand only; sometimes absent | 7. Short, wide extensions of 3 or 4 cells deep |
| 8. Bulliform cells                | 8. Poorly developed only at base of furrow on either side of median vb | 8. Absent | 8. Well-developed fan shaped groups at base of furrow on either side of median vb |
| 9. Epidermal hairs               | 9. Micro-hairs only; rare | 9. Micro-hairs only | 9. Micro - hairs but sometimes macro-hairs occur |
| 10. Silica body shape             | 10. Rounded or elliptical | 10. Dumb-bell shaped | 10. Dumb-bell shaped but round in a few specimens |
| 11. Lower glume length            | 11. (11-) 15,2 mm (-22)  | 11. (9-) 10,7 mm (-12) | 11. (14-) 17,8 mm (-22) |
| 12. Length of lower lemma awn     | 12. (9-) 12,5 mm (-16)   | 12. (8-) 9,8 mm (-11) | 12. (8-) 12,0 mm (-14) |
| 13. Hairs on back of lemma at point of insertion of awn | 13. Glabrous; occasionally very sparse; scattered hairs present | 13. Densely hairy; hairs 2-3,2 mm long | 13. Always glabrous |

abseond. *Prickles-hairs:* only present on alpine form (Fig. 22) (Table 1). Barbs short. *Micro-hairs:* present but very rare in typical *M. stricta* and then only in specimens with intercostal zones; common in other three “forms”. Bicellular, elongated (especially in alpine form); basal cell slightly longer than distal cell; tapering distal cell thin-walled (Fig. 18). *Macro-hairs:* absent except on all specimens of alpine form; occur in groove on either side of median vb in one specimen of Drakensberg form (Fig. 19). Unicellular, inflexible: 2-3 specialized epidermal cells associated with base of hair; base somewhat swollen in relation to hair thickness. *Silica bodies:* differ in different “forms” (Table 1). Costal bodies rounded or elliptical in typical *M. stricta* (Figs 14 & 15) and in certain specimens of Drakensberg form; dumb-bell shaped in Drakensberg and Cathedral Peak form (Figs 18, 20, 21); small rounded to elliptical and associated with crescentic cork cell in alpine form (Figs 22 & 24), Granules present. Width same as adjacent costal long cells except in alpine form. *Costal cells:* silica cells alternate with costal short cells except in alpine form where silico-suberosa couple alternate with costal short cells; files with silica cells alternate with files of costal long cells in all forms except alpine form.

Specimens examined.

**Typical *M. stricta* form**

*CAPE.—3119 (Calvina): Van Rhyns Pass (-AC), Ellis 1159, 1140; Kobe Mts (-CA), Ellis 2445, 2447*.

*MERXMUELLA STRICTA*

O.F.S.—2828 (Bethlehem): Golden Gate National Park, Brandwag Peak (-DA), Ellis 2371, 2372.

**Cathedral Peak form**

NATAL.—2829 (Harrismith): Royal Natal National Park (-CB), Galpin 10337; Cathedral Peak Forest Reserve (-CC), Killek 1100, 1576, Ellis 3299, 3295, 2929 (Underberg); Giants Castle Game Reserve (-AB), Trausdel 833, Nungiyie (-BA), Du Toit 2516; Highmoor Forest Reserve (-BC), Du Toit 2500.

**Drakensberg form**

NATAL.—2829 (Harrismith): Cathedral Peak Forest Reserve (-CC), Ellis 1428, 3290, 3299, 2929 (Underberg); Giants Castle Game Reserve, Bannermans Pass (-AD), Ellis 3318, 3321; Loteni Game Reserve (-DA), Ellis 3222.

*Specimens with continuous abaxial hypodermal sclerenchyma layer and without stomata.*

† Specimens cited by Conert (1975) as being *M. guillarmodiacea.*
Alpine form (M. guillarmodiae)

NATAL.—2829 (Harrismith): Cathedral Peak Forest Reserve, summit above Yellow Gap (–CC), Ellis 1393, 3181, 3182, 3208, 3226 (Fort Beaufort): Great Winterberg (–AD), Story 4522.*

LESOTHO.—2929 (Underberg): Sehlabathebe National Park (–CC), Du Toit 2631, 2642.

CAPE.—3028 (Matsatle): Quacas Nek (–BA), Ellis 243*; Ramatseliseonek (–BB), Acoks 22060, 3226 (Fort Beaufort): Great Winterberg (–AD), Story 4522.*

DISCUSSION AND CONCLUSIONS

All the specimens examined in this study have the lateral first order vascular bundles located adjacent to one another and lack the single third order bundle interspersed between them which is characteristic of M. disticha (Ellis, 1980). M. dura, considered to be closely allied to M. stricta (Chippindall, 1955; De Wet, 1960), does not share this characteristic and has, therefore, been excluded from the present considerations.

Anatomically the leaf structure of the typical M. stricta form is remarkably constant throughout its wide distributional area (Fig. 33). The only anatomic difference of mention is the development of a continuous abaxial hypodermal sclerenchyma layer (Fig. 1) with the resultant exclusion of the intercostal zones and stomata (Fig. 13). This structure was present in 40% of the specimens examined in this study, and occurs in plants from widely scattered localities, throughout the range of this form, and does not appear to be correlated with any obvious environmental factor. Morphologically there is a definite tendency for these specimens to have shorter glumes ([11–] 12.1 mm (–15]) than the remainder of the typical M. stricta specimens ([15–] 17.5 mm (–22)). These two characters, therefore, appear to be constantly linked and, on the basis of glume length, these shorter spikelets tend to resemble the Cathedral Peak form of M. guillarmodiae (Table 1). However, the M. stricta form has distinctly longer awns—averaging 11.1 mm as against 9.8 mm for the Cathedral Peak form. This form, however, does not have a continuous hypodermal sclerenchyma layer (Fig. 4) and has numerous stomatal files (Figs 16–18).

The anatomy of the Cathedral Peak form is unmistakable, due to the shape of the adaxial groove which lacks ribs and furrows, (Figs 4–6) and due to the occurrence of dumb-bell shaped silica bodies (Figs 16–18). This type of anatomical structure appears to be strongly correlated with M. guillarmodiae spikelet characters, such as the presence of hairs on the back of the lemma up to the point of insertion of the central awn (Conert, 1975). However, as Conert (1975) points out the hair arrangement of the cited Cathedral Peak form specimens (Killick 1100, 1576) resembles that of M. guillarmodiae, but the hairs themselves, are longer. The typical M. guillarmodiae spikelet character resembles the Cathedral Peak form specimens examined, having hairs up to 2.0 mm in length with the lemma being sparsely hairy but the Cathedral Peak form specimens are densely hairy on the back of the lemmas with the hairs being from 2.0–3.2 mm long.

All morphological indications are, therefore, that this Cathedral Peak form is closely linked to the typical M. guillarmodiae or alpine form. However, one specimen, Trauseld 833, does not exhibit any of these M. guillarmodiae spikelet characteristics. Although the adaxial groove and silica bodies conform, it differs anatomically from the remainder of the Cathedral Peak form sample in that it lacks adaxial bundle sheath extensions and thus the mesophyll distribution is continuous adaxially and not restricted to separate tall and narrow groups (Fig. 6). This specimen was collected at Giants Castle and, although this area was revisited, no plants with Cathedral Peak form anatomy or morphology were located. The Drakensberg form, which Trauseld 833 resembles morphologically, is common in this area, but all specimens collected had the distinctive Drakensberg form anatomy. Specimens, conforming anatomically and morphologically with the Cathedral Peak form, do occur at Highmoor to the south of Giants Castle, e.g. Du Toit 2500.

Further collections from the southern Drakensberg are required to help clarify the relationships of this Cathedral Peak form. It has been grouped under M. guillarmodiae (Conert, 1975) together with the alpine form, which it closely resembles morphologically. Anatomically, however, it has most in common with the Drakensberg form. Both these latter “forms” have similar sclerenchyma girders and bundle sheath extensions but, most significantly, both have dumb-bell shaped silica bodies.

The Drakensberg form, on the other hand, although resembling the Cathedral Peak form anatomically, differs significantly morphologically. The back of the lemmas are glabrous along the centre, as in typical M. stricta, and the lower glumes are much longer (Table 1). Anatomically the most important difference is the two deep adaxial furrows on either side of the median vascular bundle (Fig. 7) and the laminae are capable of opening to 180° (Fig. 9) especially during conditions of low irradiance. This ability is undoubtedly functionally significant and was possibly partly responsible for the relative success of this Drakensberg form in the north-eastern mountains.

* Specimens with round or elliptical silica bodies.
† Specimens cited by Conert (1975) as being M. guillarmodiae.
A comparison between the leaf anatomy of the setaceous-leaved, summer rainfall *Pentaschistis* species with the anatomy of the leaves of the *Merxmuellera stricta* group. 25, *Pentaschistis basutorum*, Ellis 2368, ×160. Note arrangement of large and small vascular bundles. 26, *Merxmuellera guillarmodiae*, Ellis 3289, ×400. Detail of mesophyll and bundle sheath structure typical of the *M. stricta* group. 27-28, *Pentaschistis fibrosa*. (27, Du Toit 646, ×160, note vascular bundle arrangement; 28, Du Toit 2301, ×400, outer bundle sheath cells thin-walled and inconspicuous.) 29-30, *Pentaschistis tysonii*. (29, Ellis 3302, ×250, third order bundles absent; 30, Ellis 3319, ×400, bundle sheath cells distinct.) 31-32, *Pentaschistis* sp. (31, Ellis 1409, ×100, no third order bundles between lateral first order bundles; 32, Ellis 3292, ×400.)
This anatomical difference, although distinct and consistent, may, however, not be as significant as it initially appears. It can be simply explained by opposite developmental trends in respect of only a single character—a single adaxial furrow on either side of the median vascular bundle. The epidermis also closely resembles that of the Cathedral Peak form as both have dumb-bell shaped silica bodies (Figs 16-21).

The anatomical indications are, therefore, that the Drakensberg form resembles the Cathedral Peak form more closely than either of the other two forms. These similarities are not corroborated by spikelet structure, however, and in this respect the Drakensberg form displays typical M. stricta structure.

Some Drakensberg form specimens from the eastern Cape (Ellis 243; Story 4522), however, anatomically demonstrate this relationship with typical M. stricta. These specimens have round silica bodies, with characteristic M. stricta type epidermal structure but in section the anatomy is typical of the Drakensberg form. This observation, therefore, provides an important clue as to the affinities of this form and provides an anatomical link to support the morphological evidence. A degree of morphological and anatomical gradation appears to occur between these two forms in the areas of sympathy in the north-eastern Cape and once again further collecting is required to help confirm affinities between the Drakensberg, Cathedral Peak and typical M. stricta forms.

The anatomy of the alpine form specimens compares very favourably with that of the type specimen of M. guillarmodiae (Jacot-Guillarmod 3734). This form appears to be distinct, both anatomically and morphologically, from M. stricta (Conert, 1975) although the Cathedral Peak form is intermediate in most spikelet characters (Table 1). In addition it has specialized habitat requirements, being restricted to the higher alpine zone of the Drakensberg, often associated with boggy conditions. It is, therefore, not spatially associated with any of the other forms.

This alpine form of M. guillarmodiae exhibits striking resemblances, in habitat preferences, growth form and anatomy, with the alpine bog form described in M. disticha (Ellis, 1980). Anatomical similarities are rib and furrow distribution and form, mesophyll configuration and epidermal structure. The only difference is in the pattern of vessels of the various orders of vascular bundle along the width of the lamina. This arrangement differs in the two "forms" but corresponds with the patterns found in either typical M. stricta or typical M. disticha. This difference is correlated with differences in inflorescence characters—a contracted panicle in M. stricta and a distichous spike in M. disticha—and appears to indicate the relationships of the alpine "forms". This seems to be an excellent example of convergent evolution in response to similar environmental conditions.

The most obvious morphological differences between the specimens of the four "forms" of M. stricta, recognized and examined in this study, are briefly summarized in Table 1. Typical M. stricta and the Drakensberg form have significantly longer lower glumes than do the alpine and Cathedral Peak forms. The longer glumes are associated with longer awns on the lower lemma except in the Cathedral Peak form which is intermediate between the alpine form and the other two. The Cathedral Peak and typical M. stricta forms are glabrous on the back of the lower lemma along the central vein up to the base of the central awn, although, occasionally, a few scattered hairs may be present in M. stricta type specimens. In both the alpine and Cathedral Peak forms the back of the lemma is hairy—sparsely hairy with hairs up to 2 mm long in typical M. guillarmodiae (the alpine form) but densely hairy with longer hairs (2.0-3.2 mm long) in the Cathedral Peak form.

Morphological characters, therefore, indicate two groups in M. stricta sens. lat.—the typical M. disticha and Drakensberg forms sharing certain characters whereas, the same characters differ considerably in the alpine and Cathedral Peak forms. This grouping is not confirmed by anatomical evidence which indicates close relationships between the Cathedral Peak and Drakensberg forms with typical M. stricta and the alpine forms being distinct. However, a few specimens with anomalous anatomy tend to break down the rigid anatomical divisions and, thereby, add substance to the morphological grouping.

The acceptance of the morphological groupings as reflecting affinities, implies that silica body structure is of no significance in this instance. This would normally be considered unlikely as silica bodies are usually of considerable value taxonomically (Metcalfe, 1960). Typical M. stricta specimens have classic rounded or elliptical festucoid-type silica bodies whereas, both the Drakensberg and Cathedral Peak forms have panicoid-type, dumb-bell shaped bodies (Clifford & Watson, 1977). All other indications are that typical M. stricta and the Drakensberg form are closely related except for silica body shape. In fact, these two "forms" of the same species possess silica bodies supposedly characteristic of different tribal groupings (Prat, 1932; 1936). De Wet (1954, 1956, 1960) notes the mixed character of the epidermis in M. stricta but actually refers to the association of micro-hairs (a panicoid character) with the festucoid elliptical silica bodies. Two panicoid epidermal characters may, therefore, occur in M. stricta sens. lat. but this is not supported by other anatomical evidence.

The recent description of M. guillarmodiae (Conert, 1975) as a separate species initially appears justified on the anatomical evidence presented in this paper. However, certain M. guillarmodiae specimens, included here in the Cathedral Peak form, differ dramatically from the type of M. guillarmodiae (the alpine form) and, applying the same criteria appear to merit specific status in their own right. The Drakensberg form would then also warrant specific status. This implies that a further two species require description, as is the case in M. disticha where an almost identical anatomical situation exists (Ellis, 1980). However, especially in M. stricta, these anatomical differences do not correlate very well with morphological differences.

This anatomical c l i e v e r : i c a t i o n w i t h M e r x m u e l l e r a populations in this restricted area of high altitudes and of climatic extremes also appears to be reflected by the description of M. stereophylla. (J. G. Anders.) Conert (Anderson, 1962) from M. drakensbergensis (Schweick.) Conert. The recognition of M. stereophylla was based on morphological and ecological grounds but, in this case, the anatomical differences are minimal in comparison with the differences between the anatomical "forms" of M. stricta and M. disticha.

In addition, two of the four setaceous-leaved Pentaschistis species from this same area, display remarkable anatomical similarities with M. stricta.
The grasses and other anatomical "forms", described in both
anatomical "forms" are of considerable magnitude, disjunct and are correlated
with other anatomical, morphological and ecological characteristics. In many instances these differences are, therefore, greater than are those between other
Merxmuellera species and even between some of the genera of the Danthoniaeae.

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UUTREKSEL

Die anatomiese struktuur, van die blaar in dwarsnee en die abakiale epidermis, van Merxmuellera stricta (Schrad.) Conert word beskryf en geïllustreer. Vier asoenderlike anatomiese "vorme" word erken: die tipiese M. stricta vorm, die Cathedral Peak vorm, die Drakensberg vorm en die alpiene vorm. Die alpiene en Cathedral Peak vorme is onlangs beskryf as M. guillarmodiae Conert (1975). Die mate van anatomiese diversifikasie van al hierdie "vorme" toon 'n ooreen­koms met die toestand wat in M. disticha beskryf is (Ellis, 1980). Populasies van, beide M. stricta en M. disticha, van die Drakensberge, vertoon anatomiese diversifikasie op groot skaal wat ook gekorreler is met omgewingsfaktore. Boonop is morfologiese verskille ook sigbaar en hierdie anatomiese "vorme" van M. stricta verdien vermoedelik om taksonomiese erkenning te verkry.

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