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A KEY BASED ON EPIDERMAL CHARACTERISTICS FOR THE IDENTIFICATION OF CERTAIN HIGHVELD GRASSES*

by

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Abstract – The grass leaf epidermis shows characteristic features which are taxonomically valuable and which renders leaf fragments identifiable in the stomach contents and faeces of animals. A brief account of the features of the grass epidermis is given, as well as the terminology which is used.
A key to identify 60 grass species of the Van Riebeeck Nature Reserve, near Pretoria, Republic of South Africa, is given. This key is based on abaxial leaf epidermal characteristics.

Introduction

The taxonomic significance and importance of the epidermis of the leaves of grasses have been dealt with by a large number of authors (Duval-Jouve, 1875; Pratt, 1932; Metcalfe, 1960). The characteristic taxonomic significance of the epidermis of grasses has been used to identify and classify different grass species. It has even been used to distinguish sub-species from one another (Goossens and Theron, 1934; Borrill, 1957). The most recent application of the epidermal identification of grass species is found in the identification of grass species in the stomach contents and faeces of animals (Baumgartner and Martin, 1939; Dusi, 1949; Martin, 1955, 1964; Davies, 1959; Hercus, 1960; Storr, 1961; Stewart, 1965, 1967, 1971; and Stewart and Stewart, 1970). In South Africa it is only during the past four years that an attempt has been made to identify food plants in the faeces of game (McAllister, 1967; Liversidge, 1970).

In the present study the epidermis of sixty grasses in the Van Riebeeck Nature Reserve, near Pretoria, Republic of South Africa, was studied in order to determine whether these species could be identified in the faeces of blesbok.

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Material and Methods

Leaves from the top of the culm as well as from the tuft, of the different grass species were collected. Slides were prepared from the epidermis taken from the base, the middle, as well as from the apex of both kinds of leaves. The reason for preparing more than one slide for every grass species was to overcome intraspecific variations.

Various methods were used in the preparation of the slides (Croker, 1959; Hercus, 1960; Metcalfe, 1960; and Storr, 1961). Drawings of the epidermis were made with the aid of a Leitz S. M. microscope and Leitz microprojector.

Features of the grass epidermis

A detailed description of the epidermis is given by Metcalfe (1960) and the terminology which he adopted was used to describe the epidermis of the different grasses. The following notes are intended to make the key intelligible and to give a general idea of the taxonomic features of the epidermis.

For descriptive purposes the epidermis is viewed with the long axis of the leaf horizontal in the field of the microscope. All the directions parallel to the long axis are then horizontal and those perpendicular to the long axis vertical.

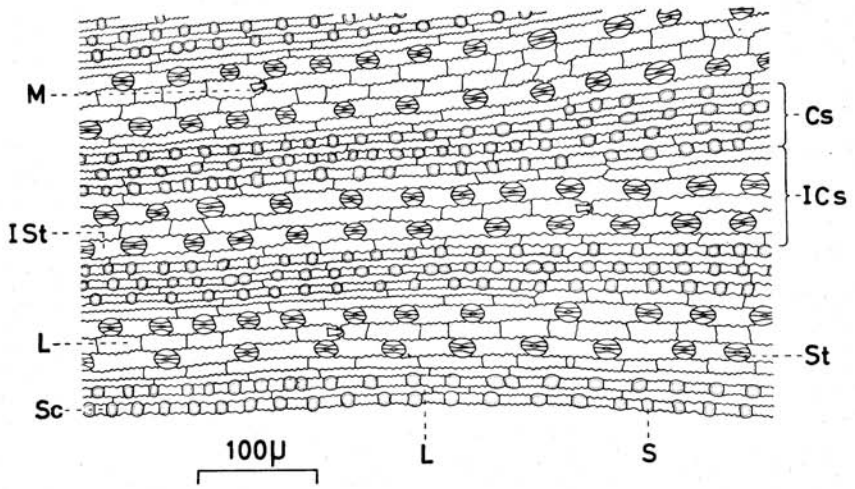

Fig. 1. Surface-view of the abaxial epidermis of *Tragus berteronianus* Schult. Cs costal zone; ICs intercostal zone; ISt interstomatal-cell; L long-cell; M micro-hair; S silica-cell; Sc short-cell; St stomata.

The epidermis of the grass leaf in surface view is divided horizontally into costal zones, which are characterized by the abundance of silica-cells, and the intercostal zones between the costal zones (Fig. 1). According to Metcalfe (1960) two types of epidermis cells may be distinguished,

namely long-cells and short-cells. In this study three categories of cells, *viz.* long-cells, silica-cells and short-cells were identified.

1.0 *Long-cells*

These are cells with horizontal walls longer than twice the vertical walls. For identification purposes the shape of the cells and their wall were taken into consideration:

(a) Long-cells with sinuous (Fig. 2A) and non-sinuous walls (Fig. 2B).
(b) Brick-shaped long-cells (Fig. 2A) and inflated long-cells (Fig. 2B).

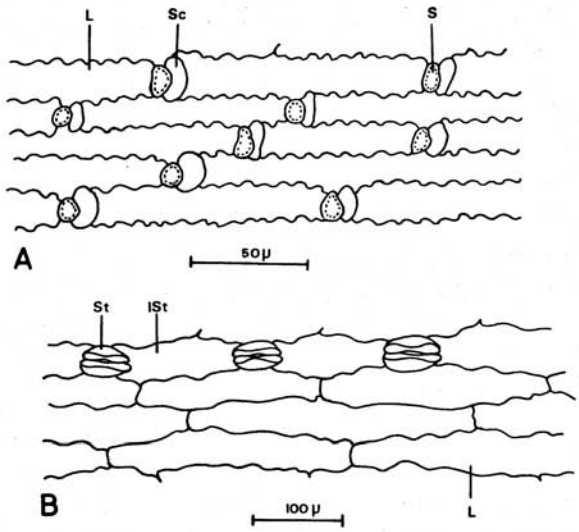

Fig. 2. Long-cells and interstomatal-cells. ISt interstomatal-cell; L long-cell; S silica-cell; Sc short-cell; St stomata.

2.0 *Silica-cells*

These cells contain a silica-body. The shape of the cell and the body do not always correspond. In the description of silica-cells it is important to state whether it is the shape of the cell or that of the body which is described (Metcalfe, 1960). In this study the description refers to the shape of the silica-body.

The following types of silica-bodies were recognized:

(a) Dumb-bell shaped. Either long dumb-bell shaped (Fig. 3A) or short dumb-bell shaped (Fig. 3B).
(b) Cross-shaped (Fig. 3C).
(c) Nodular (Fig. 3D).
(d) Saddle-shaped. The long axis can be either horizontal (Fig. 3E) or vertical (Fig. 3F).
(e) Elliptical with the long axis horizontal (Fig. 3G) or vertical (Fig. 3H).
(f) Crescent-shaped (Fig. 3I).

(g) Round (Fig. 3J).
(h) Quadrangular (Fig. 3K).
(i) Rectangular (Fig. 3L).
(j) Tall and narrow (Fig. 3M).
(k) Irregular (Fig. 3N).

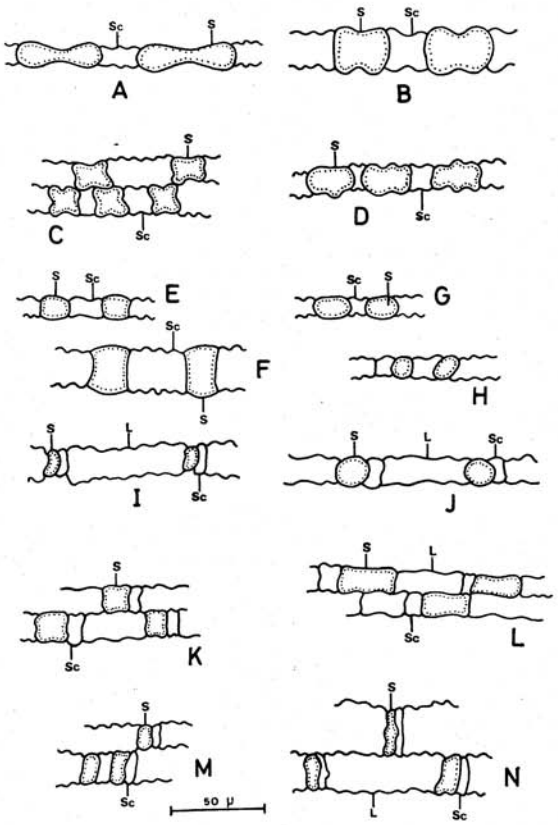

Fig. 3. Silica-bodies. L long-cell; S silica-cell; Sc short-cell.

3.0 *Short-cells*

The shapes illustrated for silica-cells are also common for the short-cells.

In the costal and intercostal zones, the silica-cells are mostly accompanied by short-cells (Fig. 4).

4.0 *Appendages of the epidermis*

4.1 *Micro-hairs*

All two-celled hairs were regarded as micro-hairs to correspond with Metcalfe (1960). Based on the shape of the basal cell and the length of the distal cell, four types were dinstinguished:

(a) Basal cell tapering to the base (Fig. 5A).
(b) Basal cell not tapering towards the base (Fig. 5B).

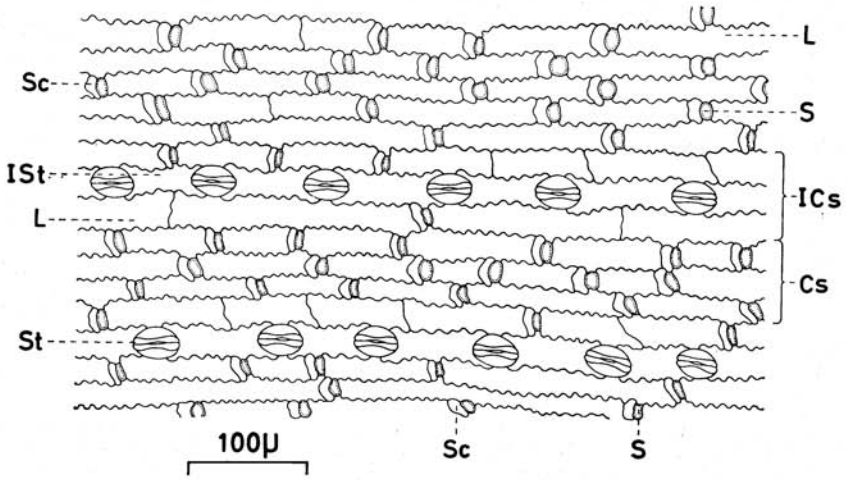

Fig. 4. Surface-view of the abaxial epidermis of *Eragrostis capensis* (Thunb.) Trin. Cs costal zone; ICs intercostal zone; ISt interstomatal-cell; L long-cell; S silica-cell; Sc short-cell; St stomata.

(c) Distal cell longer than the basal cell (Fig. 5C).
(d) Distal cell shorter than the basal cell (Fig. 5A).

Figs 5D and 5E show examples of one-celled micro-hairs which are too small to be regarded as macro-hairs.

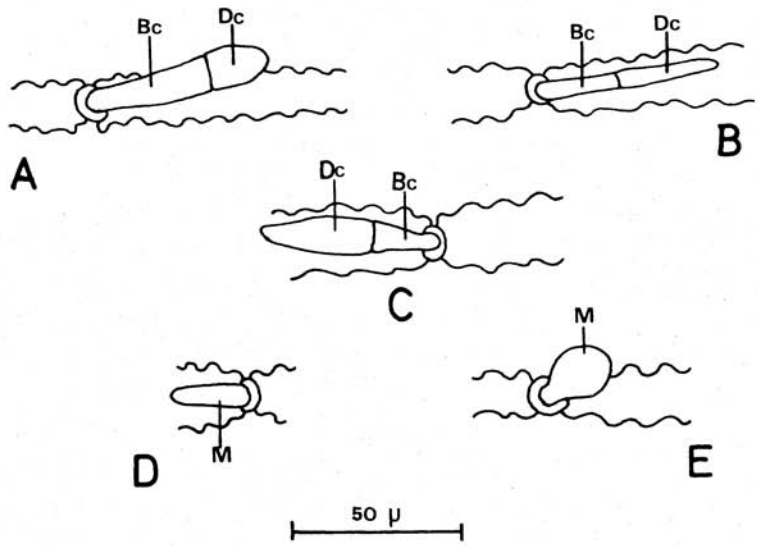

Fig. 5. Micro-hairs. Bc apical cell; Dc distal cell; M one-celled micro-hair.

4.2 *Macro-hairs and prickle-hairs*

According to Metcalfe (1960) it is sometimes difficult to distinguish between macro-hairs and prickle-hairs. The criterion used in this study is the length of the barb. The appendages with long barbs are regarded as macro-hairs and those with short barbs, as prickle hairs.

Macro-hairs

Two types of macro-hairs, based on the number of smaller epidermal cells surrounding the base, are distinguished:

(a) Base surrounded by one or two smaller epidermal cells (Fig. 6A).
(b) Base surrounded by more than two smaller epidermal cells (Fig. 6B).

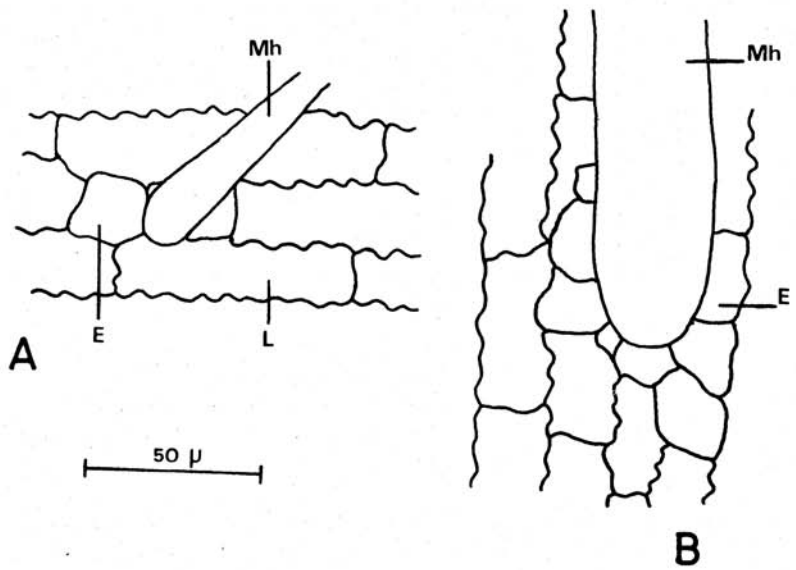

Fig. 6. Macro-hairs. E specialized (smaller) epidermal cell; L long-cell; Mh macro-hair.

Prickle-hairs

Based on the width of the base of the prickle-hairs, two types are recognized:

(a) Base narrower than adjacent cells (Fig. 7A).
(b) Base broader than adjacent cells (Fig. 7C).

The shape of the base also differs and three types are distinguished:

(a) Round base (Fig. 7A).
(b) Quadrangular to rectangular base (Fig. 7B).
(c) Elliptical base (Fig. 7C).

4.3 *Papillae*

These can be divided into two groups according to the number of papillae per cell.

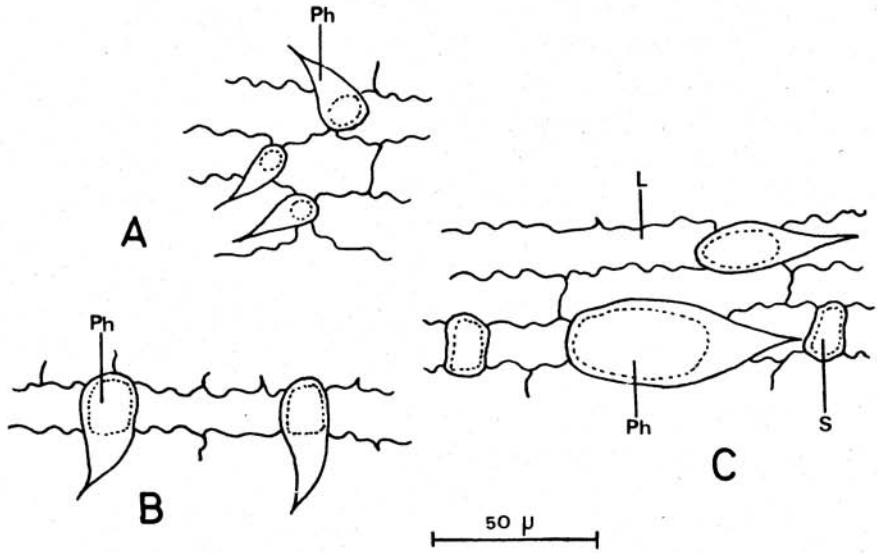

Fig. 7. Prickle-hairs. L long-cell; Ph prickle-hair; S silica-cell.

(a) One papilla per cell (Figs 8A and 8B).
(b) More than one papilla per cell (Fig. 8C).
The sizes of the papillae vary (Figs 8A and 8B).

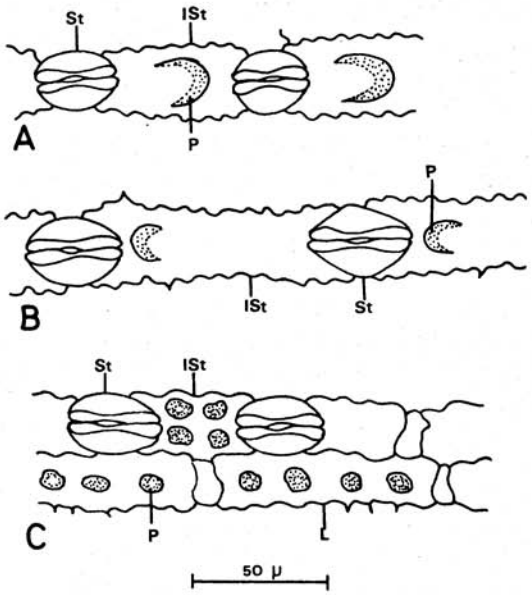

Fig. 8. Papillae. ISt interstomatal-cell; P papil; St stomata; L long-cell.

4.4 *Subsidiary cells of the stomata*

The shapes of the subsidiary cells vary and two types were recognized. However, this proved to be of minor taxonomic value.

(a) Triangular (Fig. 9A).

(b) Dome-shaped (Fig. 9B).

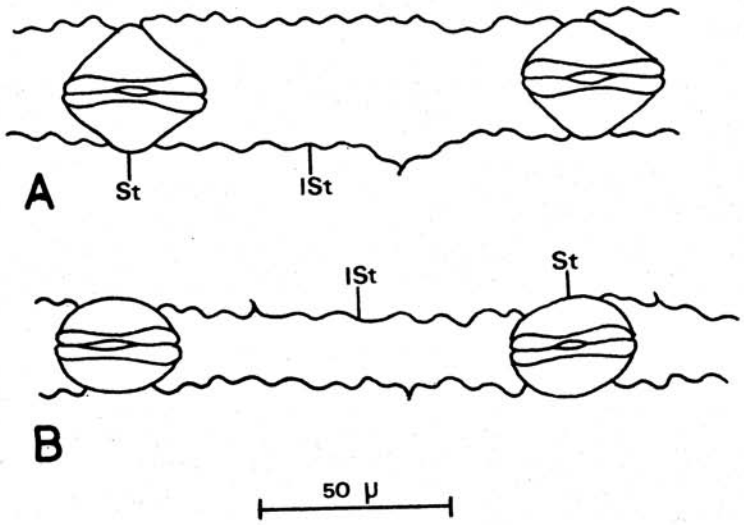

Fig. 9. Subsidiary cells of stomata. ISt interstomatal cell; St stomata.

KEY

1.	Silica-bodies on costal zones dumb-bell shaped	2
	Silica-bodies in costal zones not dumb-bell shaped	96
2.	No long dumb-bell shaped silica-bodies in costal zones	3
	Long dumb-bell shaped silica-bodies in costal zones	49
3.	Cross-shaped silica-bodies in costal zones	4
	No cross-shaped silica-bodies in costal zones	30
4.	Nodular-shaped silica-bodies in costal zones	5
	No nodular-shaped silica-bodies in costal zones	16
5.	Cells with papillae occur	6
	No cells with papillae occur	7
6.	Papillae on some long-cells as well as on some interstomatal-cells	*Echinochloa stagnina*
	Papillae on some interstomatal cells only	*Urelytrum squarrosum*
7.	No short-cells and silica-cells in intercostal zones	*Digitaria diagonalis*
	Short-cells and/or silica-cells in intercostal zones	8
8.	Prickle-hairs occur	9
	Prickle-hairs absent	11
9.	Prickle-hairs in costal and intercostal zones	10
	Prickle-hairs in costal zones only	*Rhynchelytrum setifolium*

10. Macro-hairs in intercostal zones only . . . *Urochloa panicoides*
    Macro-hairs on the margin of the leaf only . *Rhynchelytrum repens*
11. Macro-hairs occur 12
    Macro-hairs absent 14
12. Micro-hairs occur 13
    Micro-hairs absent . . . . . *Rhynchelytrum setifolium*
13. Majority of long-cells in intercostal zones alternate with a short-cell, silica-cell or a short- and silica-cell pair . *Panicum laevifolium*
    Minority of long-cells in intercostal zones alternate with a short-cell, silica-cell or a short- and silica-cell pair . *Urochloa panicoides*
14. Micro-hairs occur 15
    Micro-hairs absent . . . . . *Rhynchelytrum setifolium*
15. Interstomatal-cells shorter than the length of the stomata *Cymbopogon excavatus*
    Interstomatal-cells longer than the length of the stomata *Panicum laevifolium*
16. Irregular-shaped silica-bodies occur in costal zones . . . 17
    No irregular-shaped silica-bodies occur in costal zones . . 18
17. Rows of long-cells between rows of silica-cells in costal zones *Alloteropsis semialata*
    No rows of long-cells between rows of silica-cells in costal zones *Elyonurus argenteus*
18. Prickle-hairs occur 25
    Prickle-hairs absent 19
19. Cells with papillae 20
    No cells with papillae 21
20. Papillae on some long-cells, short-cells and interstomatal-cells *Echinochloa stagnina*
    Papillae on some interstomatal-cells only . *Diheteropogon amplectens*
21. Short-cells and silica-cells occur in intercostal zones . . . 23
    No short-cells or silica-cells occur in the intercostal zones . 22
22. Interstomatal-cells as long as or shorter than twice the length of the stomata . . . . . *Diheteropogon amplectens*
    Interstomatal-cells longer than twice the length of the stomata *Digitaria ternata*
23. Individual short-cells and silica-cells as well as short- and silica-cell pairs in the intercostal zones . . . . . *Cymbopogon excavatus*
    Only short- and silica-cell pairs in the intercostal zones . . 24
24. Interstomatal-cells taper towards the stomata; generally no long-cells between silica-cell rows in costal zone . . *Diheteropogon amplectens*
    Interstomatal-cells do not taper towards the stomata; long-cells occur between silica-cell rows in costal zones . . . *Setaria nigrirostris*
25. Prickle-hairs in costal zones only 26
    Prickle-hairs in costal and intercostal zones 28

26. Cells with papillae occur . . . . . *Echinochloa stagnina*
    No cells with papillae occur 27
27. Short-cells and/or silica-cells occur in intercostal zones . *Setaria nigrirostris*
    No short-cells or silica-cells in intercostal zones . *Digitaria ternata*
28. Prickle-hairs mainly in the costal zones . . *Diheteropogon amplectens*
    Prickle-hairs mainly on the sides of costal zones 29
29. Subsidiary-cells of stomata triangular . . . . *Digitaria smutsii*
    Subsidiary-cells of stomata dome-shaped . . . *Digitaria eriantha*
30. Nodular-shaped silica-bodies in costal zones 31
    No nodular-shaped silica-bodies in costal zones 36
31. Short- and/or silica-cells in intercostal zones 33
    No short- or silica-cells in intercostal zones 32
32. Brick-shaped long-cells with sinuous walls . . . *Digitaria ternata*
    Inflated long-cells with non-sinuous walls . . *Setaria sphacelata*
33. Long-cells between silica-cell rows in costal zones 34
    No long-cells between silica-cell rows in costal zones . . *Imperata cylindrica*
34. Individual short-cells and silica-cells as well as short- and silica-cell pairs in intercostal zones . . . *Schizachyrium sanguineum*
    Only short- and silica-cell pairs in intercostal zones . . . 35
35. Majority of long-cells in intercostal zones alternating with a short- and silica-cell pair . . . . . *Setaria nigrirostris*
    Minority (often none) of long-cells in intercostal zones alternate with a short- and silica-cell pair . . . . . *Setaria flabellata*
36. Prickle-hairs occur 37
    Prickle-hairs absent 43
37. Prickle-hairs in intercostal zones only 38
    Prickle-hairs in costal and intercostal zones 39
38. Short-cells in intercostal zones . . . *Schizachyrium sanguineum*
    No short-cells in intercostal zones . . . . *Paspalum dilatatum*
39. Macro-hairs occur 40
    Macro-hairs absent 41
40. Macro-hairs in intercostal zones only . . . *Urochloa panicoides*
    Macro-hairs on the margin of the leaf only . *Rhynchelytrum repens*
41. Short-cells and/or silica-cells in intercostal zones 42
    No short-cells or silica-cells in intercostal zones *Digitaria diagonalis*
42. Basal-cell of micro-hairs longer than stomata . *Rhynchelytrum repens*
    Basal-cell of micro-hairs shorter than stomata . . *Setaria woodii*
43. Macro-hairs occur 44
    Macro-hairs absent 45
44. Majority of long-cells in intercostal zones alternate with a short-cell, silica-cell or a short- and silica-cell pair . *Panicum laevifolium*
    Minority of long-cells in intercostal zones alternate with a short-cell, silica-cell or with a short- and silica-cell pair *Urochloa panicoides*
45. Long-cells between silica-cell rows in costal zones 46

No long-cells between silica-cell rows in costal zones . . *Imperata cylindrica*

46. Short-cells and/or silica-cells in the intercostal zones . . . 47
No short-cells or silica-cells in intercostal zones *Digitaria diagonalis*

47. Interstomatal-cells longer than twice the length of the stomata, without papillae 48
Interstomatal-cells shorter than twice the length of the stomata, and generally with papillae . . . . *Schizachyrium sanguineum*

48. Majority of long-cells in intercostal zones alternate with a silica- and short-cell pair; one row of long-cells between silica-cell rows in costal zones . . . . . *Panicum laevifolium*
Minority of long-cells in intercostal zones alternate with a silica- and short-cell pair; one to two rows of long-cells between silica-cell rows in costal zones . . . . . *Setaria woodii*

49. Nodular-shaped silica-bodies occur in costal zones . . . 50
No nodular-shaped silica-bodies occur in costal zones . . 69

50. Prickle-hairs occur 59
Prickle-hairs absent 51

51. Cells with papillae occur 52
No cells with papillae occur 53

52. One papilla per cell . . . *Andropogon schirensis* var. *angustifolius*
More than one papilla per cell . . . . . *Themeda triandra*

53. Short-cells and/or silica-cells occur in intercostal zones . . 54
No short-cells and silica-cells occur in intercostal zones *Trichoneura grandiglumis*

54. Macro-hairs present 55
No macro-hairs present 56

55. Majority of long-cells in intercostal zones alternate with a short- and silica-cell pair; one or two long-cell rows between silica-cell rows in costal zones . . . . . *Setaria flabellata*
Minority of long-cells in intercostal zones alternate with a short- and silica-cell pair; one row of long-cells between silica-cell rows in costal zones . . . . . *Urochloa panicoides*

56. Long-cells in intercostal zones inflated with non-sinuous walls; majority of long-cells in intercostal zones alternate with a short- and silica-cell pair . . . . . *Setaria flabellata*
Long-cells in intercostal zones brick-shaped with sinuous walls; minority of long-cells in intercostal zones alternate with a short- and silica-cell pair 57

57. Majority of short- and silica-cells occur in pairs in intercostal zones; no papillae 58
No short- and silica-cell pairs in intercostal zones; papillae sometimes present . . . . *Andropogon schirensis* var. *angustifolius*

58. Interstomatal-cells taper sometimes a single row long-cells between silica-cell rows in costal zones . *Monocymbium ceresiiforme*
Interstomatal-cells do not taper one or two long-cell rows

between silica-cell rows in costal zones . . . . . *Setaria woodii*

59. Cells with papillae occur . . . . . *Themeda triandra*
    No cells with papillae 60
60. Prickle-hairs in either costal or intercostal zones 61
    Prickle-hairs in costal as well as intercostal zones 62
61. Prickle-hairs in costal zones . . . . . *Diplachne biflora*
    Prickle-hairs in intercostal zones . . . . . *Brachiaria serrata*
62. Long-cells in intercostal zones brick-shaped with sinuous walls 63
    Long-cells in intercostal zones inflated with non-sinuous walls *Setaria flabellata*
63. Macro-hairs occur 64
    Macro-hairs absent 66
64. Prickle-hairs on margin of intercostal zones . . *Brachiaria serrata*
    Prickle-hairs in centre of costal zones 65
65. Interstomatal-cells longer than twice the length of the stomata *Urochloa panicoides*
    Interstomatal-cells shorter than twice the length of the stomata *Trachypogon spicatus*
66. Basal cell of micro-hairs longer than distal cell *Ctenium concinuum*
    Basal cell of micro-hairs shorter than distal cell 67
67. Interstomatal-cells longer than twice the length of stomata . 68
    Interstomatal-cells shorter than twice the length of stomata *Trachypogon spicatus*
68. Interstomatal-cells horizontally tapered; sometimes a row of long-cells between silica-cell rows in costal zones . *Monocymbium ceresiiforme*
    Interstomatal-cells not horizontally tapered; one or two long-cell rows between silica-cell rows in costal zones . . . . *Setaria woodii*
69. Cells with papillae occur 70
    Cells with papillae absent 74
70. One papilla per cell 71
    More than one papilla per cell . . . . . *Themeda triandra*
71. Papillae on some long- and interstomatal-cells *Heteropogon contortus*
    Papillae on some interstomatal-cells only 72
72. Prickle-hairs occur 73
    No prickle-hairs occur . . *Andropogon schirensis* var. *angustifolius*
73. Basal cell of micro-hairs longer than stomata . . *Hyparrhenia hirta*
    Basal cell of micro-hairs shorter than stomata . *Trachypogon spicatus*
74. Prickle-hairs occur 75
    Prickle-hairs absent 87
75. Short-cells and/or silica-cells present in intercostal zones . . 80
    No short-cells or silica-cells in intercostal zones 76
76. Prickle-hairs in costal zones only 77
    Prickle-hairs in costal and intercostal zones 78
77. Long-cells in intercostal zones brick-shaped with sinuous walls *Diplachne biflora*

Long-cells in intercostal zones inflated with non-sinuous walls *Setaria pallide-fusca*

78. Long-cells in intercostal zones brick-shaped with sinuous walls 79
Long-cells in intercostal zones inflated with non-sinuous walls *Setaria sphacelata*

79. Basal cell of micro-hairs longer than distal cell . . *Trichoneura grandiglumis*
Basal cell of micro-hairs shorter than distal cell *Andropogon eucomus*

80. Prickle-hairs in costal zones only 81
Prickle-hairs in costal and intercostal zones 83

81. Long-cells in intercostal zones brick-shaped with sinuous walls 82
Long-cells in intercostal zones inflated with non-sinuous walls *Setaria pallide-fusca*

82. Basal cell of micro-hairs longer than the stomata . . *Aristida* spp.
Basal cell of micro-hairs shorter than the stomata . *Diplachne biflora*

83. Prickle-hairs on margins of costal zones 84
Prickle-hairs in centre of costal zones 85

84. Macro-hairs in intercostal zones only . . . *Tristachya rehmannii*
Macro-hairs, if present, on the margin of the leaf . *Rhynchelytrum repens*

85. Interstomatal-cells horizontally tapered; sometimes a single row of long-cells between silica-cell rows in costal zones *Monocymbium ceresiiforme*
Interstomatal-cells not horizontally tapered; one or two long-cell rows between silica-cell rows in co tal zones 86

86. Macro-hairs, prickle-hairs and/or papillae occur; one, two or all three abovementioned appendages may in exceptional cases be absent . . . . . *Trachypogon spicatus*
Macro-hairs, prickle-hairs and papillae absent; in highly exceptional cases one, two or all three abovementioned appendages may be present . . . . . *Andropogon eucomus*
(Although these two grasses are easily distinguished from one another under a microscope, it is difficult to separate them in a key).

87. Short-cells and/or silica-cells occur in intercostal zones . . 91
No short-cells and silica-cells in intercostal zones 88

88. Long-cells in intercostal zones brick-shaped with sinuous walls *Andropogon eucomus* and *Andropogon schirensis* var. *angustifolius* or 90
Long-cells in intercostal zones inflated with non-sinuous walls *Setaria pallide-fusca* and *Setaria sphacelata* or 89

89. Long-cells near costal zones less inflated than those in the centre of intercostal zones . . . . . *Setaria pallide-fusca*
Long-cells near costal zones do not differ significantly from those in the centre of intercostal zones . . . . *Setaria sphacelata*

90. Intercostal zones wider than five cell rows; papillae usually present . . . . . *Andropogon schirensis* var. *angustifolius*
Intercostal zones narrower than five cell rows; papillae never present . . . . . *Andropogon eucomus*

91. Long-cell rows occur between silica-cell rows in costal zones . 92
No long-cell rows occur between silica-cell rows in costal zones *Monocymbium ceresiiforme*

92. Basal cell of micro-hairs longer than stomata 93
Basal cell of micro-hairs shorter than stomata 94

93. Silica-cells in costal zones wider than long-cells in intercostal zones . . . . . *Aristida* spp.
Silica-cells in costal zones as wide as or narrower than long-cells in intercostal zones . . . . . *Loudetia simplex*

94. Majority of long-cells in intercostal zones alternate with short- and silica-cells individually or in pairs . *Triraphis andropogonoides*
Minority of long-cells in intercostal zones alternate with short- or silica-cells individually or in pairs 95

95. Centre width of interstomatal-cells is larger than length of silica-cells in costal zones . . . . . *Setaria pallide-fusca*
Centre width of interstomatal-cells is smaller then length of silica-cells in costal zones . . . . . *Andropogon eucomus*

96. Silica-bodies in costal zones are irregular, cross-shaped, tall and narrow or square 97
Silica-bodies in costal zones are saddle-shaped, round or oval 103

97. Long-cell rows between silica-cell rows in costal zones present 98
No long-cell rows between silica-cell rows in costal zones present 99

98. Nodular-shaped silica-bodies in costal zones . *Paspalum dilatatum*
No nodular-shaped silica-bodies in costal zones *Digitaria monodactyla*

99. Micro-hairs occur 101
Micro-hairs absent 100

100. Prickle-hairs occur . . . . . *Helictotrichon turgidulum*
Prickle-hairs absent . . . . . *Panicum natalense*

101. Cells with papillae occur . . . . . *Urelytrum squarrosum*
Cells with papillae absent 102

102. Subsidiary-cells of stomata dome-shaped . . *Elyonurus argenteus*
Subsidiary-cells of stomata triangular . . . *Hemarthria altissima*

103. Long-cell rows between silica-cell rows in costal zones present 108
No long-cell rows between silica-cell rows in costal zones present 104
104. Micro-hairs occur 106
Micro-hairs absent *Eragrostis gummiflua* and *Eragrostis plana* or 105
105. Majority of silica-bodies tall and narrow . . *Eragrostis gummiflua*
Minority of silica-bodies tall and narrow . . . *Eragrostis plana*
106. Micro-hairs one-celled . . . . . *Sporobolus pyramidalis*
Micro-hairs two-celled 107
107. Distal cell of micro-hairs longer than basal cell *Eragrostis capensis*
Distal cell of micro-hairs shorter than basal cell *Sporobolus pectinatus*
108. Micro-hairs occur 109
Micro-hairs absent . . . . . *Eragrostis curvula*
109. Micro-hairs one-celled 110
Micro-hairs two-celled 113
110. Prickle-hairs occur 112
Prickle-hairs absent 111
111. Silica-cells in costal zones wider than length of stomata *Microchloa caffra*
Silica-cells in costal zones as wide as or narrower then length of stomata . . . . . *Cynodon dactylon*
112. Silica-cells occur in intercostal zones . . . . *Cynodon dactylon*
No silica-cells in intercostal zones . . . . . *Chloris virgata*
113. Prickle-hairs occur 114
Prickle-hairs absent 121
114. Prickle-hairs in costal and intercostal zones . *Eragrostis heteromera*
Prickle-hairs in either costal or intercostal zones 115
115. Prickle-hairs in intercostal zones . . . . . *Paspalum dilatatum*
Prickle-hairs in costal zones 116
116. Cells with papillae present 117
No cells with papillae present 118
117. Macro-hairs in intercostal zones . . . . . *Cynodon hirsutus*
Macro-hairs on margin of the leaf . . . *Tragus berteronianus*
118. Short-cells and/or silica-cells in intercostal zones 120
No short-cells or silica-cells in intercostal zones 119
119. Macro-hairs in intercostal zones . . . . *Digitaria monodactyla*
Macro-hairs on margin of the leaf . . . *Tragus berteronianus*
120. Basal cell of micro-hairs as long as or shorter than length of stomata . . . . . *Eragrostis pseudo-sclerantha*
Basal cell of micro-hairs longer than length of stomata *Eragrostis chloromelas*

121. Short-cells and/or silica-cells present in intercostal zones . . 123
No short-cells and silica-cells present in intercostal zones . . 122

122. Macro-hairs in intercostal zones . . . . *Digitaria monodactyla*
Macro-hairs on margin of the leaf . . . *Tragus berteronianus*

123. Basal cell of micro-hairs shorter than distal cell . . *Eragrostis pseudo-sclerantha*
Basal cell of micro-hairs longer than distal cell 124

124. Basal cell of micro-hairs shorter than stomata 125
Basal cell of micro-hairs longer than stomata 126

125. Three adjacent silica-cells occur in silica-cell rows of costal zones . . . . . *Eragrostis racemosa*
Three adjacent silica-cells in silica-cell rows of costal zones do not occur . . . . . *Pogonarthria squarrosa*

126. Interstomatal-cells shorter than stomata . *Eragrostis chloromelas*
Interstomatal-cells longer than stomata . . . *Eragrostis heteromera*

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