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THE INDUMENTUM OF THE GENUS *DAMPIERA* R. Br. (GOODENIACEAE)

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Abstract

Hairs of 66 species of genus *Dampiera* R. Br., from the outside of corolla were examined. Three main types of hairs are recognized in this genus. The hairs shape and their nature can be used as a most important taxonomic tool for the recognition of *Dampiera* species.

Introduction

The genus *Dampiera* R. Br., belongs to family Goodeniaceae, it is endemic to Australia so far as its distribution is known. It consists of 66 species. The hairs of the family Goodeniaceae were not examined in detail before Carolin (1970). Krause (1912) used the indumentum types in his description and keys, and in *Dampiera* R. Br., he gave only one illustration of a hair i.e. that of *Dampiera luteiflora.*

The usefulness of hairs as an important taxonomic character has been diminished by the fact that no standard terminology exist for them. The descriptive vocabulary for indumentum mostly suffers from generalization, use of the words often not derived from latin and inconsistent application of these words. Nevertheless since the indumentum is frequently of diagnostic value a terminology is needed. Carolin (1970) has given standard terminology for the hairs of family Goodeniaceae.

Material and Methods

The hairs taken directly from the herbarium specimen, from the outside of corolla for 66 species of *Dampiera* were mounted on specimen stubs with double stick cellophane tape. The specimens were vapour-coated with 200–400 Å thickness of gold in a polaron coating machine, examined and photographed with JSM-U3 Scanning Electron Microscope and compound microscope. Two to three sample of hairs from the outside of corolla from each species were examined. Every specimen of all the species were examined using the compound light microscope. Most of the terms used in this treatment are those suggested by Carolin (1970), and some additions have been made. Most of the descriptions are given with illustrations.

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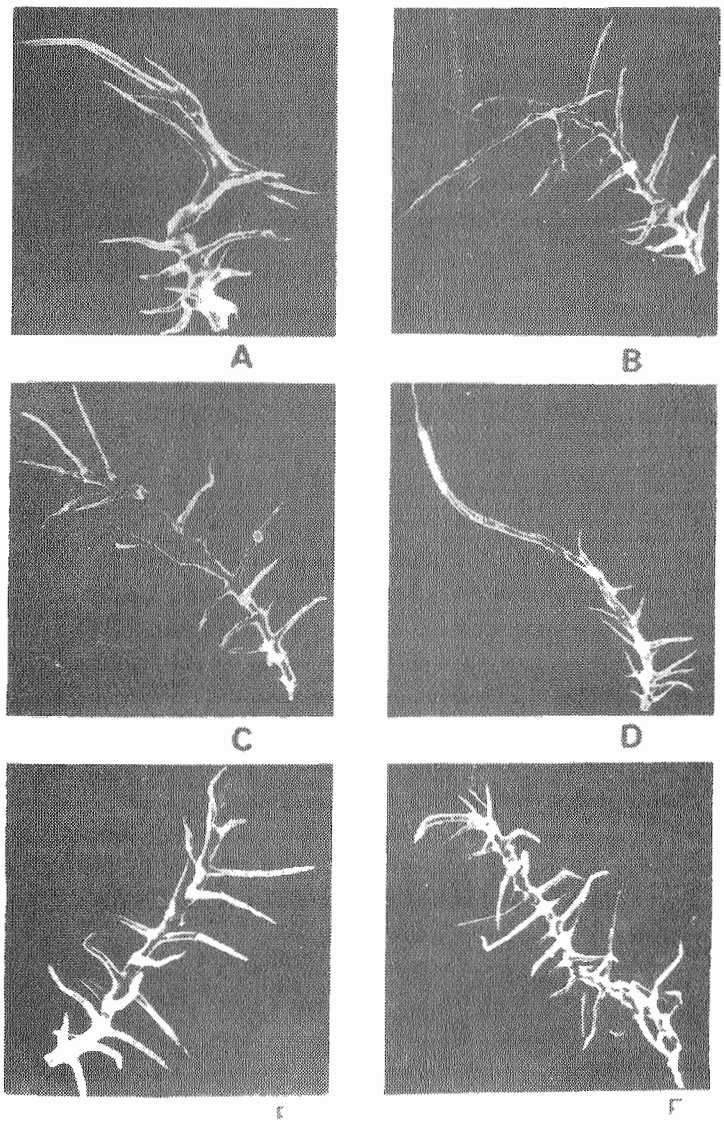

Fig. 1. Hairs of *Dampiera* species.

A. *D. haematotricha* ssp. *haematotricha*, 110 X. (Drummond 105, MEL 516692).

B. *D. lutiflora*, 90 X. (E. Pritzel 879, NSW 83459).

C. *D. lutiflora*, 90 X. (R.D. Royce 10444, SYD).

D. *D. dysantha*, 90 X. (M.E. Philips, CANB 031197).

E. *D. lanceolata* var. *lanceolata*, 100 X. (Peacock 60112.3, SYD).

F. *D. rosmarinifolia*, 110 X. (B. Copley 701, SYD).

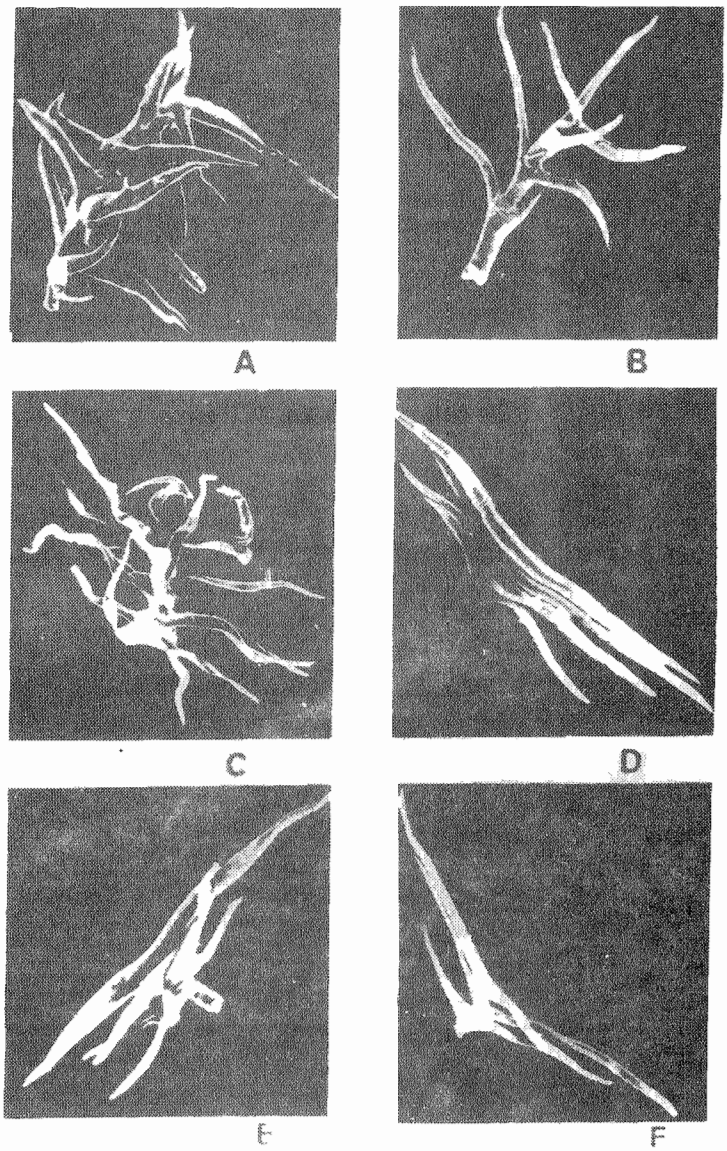

Fig. 2. Hairs of *Dampiera* species.

A. *D. haematotricha* ssp. *dura*, 170 X. (R. Carolin 3132, SYD).
B. *D. oligophylla* ssp. *juncea*, 260 X. (J. Peacock 6099.3, SYD).
C. *D. altissima*, 155 X. (C.A. Gardner 12721, PERTH).
D. *D. fasciculata*, 155 X. (A.M. Ashby 3598, SYD).
E. *D. trigona*, 210 X. (A.R. Fairall 1694, PERTH).
F. *D. angulata*, 90 X (A.C. Beauglehole 49287, SYD).

Results

The hairs on the outside of corolla were similar in essential features to those on the leaves, although colour was frequently different. The surface of the hairs was completely smooth (Fig. 1–4), but there were variations with regards to the colour, length, thickness, density, and direction of lateral branches. The details such as the number of cells, number of lateral arms or branches and the size of the terminal cell in relation to the lateral arm or branches in the trichome are given in Table 1.

Shape of the indumentum: Out of 66 species of *Dampiera* only *D. diversifolia* has glabrous corolla on outside. The hairs on the outside of corolla in all the species of *Dampiera* have uniseriate multicellular dendritic types of hairs. According to their shapes they can be divided into three main types:

(I) A trichome in which the apical cell is transversely oriented with regards to the stalk cell or a trichome in which the terminal cell has equal side arms or lateral branches, thus looks superficially like a T, (Fig. 2, D-F, Fig. 5 A-D) e.g. common in all species of sect. Camptospora, except *D. alata.*

(II) A trichome in which the apical cell is not transversely oriented with regards to the basal or the stalk cell, or a trichome in which the terminal cell has only one side arm or lateral branch, (Fig. 11), e.g. common in all the members of Sect. Cephalantha and in some species of sect. Dampiera.

(III) A trichome in which the apical cell is not transversely oriented with regard to the stalk cell or the basal cell and except the few apical cells all the other cells of the trichome have three side arms or lateral branches, e.g. *D. conospermoides,* (Fig. 10 G).

The number of the cells in the trichome varies from 2 (*D. trigona*) to ca. 19 (*D. tomentosa*), slight variation is also found with the position of the two lateral arms or branches of each cell of the trichome with regards to each other but it has very little taxonomic value. Drawing of hair outlines are provided for each species (Fig. 5–11).

In some species there is a tendency for the upper cells to be attached to the trichome somewhat laterally rather then terminally on the proceeding cell of the trichome, e.g. *D. sylvestris* (Fig. 3 E).

Colour of the indumentum: Whereas the indumentum shape plays a key role in the identification and circumscription of *Dampiera* species, the colour of the hairs is of equal importance, although colour is rather difficult to define accurately. The terms used here are from Stearn (1966). An attempt was made to produce colour plates, to define them

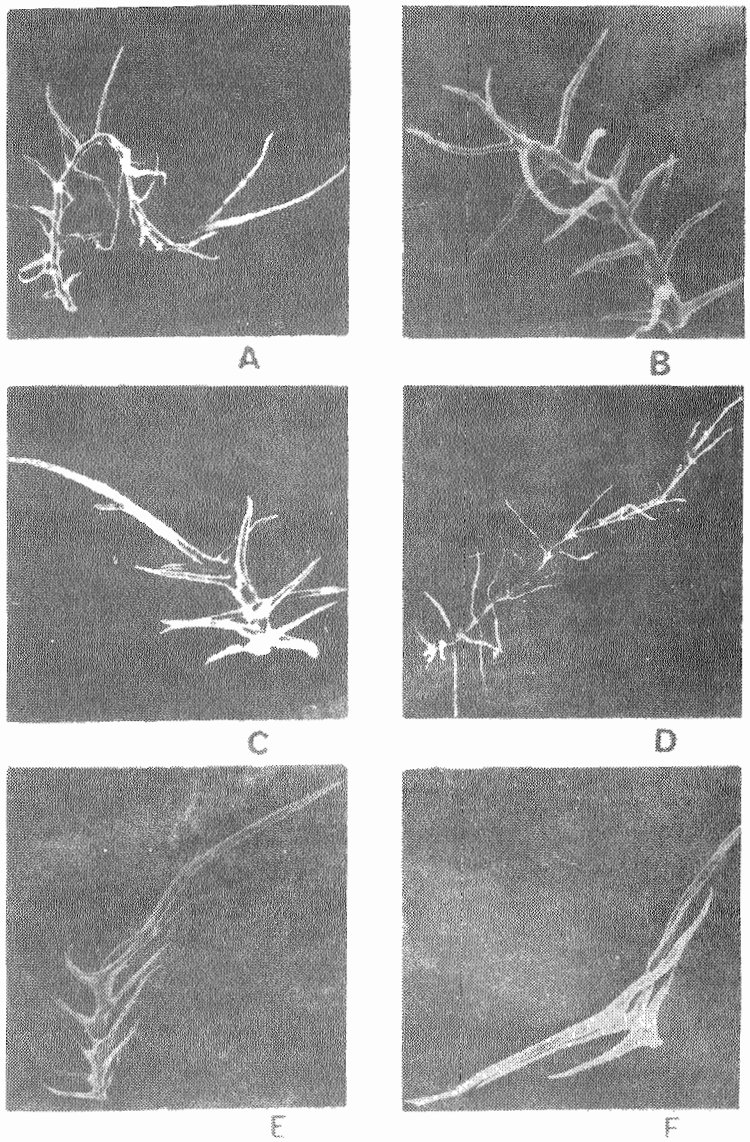

Fig. 3. Hairs of *Dampiera* species.

A. *D. lutiflora*, 80 X. (J. Peacock 60991, SYD).

B. *D. tomentosa*, 105 X. (R. Carolin 3146, SYD).

C. *D. stenophylla*, 110 X. (P.G. Wilson 7626, SYD).

D. *D. oligophylla* ssp. *oligophylla*, 90 X. (R. Carolin 3329, SYD).

E. *D. sylvestris*, 85 X. (R. Carolin 1943, SYD).

F. *D. angulata*, 80 X. (A.L. Beauglehole 49287, SYD).

Table 1. Comparison of the hairs of *Dampiera* species.

Species	Usual total no. of cells in the trichome	No. of cells with 2 lateral arms in the trichome	No. of cells with 1 or 3 lateral arms in the trichome	Terminal cell longer or shorter than the lateral arms
Sect. Camptospora.				
D. alata	7	7	0	L
D. angulata	5	5	0	–
D. carinata	3	3	0	–
D. coronata	4	4	0	–
D. deltoidea	3	3	0	–
D. heteroptera	3	3	0	-
D. lindleyi	4	4	0	–
D. sacculata	5	5	0	-
Sect. Dicoelia				
D. decurrens	3	3	0	-
D. fasciculata	4	4	0	–
D. fusca	6	4	2	L
D. galbraithiana	3	3	0	–
D. glabrescens	4	4	0	S
D. latealata	4	4	0	–
D. leptoclada	5	5	0	–
D. loranthifolia	6	5 or 6	0 or 1	SS or L
D. obliqua	6	6	0	–
D. parvifolia	5	3	2	VL
D. sericantha	5	5	0	-
D. stricta	7	6	1	L
D. sylvestris	8	8 or 7	0 or 1	VL
D. trigona	2	2	0	-
D. triloba	7	6	1	L or SS
Sect. Dampiera				
D. adpressa	7	3	4	VL
D. altissima	12	12	0	S
D. fitzgeraldiana	3	3	0	L
D. diversifolia	–	–	–	-
D. dysantha	7	4	3	L

D. eriantha	6	5	1	L
D. ferruginea	15	15	0	L
D. haematotricha	12	9	3	L
D. hederacea	11	10	1	L
D. incana	6	6	0	± SS
D. lanceolata	16	15	1	L
D. lavandulacea	5	5	0	L
D. linearis	7	7	0	L or VL
D. luteiflora	13	13	0	L or SS
D. marifolia	8	7	1	L
D. oligophylla	7 or 9	7 or 9	0	S or L
D. pedunculata	5	3	2	L
D. pritzelii	7	4	3	L
D. purpurea	12	11	1	L
D. rodwayana	8	2	8	VL
D. orchardii	2	2	0	–
D. rosmarinifolia	5	5	0	L
D. roycei	5	4	1	L
D. salehae	10	8	2	VL
D. scaevolina	3	3	0	–
D. stenophylla	10	7	3	S or L
D. tenuicaulis	4	3	1	L or SS
D. tephrea	9	9	0	L
Sect. Linschotenia				
D. atriplicina	13	12	1	L
D. candicans	15	15	0	S
D. cinerea	8	7	1	S
D. conospermoides	22	2	20	S
D. discolor	10	10	0	L
D. krausiana	17	17	0	L
D. ramosa	8	8	0	SS
D. spicigera	7	5	2	L
D. stenostachya	8	8	0	SS
D. teres	4	4	0	SS
Sect. Cephalantha				
D. dentata	4	3	1	L
D. eriocephala	6	4	2	VL
D. plumosa	2 or 3	2 or 3	0	L
D. wellsiana	3 or 4	3 or 4	0	VL

Abbreviations used: L, long; VL, very long; S, small; SS, same size.

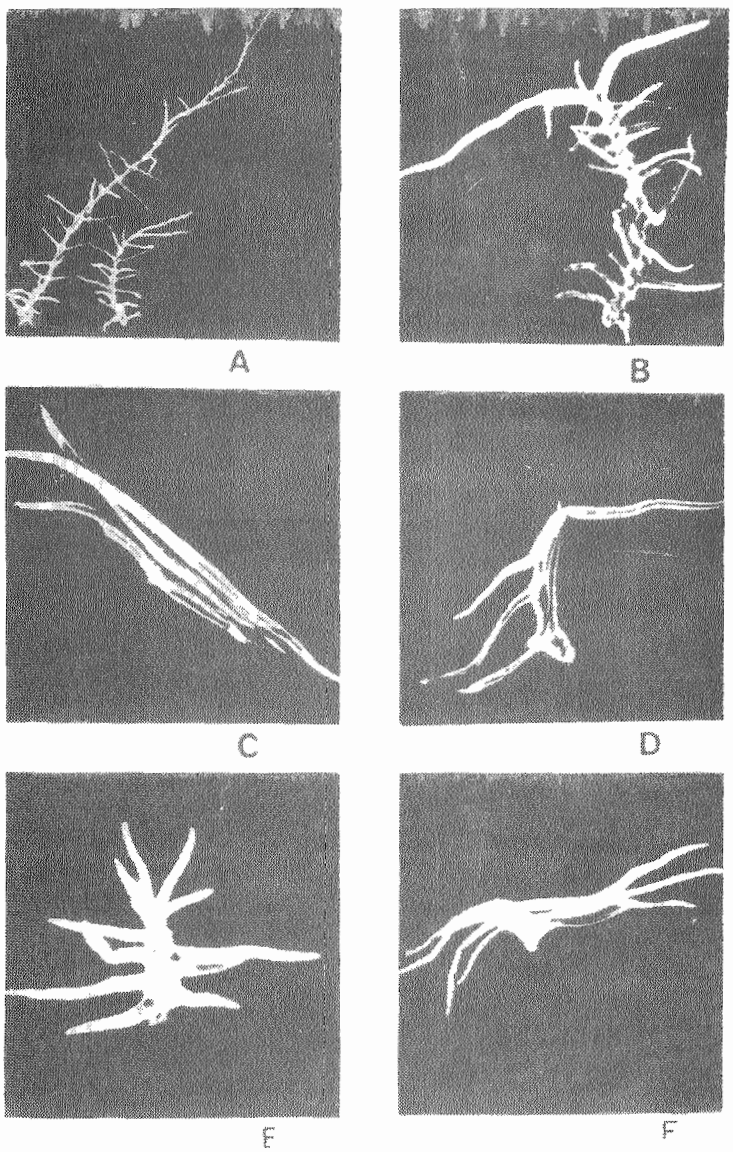

Fig. 4 Hairs of *Dampiera* species
A *D. lutiflora*. 60 X (R.D. Royce 10444, PLRTH).
B. *D. purpurea* 75 X (J. Pascoe 601, 4.2, SYD).
C *D. sacculata*. 135 X (R. Carolin 3172, SYD).
D *D. alata* 160 X (E. Bennett 582, SYD).
E *D. mentolia*. 150 X (M.E. Philips CANB00641).
F. *D. sericantha* 120 X (Beauglehole ABC 49311, SYD).

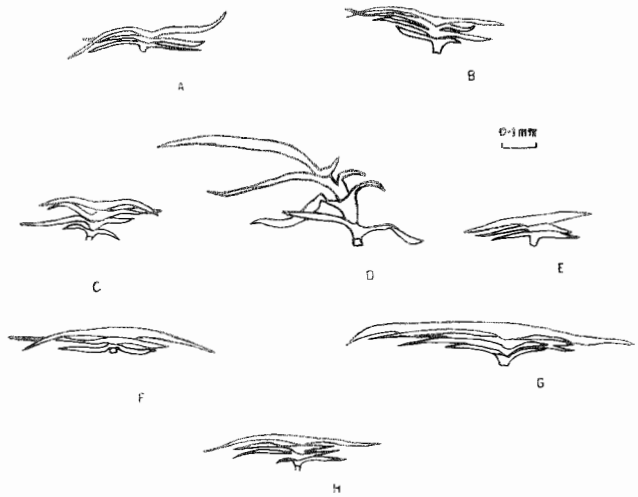

Fig. 5. Hairs of *Dampiera* species from the outside of corolla.
A, *D. carinata;* B, *D. lindleyi;* C, *D. Sacculata;* D, *D. alata;*
E, *D. heteroptera;* F, *D. deltoidea;* G, *D. coronata;* H, *D. angulata.*

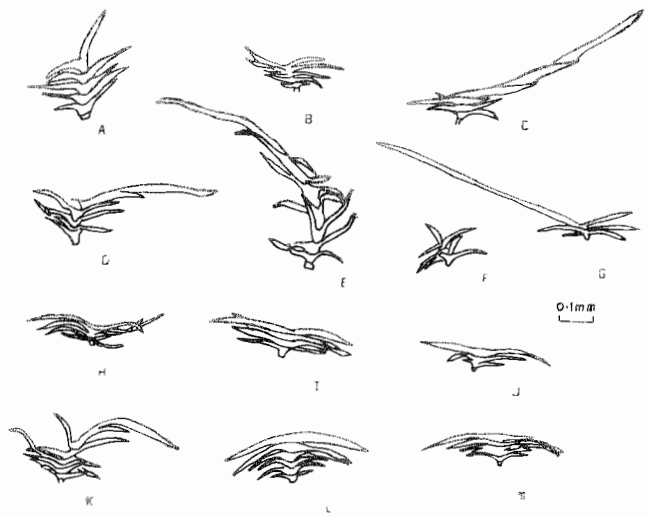

Fig. 6. Hairs of *Dampiera* species from the outside of corolla.
A, *D. loranthiafolia;* B, *D. obliqua;* C, *D. fusca;* D, *D. stricta;*
E, *D. sylvestris;* F, *D. glabrescens;* G, *D. parvifolia;* H, *D. sericantha;*
I, *D. fasciculata;* J. *D. glabraithiana;* K, *D. triloba;* L, *D. triloba;* M, *D. leptoclada.*

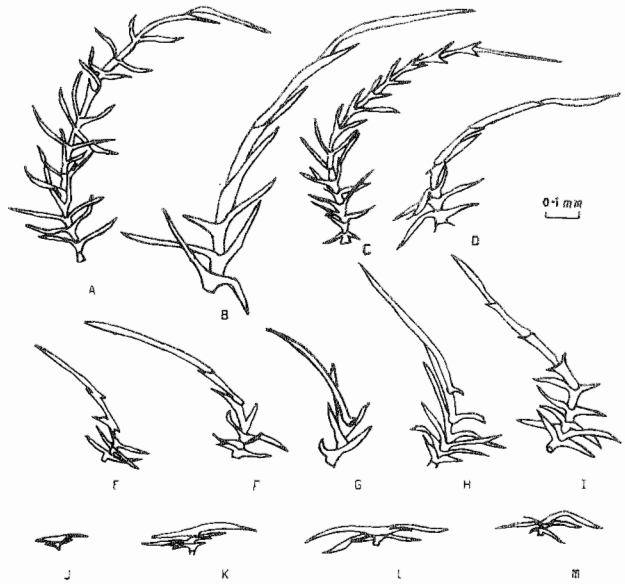

Fig. 7. Hairs of *Dampiera* species, from the outside of corolla.
A, *D. lanceolata* var *lanceolata;* B, *D. adpressa;* C, *D. ferruginea;* D. *D. dysantha;*
E, *D. pedunculata;* F, *D. pritzelii;* G, *D. lavandulacea;* H, *D. linearis;* I, *D. marifolia;* J, *D. trigona;*
K, *D. latealata;* L, *D. decurrens;* M, *D. tenuicalis* var. *tenuicaults.*

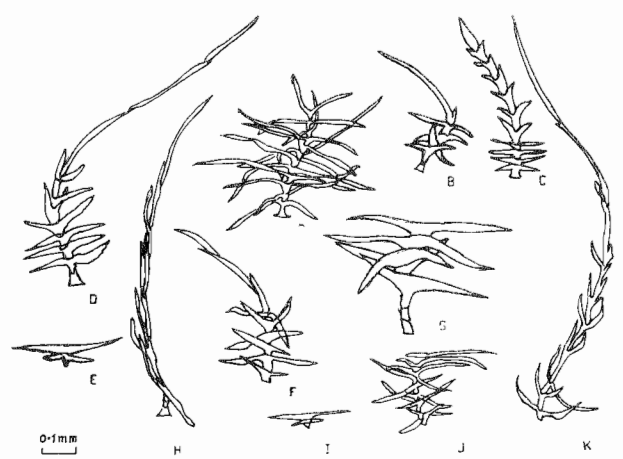

Fig. 8. Hairs of *Dampiera* species from outside of corolla.
A, *D. altissima;* B, *D. rosmarinifolia;* C, *D. hederacea;* D, *D. haematotricha* ssp. *haematotricha;*
E, *D. scaevolina;* F, *D. stenophylla;* G, *D. rosmarinifolia;* H, *D. rodwayana;* I, *D. orchardii*
J, *D. tephrea;* K, *D. salehae.*

more accurately. However, this was not successful since the colours did not print true. We have therefore nominated voucher specimens for standard colours of the indumentum.

Grey: A colour between white and black like wood-ashes.
(*D. roycei,* N. Horper 8, PERTH).

Golden-Yellow: Pure yellow but very dull.
(*D. orchardii,* A.E. Orchard, 1709; PERTH).

White: Like the colour of pure snow.
(*D. wellsiana,* H. Demarz, 5409; PERTH).

Rusty: Light-brown with a very little mixtured of red.
(*D.stricta,* T.B. Muir, 2310; AD96736205).

Ivory-white: White verging to yellow or cream coloured.
(*D. candicans,* C.A. Gardner, 6410; PERTH).

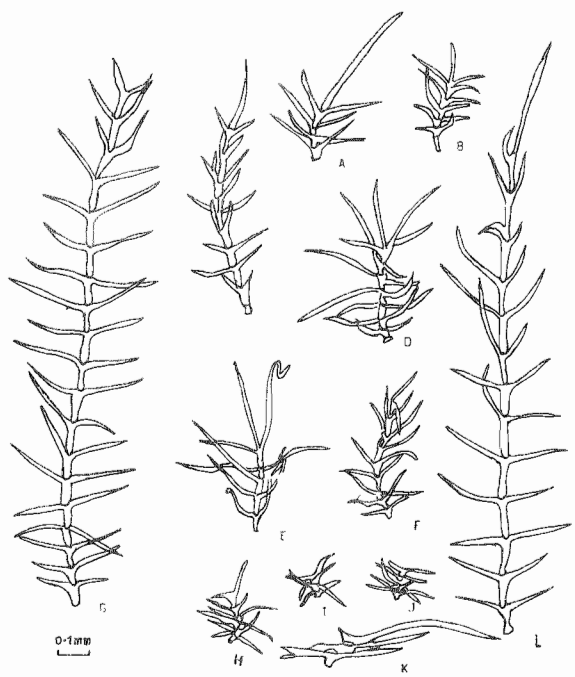

Fig. 9. Hairs of *Dampiera* species from the outside of corolla.
A, *D. roycei;* B, *D. oligophylla* ssp. *juncea;* C, *D. purpurea;* D, *D. lanceolata* var. *lanceolata;* E, *D. eriantha;* F, *D. oligophylla* ssp. *oligophylla;* G, *D. tomentosa;* H, *D. incana* var. *fuscescens;* I, *D. tenuicaulis* var. *carvula;* J, *D. incana* var. *incana;* K, *D. fitzgeraldiama* L, *D. lutiflora.*

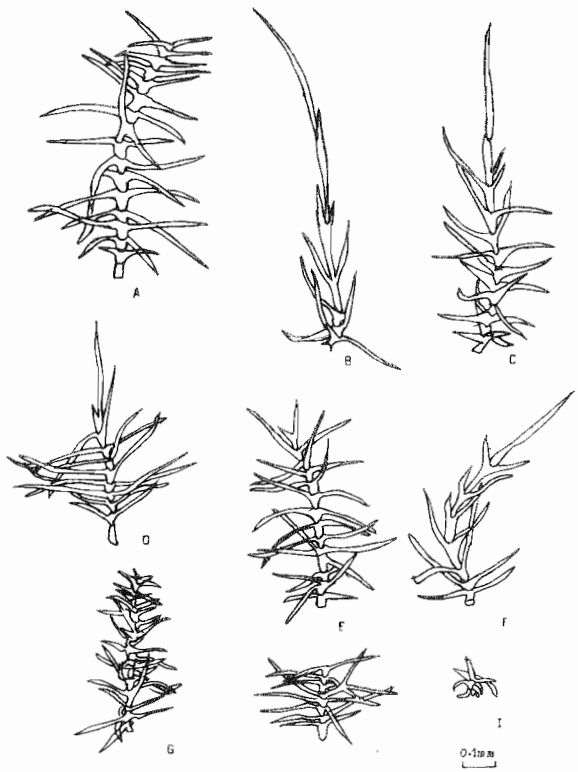

Fig. 10. Hairs of *Dampiera* species from the outside of corolla.
A, *D. krausiana;* B, *D. spicigera;* C, *D. atriplicina;* D, *D. discolor;* E, *D. candicans;* F, *D. cinerea;* G, *D. conospermoides;* H, *D. stenostachya;* I, *D. teres.*

Smoky: Grey changing to brown, i.e. brown-grey.
(*D. sylvestris,* Pt. Wollstone Craft, B. Barlow, 2–8–1953, SYD).

Red-brown: Dull red with a light mixture of brown.
(*D. haematotrichia* ssp. *haematotrichia,* Drummond suppl. 56, No. 105; MEL 516692).

Silvery: White-grey with blue colour, more or less having a metallic lustre.
(*D. parvifolia,* Young River to Esperance, B. Benn, 11–10–1963 SYD).

Yellow: Pure yellow without mixture of other colour.
(*D. lutiflora,* R.D. Royce, 10444; PERTH).

Fig. 11. Hairs of *Dampiera* species from the outside of corolla.
A & B, *D. wellsiana;* C, D. *eriocephala;* D, *D. dentata;* E, *D. pulmosa.*

Glossary of the terms used in this treatment.

Appressed: Closely and flatly pressed against the surface of the organ or lying more or less along the surface of the organ.

Dendritic: A tree like trichome having many lateral arms or branches, with the terminal cell more or less equal to the lateral arms or branches.

Plumose: A trichome with a few lateral arms or branches, having the terminal cell always longer then the lateral arms or branches.

Pubescent: Covered with very short soft hairs, having the appearance of almost a dust or white powder.

Spreading: Not lying along the surface of the organ, but held away from the surface of the organ by 45^{O}–90^{O}.

Tomentose: Covered with short and long intermixed hairs.

Villous: Tomentose with long soft silky plumose hairs.

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References

Carolin, R.C. 1970. The trichome of the Goodeniaceae. *Pro. Linn. Soc.* N.S.W., 96:1: 7–22.

Krause, K. 1912. *Goodeniaceae und Brunoniaceae.* Das Pflanzenreich, 54: 171–200. H.R. Engelmann, Weinheim, Berlin.

Stearn, W.T. 1966. *Botanical Latin.* Hafner publishing Co., New York.

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