

THE INDUSIUM STRUCTURE IN *DAMPIERA* SPECIES (GOODENIACEAE)

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Abstract

The structure of indusium of all the 66 species of *Dampiera* R.Br. of the family Goodeniaceae were examined with Scanning Electron Microscope and the light microscope. Two types of indusium structures were recognized among the species of *Dampiera*. SEMGS of the indusia of 11 species are provided, which cover the almost entire structural variation found within the species of *Dampiera*.

Introduction

In preparing a taxonomic revision of *Dampiera* R.Br. (Goodeniaceae) for the flora of Australia, (Rajput & Corolin, 1992) and the other systematic studies, based on numerical analysis, (Rajput & Carolin, 1988) it became clear that the structure of the indusium of the genus *Dampiera* and its relatives had considerable taxonomic significance. Most of the important characteristics of the genus have been discussed in separate contributions, (Rajput & Corolin, 1984, 1988, 1989 and Rajput *et al.*, 1985). The features of indusium structure are separately given in this contribution.

In the family Goodeniaceae, it is the indusia or pollen cup at the top of the style which ensure the fertilization. Brough (1927) and Hamilton (1884) have described pollinating mechanism, which involves the dehiscence of the anther, and deposition of the pollens within the indusium. The indusia of Goodeniaceae has attracted much speculation and several interpretations have been put forward based on macroscopic appearance. According to Brown (1818) the indusium is derived from the up growth of an epigynous or hypogynous disc which he supposed to be modified stamens. Geobel (1899) modified Brown's theory and considered the indusium as a structure, developed by an up growth from the receptacle. Lindley (1886) consolidated into a cup like a structure, as found in Lobelioideae.

Carolin (1959), while discussing the structures involved in the collection of pollens by visiting insects in the order Campaniles, has shown that the indusium of the Goodeniaceae is not homologous to the pollen collecting hairs of the Companulaceae. Carolin (1959) used the light microscope for his investigation on indusia, but in the present study, the complete structure of indusia has been examined with Scanning Electron Microscope.

Materials and Methods

The indusia used in this study were taken directly from the herbarium specimens, deposited at the John Ray Herbarium (SYD), and on loan from AD, BM, CANB, CANTA, MEL, and PERTH. The specimens used in this study are held at SYD.

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Appendix-1. List of the vouchers specimens used for S.E.M. study of indusia of *Dampiera* R.Br. of which the EMG's are provided, in Figure 1 and 2.

D. alata Lindl., Moora, R.C. Carolin 3242, 24-VII-1961 (SYD).
D. conospermoides Fitzg., Deaf Adder Groge, C. R. Dunlop 4449, 24-IX-1977 (SYD)
D. discolor (De Vries) Krause. Perth, Peacock 6111 36.1 (SYD)
D. fasciculata R.Br., Ca. 16 km. N.N.W. of Young River crossing on Ravenstrophe and Esperane main road, N.N. Donner 3064, 18-X-1968 (PERTH).
D. kausiana Rajput & Carolin, Perth, Peacock 60846.1. (SYD)
D. leptoclada Benth., East of Esperance, R.D. Royce 8718, 21-X-1969 (PERTH)
D. luteiflora Krause, 18 miles W of old Gadgee Homestead N. of Sandstone, R.D. Royce 10444 16-X-1972 (PERTH).
D. marifolia Benth, Hundreds of Senior, ca. 20 km. of Bordertown, D. Hunt 1807, 9-1-1964 (SYD).
D. purpurea R.Br. New South Wales, R.C. Carolin 5498 (SYD)
D. rosmarinifolia Schlectd. Lower Murray Mallee, Monarto South, Ising 15-IX-1917 (SYD)
D. teres Lindl. 87 miles N. of Perth, M.E. Philips sn. 22-IX-1962 (SYD)

For the SEM study the mature indusia were cut with a razor blade from the flowers and were mounted on to the specimen stubs with double-stick cellophane tap or with conductive silver paint. The prepared stubs were coated with 200-400 \AA thickness of gold in a polaron coating machine, then examined and photographed with JSM-U3 Scanning Electron Microscope. Two to three samples from different collections were examined for all the species. The SEM photographs were taken at accelerating voltage of 15 K., the voucher of SEM photographs are provided in Appendix-I.

Results and Discussion

During the taxonomic review of genus *Dampiera* R.Br. of the family Goodeniaceae, it has been observed that the size, shape and the degree of bending of the indusium with respect to the style varies from species to species and the characters related to indusium can be used in discriminating the species.

In all the species of *Dampiera* the superior lobes of the corolla are equipped with auricles, which encloses the indusium. The colour of indusia are mostly purple, perplexed or occasionally yellow or pale-brown eg., *D. lutiflora* R. Br.

The size of indusium varies within the species of *Dampiera*, the length of the indusium ranges from 0.2-1.2 mm, and breadth ranges from 0.2-1.6 mm. The small sized indusium has been observed in *D. Conospermoides* Schlectd (ca.0.2 x 0.2-0.4 mm), and a large size indusium is observed in *D. alata* Lindl. (ca 1.2 x 1.2-1.5 mm). Most of the members of sect. Linshotenia have a small sized indusium ca 0.5 mm long. In the members of sect. Camptospora except *D. heteropetra*. Rajput & Carolin where the indusia are mostly of large size ca.1.0 mm long.

On the basis of morphological structure of indusium following two main types of are recognized:-

1. Bi-lipped indusium: in which the indusia have two distinct lips at the upper portion, eg., *D. purpurea* R. Br. (Fig. 1)

2. Non-lipped indusium: in which indusia do not have distinct lips at the upper portion, and the indusia are more or less globular in shape e.g., *D. teres* Lindl. (Fig. 2D).

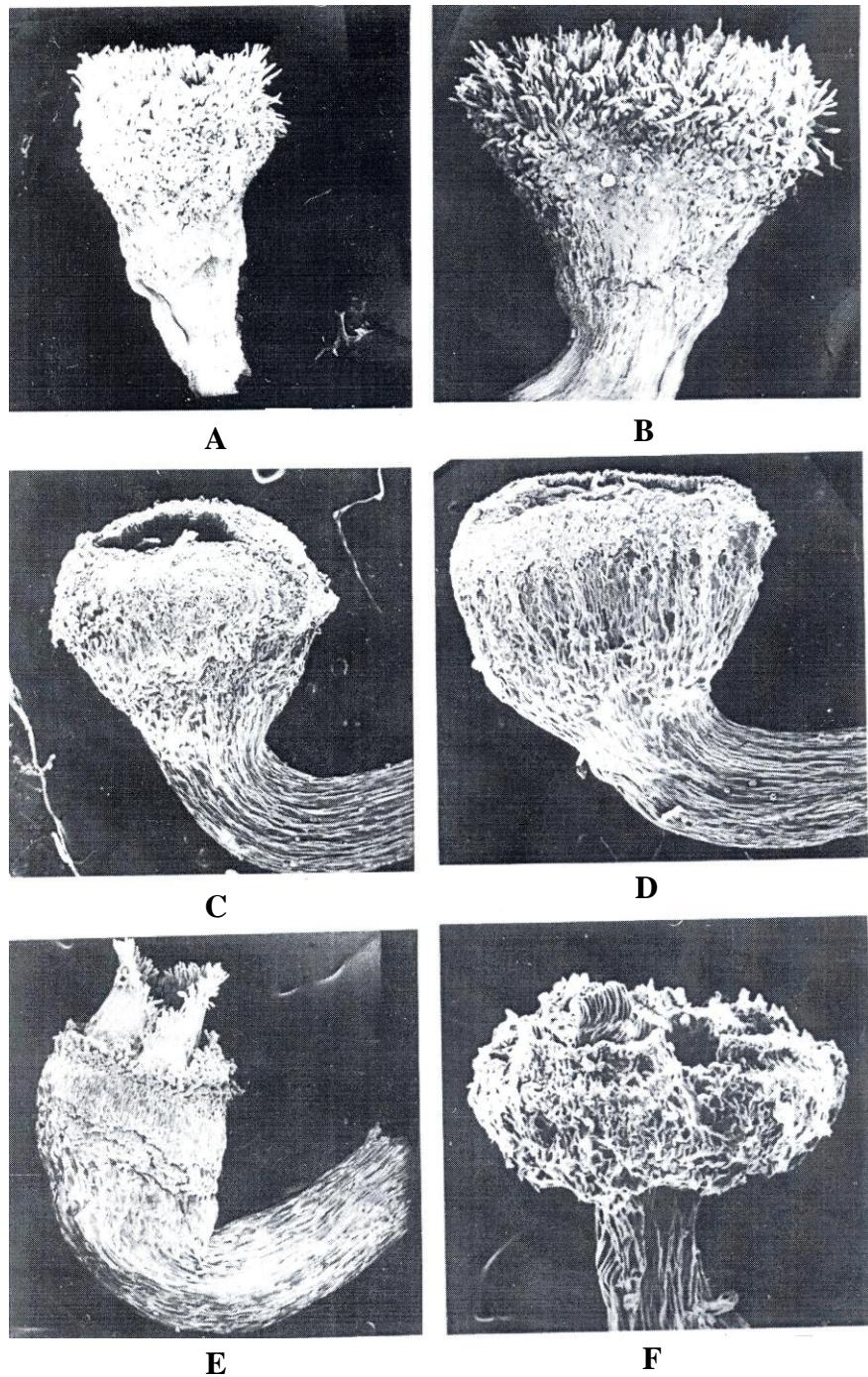


fig. 1. **A.** *D. rosmarinifolia* Schlectd 100 X; **B.** *D. luteflora*, R. Br 75 X; **C.** *D. purpurea*, R. Br. 100 X; **D.** *D. marifolia* Benth. 100 X; **E.** *D. fasciculata* R. Br. 110 X; **F.** *D. leptoclada* Benth. 80 X.

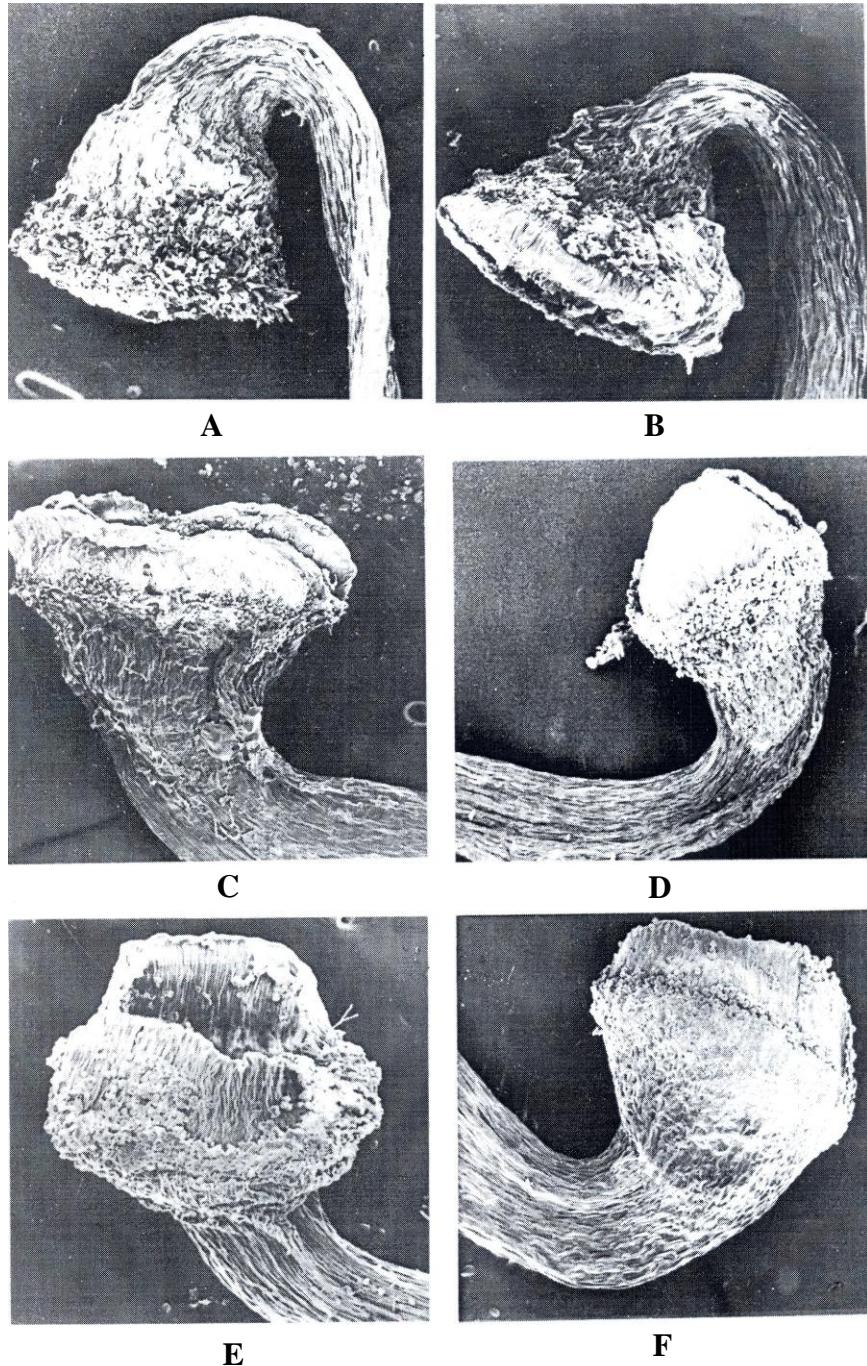


Fig: 2. **A.** *D. krausiana*, Rajput & Carolin 60 X; **B.** *D. krausiana*, Rajput & Carolin 85 X; **C.** *D. discolor* (De Vriese) Krause 110 X; **D.** *D. teres*, Lindl. 115 X; **E.** *D. alata* Lindl. 130 X.

Out of 66 species of *Dampiera*, 62 species have bi-lipped indusia, only 4 species eg., *D. ferruginea* Rajput & Carolin, *D. conospermoidea* Fitzg, *D. krausiana* Rajput & Carolin and *D. stricta* R. Br do not have lipped indusia. In some non-lipped species of *Dampiera* eg., *D. krausiana* Rajput & Carolin (fig 2 A and B), the epidermal cells of the apical portion of the indusium are modified into the hairs. Out of the 62 species having bi-lipped indusia 54 species have glabrous lips eg., *D. marifolia*, Benth. (Fig. 1D), and the remaining 8 species have hairy lipped indusia eg., *D. alata* (Fig. 1-E).

In species having 2-lipped indusia, the epidermal cells of lips are modified into hairs, and the lips look like the eye lashed. 12 EMGs with vouchers are provided to cover the entire range of structural variations, found within the species of *Dampiera*. During the S.E.M, examination of indusia pollen grains were mostly found either on lips or on the hairs (Figs. 2-E and 1 E & F).

In most cases the body of indusia is glabrous, but in *D. krausiana* Rajput & Carolin the upper part of the body of indusium is hairy, (Fig. 1-A and B). On the basis of this unique indusium structure this species can easily be separated from all other species of *Dampiera*.

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