Selbyana 5 (3-4): 274-278, 1981

SHOOT ANATOMY OF TWO ADDITIONAL SPECIES OF *DRESSLERELLA* (ORCHIDACEAE)

*Alec M. Pridgeon**

In a previous report (Pridgeon & Williams, 1979), the vegetative anatomy of all but two species of *Dresslerella* Luer was treated. This communication presents anatomical characteristics of leaves and secondary stems of *D. hirsutissima* (C. Schweinf.) Luer and *D. pilosissima* (Schltr.) Luer. Both are transfers from *Restrepiella* Garay & Dunsterv. (Luer, 1978).

MATERIALS AND METHODS

Procedures for light microscopy were as outlined in Pridgeon & Williams (1979). Voucher specimens have been deposited at the Marie Selby Botanical Gardens (SEL).

OBSERVATIONS AND DISCUSSION

Leaf Anatomy

EPIDERMIS. As in other *Dresslerella* specimens previously considered (Pridgeon & Williams, 1979), the epidermal cells of *D. hirsutissima* each possess a central papilla, with the exception of cells comprising the stomatal apparatus and glandular trichome accessory cells (Figure 1). Apices of the papillae are acute to acuminate. *Dresslerella pilosissima*, however, is unique among the eight species in completely lacking these papillae on both epidermal surfaces (Figures 2, 3, 6). Both species possess the longer unicellular trichomes characterizing other species, and the apices of these are acuminate (Figure 7).

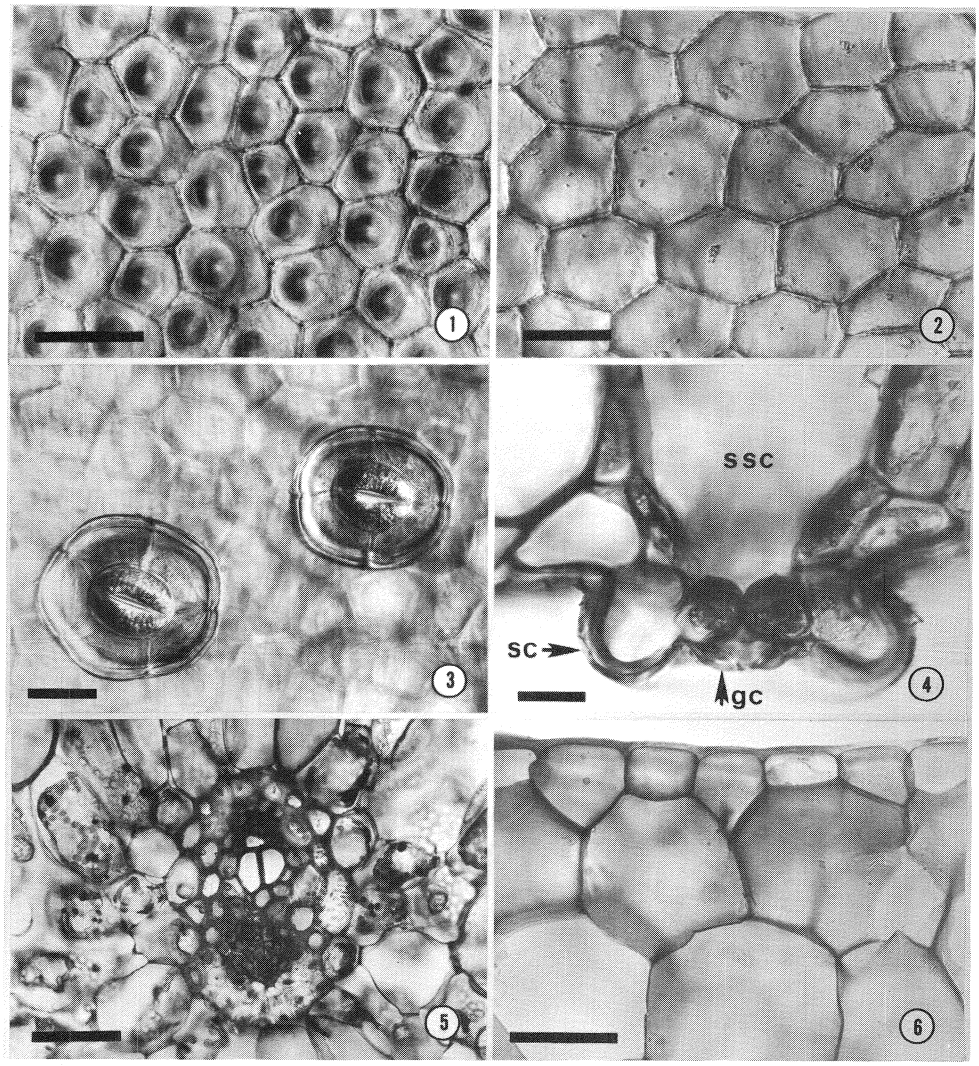
In surface view cells on both epidermal surfaces are rectangular to polygonal with moderately thick walls and conspicuous pit canals (Figures 1-3). A thin, smooth cuticle overlies all epidermal cells (Figure 6). Adaxial cells are slightly larger than abaxial cells. In transection the cells are either rectangular, peg-shaped, triangular, or elliptical (Figures 6,7). Like those of *D. caesariata* Luer, the epidermal cell walls of *D. hirsutissima* are unevenly thickened as seen in transection, with the outer tangential walls more prominent. Anthocyanin-like compounds are absent in epidermal cells of both species.

Although the diagnostic generic character of papillose epidermal cells now no longer holds without exception, the characteristic construction of the stomatal apparatus of *Dresslerella* is consistent in both species. The stomata are confined to and raised above the abaxial epidermis, and subsidiary cells ranging in number per stomate from 4 to 8 in *D. hirsutissima* and 4 to 7 in *D. pilosissima* are arranged in a wreath-like configuration around the guard cell pair (Figure 3). The axis of subsidiary cells of *D. hirsutissima* in transection is vertical, but that of *D. pilosissima* is oblique as it is for *D. pertusa* (Dressler) Luer (Figure 4). Mean heights of subsidiary cells and mean lengths and widths of guard cell pairs for the two species are listed in Table 1. Conspicuous substomatal chambers occur in both species (Figure 4)

The glandular trichomes of *Dresslerella*, treated in Pridgeon & Williams (1979), are present also in *D. hirsutissima* and *D. pilosissima* on both epidermal surfaces. The absorbing activity of these trichomes soon after initiation and throughout their development has been reported by Pridgeon (1981).

HYPODERMIS. The adaxial hypodermis of *D. hirsutissima* consists of 10-11 layers of cells, while that of *D. pilosissima* consists of 6-7 layers, a condition

* Department of Biological Science, Florida State University, Tallahassee, Florida 32306 U.S.A.



Figures 1 - 6. All light microscope photographs. Fig. 1. *Dresslerella hirsutissima*. Adaxial epidermal surface of leaf showing one papilla in each epidermal cell and pit canals in cell walls. Scale bar equals 50 μm. Fig. 2. *Dresslerella pilosissima*. Adaxial epidermal surface of leaf. Papillae are absent. Scale bar equals 50 μm. Fig. 3. *Dresslerella pilosissima*. Abaxial epidermal surface of leaf with two stomata. The stoma on the left has five subsidiary cells, and the one on the right has four subsidiary cells. Scale bar equals 50 μm. Fig. 4. *Dresslerella pilosissima*. Transverse section of leaf showing abaxial stomate with guard cells (gc), subsidiary cells (sc), and substomatal chamber (ssc). Scale bar equals 25 μm. Fig. 5. *Dresslerella hirsutissima*. Transverse section of leaf. Vascular bundle of the largest size class. Scale bar equals 50 μm. Fig. 6. *Dresslerella pilosissima*. Transverse section of leaf showing cuticle, adaxial epidermis, and portion of adaxial hypodermis. Scale bar equals 50 μm.

quite distinct from the other species with fewer layers. The upper 1-2 layers comprise cells roughly isodiametric and polygonal (Figure 6), while cells of the lower layers are transversely elongate and either polygonal, elliptical, rectangular, or trapezoidal. Chloroplasts may occur in some cells, especially those in the lowest layers. In both species a uniseriate abaxial hypodermis is

present; cell shape ranges from elliptical to polygonal and isodiametric. Spiral wall thickenings are absent.

MESOPHYLL. The mesophyll of both species is bifacial. Palisade mesophyll in *D. hirsutissima* consists of 2-3 layers of trapezoidal, elliptical, or rectangular cells and that in *D. pilosissima* is 1-2 layers of similarly shaped cells. Spongy mesophyll cells are ovate, isodiametric, elliptical or polygonal.

VASCULAR BUNDLES. Viewed in transection, both species possess a single row of collateral vascular bundles disposed just below palisade mesophyll. The number of vascular bundles present in the middle of the leaves for the two species is listed in Table 1.

As in the six other species, the veins of these two species are of three sizes and their size ratios are presented in the table. Type I bundles possess a well-developed abaxial sclerenchyma cap and fewer fibers at the adaxial pole (Figure 5). Types II and III rarely possess adaxial fibers. Commissural veins also occur in both species.

Xylem consists of tracheids with annular, helical, scalariform or pitted thickenings, and xylem parenchyma. Vessels are absent. Phloem consists of sieve-tube elements, companion cells and phloem parenchyma. A sclerenchymatous bridge extends between the xylem and phloem tissues.

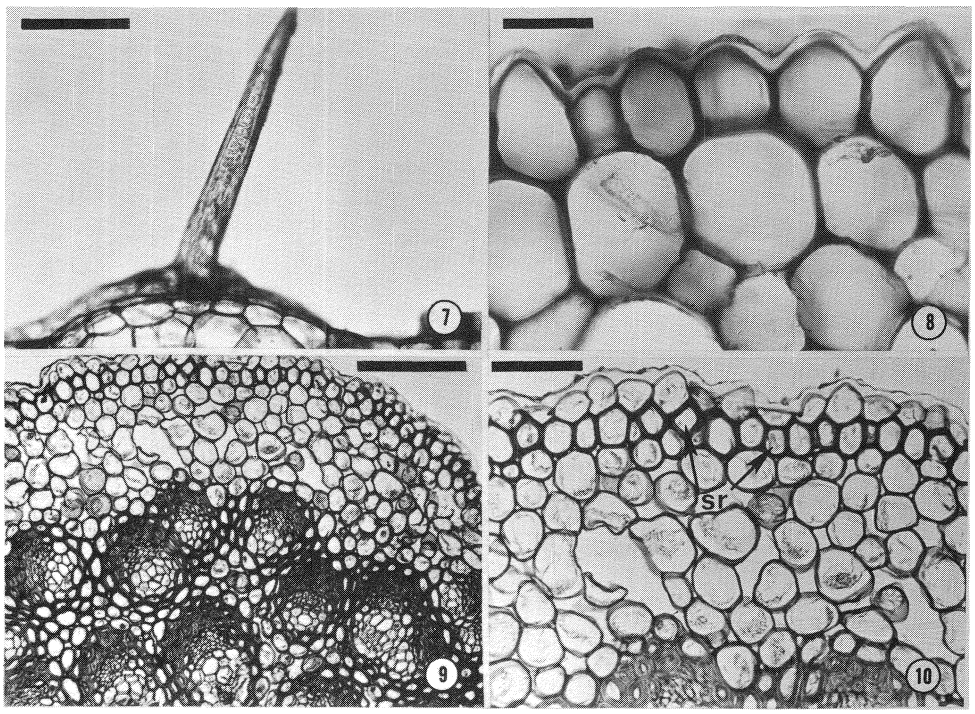
Secondary Stem Anatomy

EPIDERMIS. A moderately thick cuticle extends over the epidermal surfaces of both species (Figure 8-10). Epidermal cells vary in shape from ovate, elliptical, or isodiametric to irregular. Some cells in both species possess papillae with obtuse to acuminate apices. Chloroplasts are infrequently present in epidermal cells and stomates are absent on the stem.

CORTEX. As in other species, the cortex is irregular in extent due to an eccentric vascular cylinder. A subepidermal sclerenchymatous ring is continu-

TABLE I

SPECIES	*D. hirsutissima*	*D. pilosissima*
CHARACTER		
Mean height of subsidiary cells	28.6 μm	33.0 μm
Mean lengths and widths of guard cell pairs	51.8 x 39.2 μm	55.7 x 46.5 μm
Number of vascular bundles at middle of leaf	32	16
Vascular bundle size ratio Type I: Type II: Type III	1 1.6 : 2.3	1 : 1.3 : 1.7
Number of vascular bundles at middle of secondary stem	29	17



Figures 7 - 10. All light microscope photographs. Fig. 7. *Dresslerella pilosissima*. Transverse section of leaf showing abaxial epidermis and long unicellular trichome. Scale bar equals 100 μm. Fig. 8. *Dresslerella pilosissima*. Transverse section of secondary stem. Cuticle, epidermis, and a portion of the cortex are visible. Scale bar equals 20 μm. Fig. 9. *Dresslerella hirsutissima*. Transverse section of secondary stem. Scale bar equals 100 μm. Fig. 10. *Dresslerella hirsutissima*. Transverse section of secondary stem. Note subepidermal sclerenchymatous ring (sr). Scale bar equals 50 μm.

ous in *D. hirsutissima* (Figures 9, 10) and intermittent in *D. pilosissima*. Cell shape in other cortical layers is ovate, isodiametric, or elliptical, and chloroplasts occupy most cells.

VASCULAR CYLINDER. A phloic fiber sheath delimits cortex from pith in both species (Figure 9). Fewer fibers occur at the xylem pole of vascular bundles. Bundles are disposed in three concentric rings in *D. hirsutissima* and two rings in *D. pilosissima*. The number of vascular bundles at the middle of the secondary stem for both species is presented in the table.

Bundles are collateral with xylem internal and phloem external. A sclerenchymatous bridge separates xylem and phloem tissues. Xylem consists of xylem parenchyma, xylem fibers, and tracheids with annular, helical, scalariform or pitted secondary thickenings. Vessels are absent. Phloem consists of sieve-tube elements, companion cells, phloem parenchyma, and phloem fibers.

PITH. A parenchymatous pith of 4-8 cell layers in diameter occurs in both species. Cells are ovate, elliptical, or isodiametric. Chloroplasts are frequently present.

In summary, *D. hirsutissima* is anatomically distinct from other *Dresslerella* species in possessing a foliar adaxial hypodermis of 10-11 layers. *Dresslerella pilosissima* is identifiable by the size of its stomates and subsidiary cells (largest of the genus) and by the absence of foliar epidermal papillae.

ACKNOWLEDGEMENTS

I thank Dr. Norris H. Williams for reading the manuscript and Dr. Carlyle A. Luer for supplying preserved material of these two species.

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