

Trichome Types in the Genus *Otostegia* Benth. (Lamiaceae).

1. *O. fruticosa* var. *fruticosa* (Forssk.) Briq. and *O. fruticosa* var. *schimperi* (Boiss.) Tackh.

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Abstract. The morphology and structure of trichomes on the aerial parts (stems, leaves and floral parts) of *O. fruticosa* var. *fruticosa* (Forssk.) Briq. and *O. fruticosa* var. *schimperi* (Boiss.) Tackh. were studied in detail with a view to gaining information on their possible taxonomic significance. It was found that trichomes of *O. fruticosa* var. *fruticosa* and *O. fruticosa* var. *schimperi* could be grouped into seven types, including 15 forms of nonglandular and ten forms of glandular trichomes.

Introduction

The genus *Otostegia* is represented in the flora of Saudi Arabia by one species: *Otostegia fruticosa* which is found in two varieties viz: *Otostegia fruticosa* var. *fruticosa* (Forssk.) Briq. (= *Clinopodium fruticosum* Forssk., *O. repanda* and *scaniosa* Benth., *O. moluccoides* (Vahl.) Jaub. et Sp., *O. sinaitica* (Ehr.) Tackh.) and *O. fruticosa* var. *schimperi* (Boiss.) Tackh. (= *O. microphylla* (Desp.) Asch. et Schweinf.). The former variety grows in the south region and the latter grows in the eastern Najd of Saudi Arabia [1, pp. 465-466; 2, p. 142], these two regions have different ecological conditions. However, the two varieties were collected from the south region of Saudi Arabia by the author in 1980 and they were identified by Professor M.A. Migahid in 1980. The two varieties are shrubs with crenate leaves, but *O. fruticosa* var. *fruticosa* has large leaves with petioles as long as the flower whorls whilst *O. fruticosa* var. *schimperi* has minutely velvety stiff stems and densely woolly leaves with short petioles [1, pp. 465-466]. These minor differences in the morphological characters with the presence of densely woolly trichomes in the leaves and stems of both varieties made it worth making a detailed study of the structure and morphology of trichomes on the aerial parts of the two varieties.

Various types of trichomes are present on the stems, leaves and floral parts of members of the Lamiaceae. A detailed investigation of the structure, development and morphology of the trichomes in different member of Lamiaceae has been established with the view to assessing the taxonomic significance of these structures [3,4]. Nevertheless, this work deals with the structure and morphology of trichomes on the aerial parts of *O. fruticosa* var. *fruticosa* and *O. fruticosa* var. *schimperii* which are growing naturally in Saudi Arabia, with a view to gaining information on their possible taxonomic significance.

Materials and Methods

Plant material was collected during the flowering season from Abha region, South of Saudi Arabia, and immediately preserved in 70% ethanol. Surface preparations were made from leaves and stems by stripping the epidermis; these were mounted in 50% v/v glycerol solution for examination and drawing. Floral parts were cleared in chloral hydrate solution and then mounted in 50% v/v glycerol solution. Cell wall thickness was measured according to Doaigey et al. [4]: "thick" > 6 μm , "slightly thick" 2.5-6 μm and "thin" < 2.5 μm . Samples: 3 samples of each plant were taken. Three leaves (upper, middle, lower) of each sample were chosen to make 5 epidermal strips of the parts of each leaf (base, middle, apex, margin, petiole). Epidermal strips from three regions of each stem (upper, middle, lower) were taken and three flowers of each sample were also examined.

Results

The results of this work indicate that the trichomes of *O. fruticosa* var. *fruticosa* and *O. fruticosa* var. *schimperii* could be grouped into 7 types including 15 forms of nonglandular and 10 forms of glandular trichomes as follows:

Type I: Nonglandular, unicellular, unbranched.

Ia: Short; thick, smooth cell walls; wide lumen and acute apex, occasionally with hooked apex (Fig. 1, a & c)

Ib: Short; thick, warty cell walls; wide lumen and acute apex (Fig. 1, b).

Type II: Nonglandular, bicellular, unbranched.

IIa: Smooth cell walls.

a1: Short; cell walls slightly thickened, and hooked apex (Fig. 1, f).

a2: Long; slightly thickened walls; narrow lumina and acute apex (Fig. 1, e).

Iib: Short; thick, warty cell walls; wide lumina and acute apex; occasionally with hooked apex (Fig. 1, d).

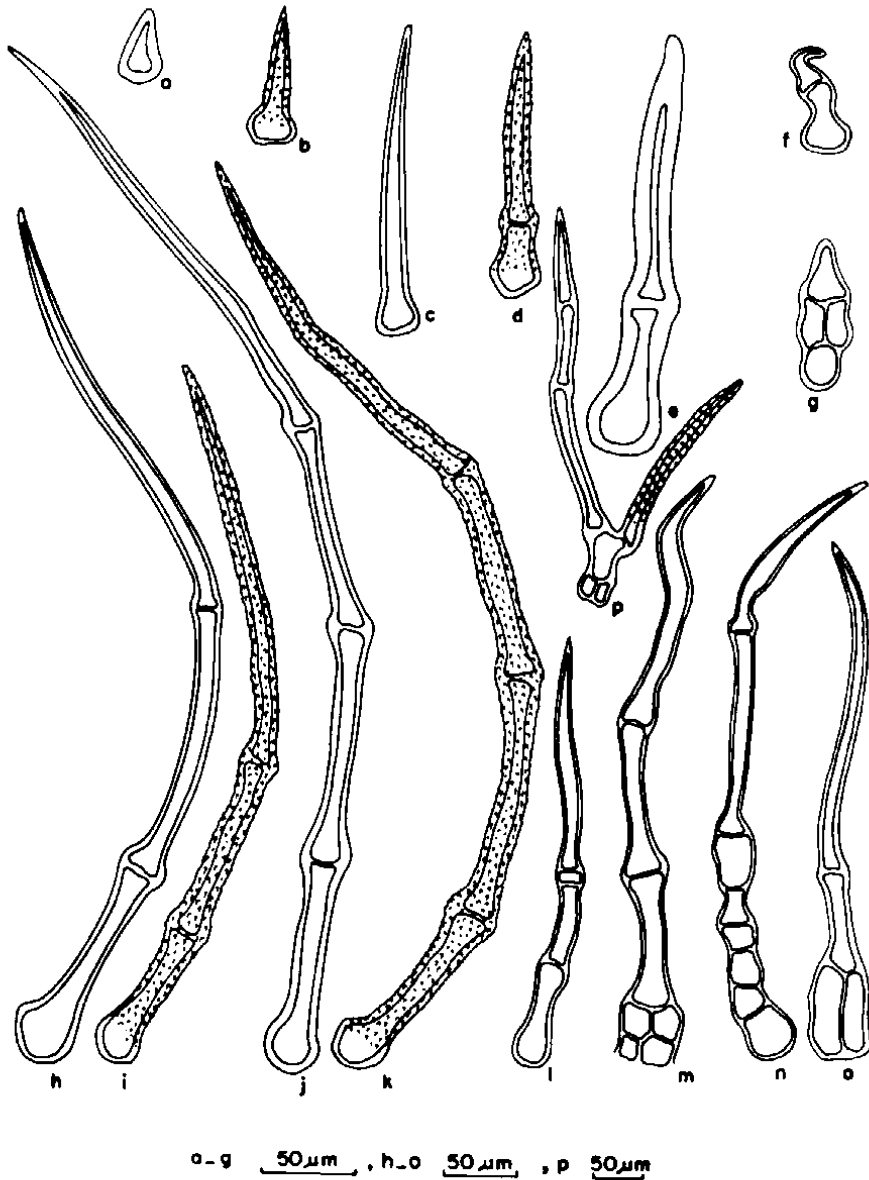


Fig. 1. Types of nonglandular trichomes (a-n) of *O. fruticosa* var. *fruticosa* and (o & p) of *O. fruticosa* var. *schimperi*.

Type III: Nonglandular, multicellular unbranched

IIIa: Smooth cell walls

- a1:** Short; 3 cells long; middle cell divided longitudinally into two cells; thick walls; wide lumina and blunt apex (Fig. 1,g).
- a2:** Long; 3-cells long, thick walls and acute apex; terminal cell longer than the other two cells (Fig. 1,h).
- a3:** Short; 4-cells long, slightly thickened walls; acute apex (Fig. 1,j)

- a4:** Short; 4-cells long; slightly thickened walls; acute apex and third cell very short (Fig. 1,l)
- a5:** Short; 4-celled; slightly thickened walls; narrow lumina; acute apex, basal cell divided longitudinally into two cells (Fig. 1,o).
- a6:** Long; 7-celled; the basal cells biseriate; wide lumina and acute apex (Fig. 1,m).
- a7:** Long; 8-cells long; slightly thickened walls and acute apex (Fig. 1,n).
- IIIb:** Warty cell walls.
 - b1:** Long; 3-cells long; narrow lumina; thick walls; acute apex terminal cell longer than the others (Fig. 1,i).
 - b2:** Long; 4-cells long, thick walls, wide lumina, acute apex (Fig. 1,k).
- Type IV:** Nonglandular, multicellular, branched, 5-8-cells long; warty, thick walls; commonly narrow lumina and acute apex; branches commonly unicellular, basal cells often biseriate (Fig. 1,p).
- Type V:** Glandular, stalk unicellular, unbranched.
 - Va:** Unicellular stalk, unicellular head, stalk cell with slightly thickened, smooth walls (Fig. 2,a).
 - Vb:** Unicellular stalk, bicellular head, stalk cell with slightly thickened, smooth walls (Fig. 2,b).
 - Vc:** Unicellular stalk, multicellular head, stalk cell with slightly thickened, smooth walls (Fig. 2,c,l & m).
- Type VI:** Glandular; stalk bicellular, uniseriate, unbranched.
 - VIa:** Bicellular, biseriate head, stalk cell with slightly thickened, smooth walls (Fig. 2,d).
 - VIb:** Bicellular, uniseriate head, stalk cell with slightly thickened, smooth walls (Fig. 2,f).
 - VIc:** Multicellular, uniseriate head, stalk cells with slightly thickened walls (Fig. 2,j & k).
 - VI d:** Multicellular, biseriate head, stalk cells with slightly thickened walls (Fig. 2,g).
- Type VII:** Glandular; stalk multicellular, uniseriate, unbranched.
 - VIIa:** Unicellular head; stalk cells with slightly thickened, smooth walls (Fig. 2,h).
 - VIIb:** Bicellular, biseriate head; stalk cells with slightly thickened, smooth walls (Fig. 2,i).
 - VIIc:** Multicellular head; stalk cells with slightly thickened, smooth walls; basal cells of the stalk becoming biseriate (Fig. 2,e).

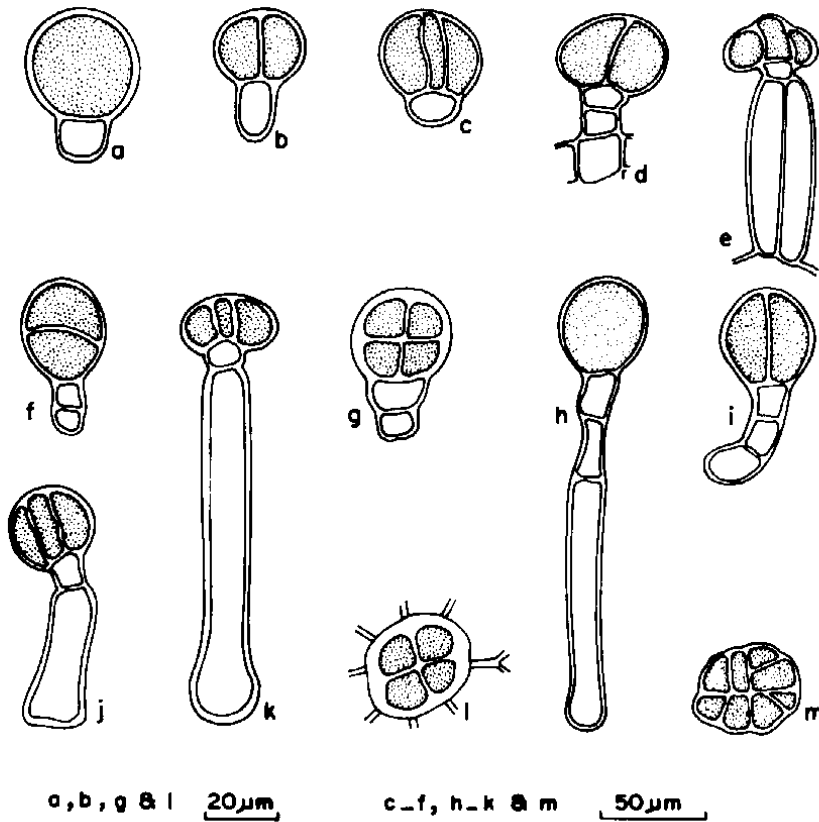


Fig. 2. Types of glandular trichomes (a-m) of *O. fruticosa* var. *fruticosa*.

Discussion

The value of trichomes in identification of some members of Lamiaceae has already been observed [3-7]. This study shows that the cell wall structures and the cell numbers of trichomes may be used to group the trichomes in these two varieties into seven types including 15 forms of nonglandular and 10 forms of glandular trichomes (Table 1, Fig. 1 & 2).

However, both nonglandular and glandular trichomes were present on both *O. fruticosa* var. *fruticosa* and *O. fruticosa* var. *schimperi*. The trichome types present on the two varieties are mostly similar to those of the family Lamiaceae reported by Doaigey et al. [4]. Trichomes with many branches were not observed in either variety whereas occasional nonglandular trichomes exhibiting few branches were only present on the leaf and stem of *O. fruticosa* var. *schimperi* (Table 1). The two varieties have some trichome forms in common (Table 1): these forms occur frequently on different organs of both varieties. Type Vc occurs on every organ of each variety (Table 1). This type is also common in the most members of the family Lamiaceae. How-

Table 1. Types and occurrence of trichomes in *O. fruticosa* var. *fruticosa* and *O. fruticosa* var. *schimperii*

Trichome types	<i>O. fruticosa</i> var. <i>fruticosa</i>						<i>O. fruticosa</i> var. <i>schimperii</i>					
	Stem	Leaf			Flower		Slem	Leaf			Flower	
		UE	LE	PT	P	FP		UE	LE	PT	P	FP
Type Ia	-	+a	-	+a	-	+a	-	-	+a	-	-	-
Ib	+a	-	-	+a	+a	-	+a	+a	-	-	+a	+a
Type IIa1	-	-	+b	-	-	-	-	-	-	-	-	-
IIa2	-	+a	+a	-	-	+a	-	-	+a	-	-	-
IIb1	+a	-	+a	+a	+a	-	+a	+a	+a	+a	+a	+a
Type IIIa1	-	-	+b	-	-	-	-	-	-	-	-	-
IIIa2	-	+a	+a	-	-	+a	-	-	+a	-	-	-
IIIa3	-	-	-	-	-	+a	+a	-	-	-	-	-
IIIa4	-	-	-	-	-	+b	-	-	-	-	-	-
IIIa5	-	-	-	-	-	-	+b	-	-	-	-	-
IIIa6	-	+b	-	-	-	-	-	-	-	-	-	-
IIIa7	-	-	-	+b	-	-	-	-	-	-	-	-
IIIb1	+a	-	+a	+a	+a	-	+a	+a	+a	+a	+a	+a
IIIb2	+a	-	-	+a	+a	-	+a	-	-	-	-	-
Type IV	-	-	-	-	-	-	+b	+b	-	-	-	-
Type Va	-	+a	+a	-	+a	+a	-	-	-	-	-	-
Vb	-	-	+a	+a	-	-	-	-	-	-	-	-
Vc	+a	+a	+a	+a	+a	+a	+a	+a	+a	+a	+a	+a
Type VIa	+a	-	-	-	-	+a	-	+a	+a	+a	-	+a
VIb	-	-	-	-	-	+b	-	-	-	-	-	-
VIc	+a	+a	+a	+a	+a	+a	-	-	+a	+a	+a	+a
VI d	-	-	-	+b	-	+b	-	-	-	-	-	-
Type VIIa	-	+b	-	-	-	+b	-	-	-	-	-	-
VIIb	+a	-	-	-	-	+a	+a	-	-	-	-	+a
VIIc	-	+b	-	-	-	-	-	-	-	-	-	-

UE = upper epidermis; LE = lower epidermis; PT = petiole; P = pedicel; FP = flower parts; + = present; - = absent; a = frequent, 12-40/mm²; b = occasional, 0-8/mm². (frequency ranges were taken out of 10 readings).

ever, each variety has some specific forms of trichomes. *O. fruticosa* var. *fruticosa* has type II a1; type III a1, a4, a6 & a7; type VI b, VI d; type VII a & VII c. These types occur occasionally either on the leaf or the flower parts but were not observed

on the stem. *O. fruticosa* var. *schimperi* has only two forms: type III a5 and type IV, these two forms occur occasionally in the stem and in the upper epidermis of the leaf.

The foregoing discussion indicates that the frequency of specific trichome forms in each variety are not of sufficient importance to be used to distinguish between the two varieties.

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أنماط الشعيرات في جنس أوتوستيجيا

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شيمبيري

عبدالله رشيد الدعيجي

قسم علم النبات - كلية العلوم - جامعة الملك سعود - ص. ب. ٢٤٥٥ - الرياض ١١٤٥١ -

المملكة العربية السعودية

(استلم في ١٥ صفر ١٤٠٩هـ، قُبل للنشر في ٢٤ ذو القعدة ١٤١٠هـ)

ملخص البحث. لقد تمت دراسة الشكل المورفولوجي والتركيب للشعيرات الموجودة في الأجزاء الهوائية (السيقان والأوراق وأجزاء الزهرة) لكل من:

Otostegia fruticosa var. *fruticosa* (Forssk.) Briq. and *Otostegia fruticosa* var. *schimperi* (Boiss.) Tackh.

وذلك بهدف الحصول على معلومات عن أهميتها التصنيفية. وقد أوضحت الدراسة أنه بالإمكان تصنيف شعيرات كل من النباتين تحت الدراسة إلى سبعة أنماط تحتوي على ١٥ طرزاً من الشعيرات اللاغدية و ١٠ طرز من الشعيرات الغدية.