

# Interspecific Variation of Micromorphology of Glandular Trichomes between two *Salvia* Species in South Albania

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**Abstract:** Micromorphology of glandular hairs on the leaves of *Salvia officinalis* L. and *Salvia triloba* L. was investigated by light microscopy. We noticed similarity and variation between the two species regarding morphology of glandular trichomes. Two main types of glandular trichomes were identified on both species: peltate and capitate. Peltate trichomes consisted of a basal cell, one stalk cell and a large multisecretory head in *S. officinalis* L. In *S. triloba* L. peltate trichomes possess a basal cell, a short unicellular stalk, and a large secretory head with 8 secretory cells. In *Salvia officinalis* L., four types of capitate trichomes have been distinguished. Five types of capitate trichomes have been found in *Salvia triloba* L. The fifth type of capitate trichome, called digitiform trichome was found in *S. triloba* L. This determined interspecific diversity between the two *Salvia* species.

**Key words:** Glandular trichomes, *S. officinalis*, *S. triloba*, peltate trichome, capitate trichome, interspecific diversity.

## 1. Introduction

*Salvia* (Sage) is the largest genus of the family *Lamiaceae* comprising around 1,000 species [1, 2]. It is widespread in various regions around the world from the Mediterranean area, South Africa, Central and South America as well as Asia [1, 3] and some of its representatives are also cultivated and exported to other regions worldwide. In our country this genus is represented by 16 species [4]. The leaves of *Salvia* species are covered with nonglandular and glandular trichomes which originate from epidermal cells [5]. Ref. [6] emphasized that *Salvia* is the genus that has the largest number of trichomes in the *Lamiaceae* family.

For the morphological variety they represent, glandular trichomes are widely used in taxonomy to make comparisons between species within the same genus [7].

In this paper we consider *Salvia officinalis* L. and the closely related *Salvia triloba* L. (*Lamiaceae*) in

Dhermi area, Albania which are amongst the economically most important medicinal and aromatic plants [8]. Our country is one of the main exporters of both species [8]. *S. officinalis* L. is distributed from north to south, while *S. triloba* L. is distributed in southwestern part of Albania. Among *Salvia* species *S. officinalis* is one of the most studied species regarding glandular hairs micromorphology. Ref. [9] for the first time classified capitate hairs as types I, II and III according to their morphology and secretion mode. Following their classification, type IV capitate hairs were described in *S. officinalis* by Ref. [10]. There are not much data on micromorphology of glandular hairs for *Salvia triloba* L. Considering that there are no data about the micromorphology of glandular trichomes for these two species in our country, the present study was undertaken, in order to use these features for species characterization and to evaluate interspecific diversity.

These are preliminary results on the framework of doctoral research. Histochemical analysis is being performed and the data on the presence of secondary metabolites will be presented in the next publication.

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## 2. Materials and Methods

The materials used for the present study are fresh leaves from *Salvia triloba* L. and *Salvia officinalis* L. collected in Dhermi, in the area called Potami source with geographic coordinates N 40.155336, E 19.639430. For micromorphological investigations of glandular trichomes we used free hand sections of fresh leaves and examined with light microscopy Optika and Olympus at  $\times 40$  magnification. Photographs were realised with a photcamera (apple phone) directly in the eyepiece and with Microgiciel software. For glandular trichome classification we followed Ref. [10].

## 3. Results and Discussions

Leaves of *S. officinalis* and *S. triloba* carry both peltate and capitate glandular trichomes, as well as non-glandular, which is characteristic feature for *Lamiaceae* species [9]. From the examination we carried out at *S. officinalis*, short stalk and long stalk capitate glandular trichomes have been distinguished. This agrees with the findings of Refs. [9, 10] for *S. officinalis* in the area of Pisa (Italy) and the data submitted by Ref. [11] for *S. officinalis* in the area of Split (Croatia).

Peltate trichomes consisted of a basal cell, one stalk cell and a large multisecretory head (Fig 1/1).

Data reported by Ref. [10] for *Salvia officinalis* population of Pisa/Italy revealed peltate trichomes with one basal cell, a unicellular stalk and a large multisecretory head by 12 secretory cells.

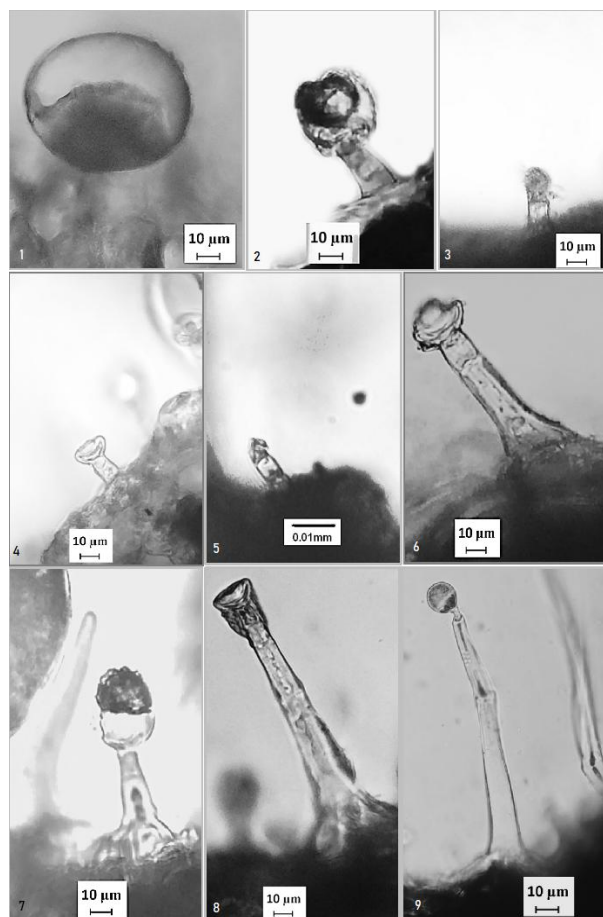
Four type of capitate trichomes we distinguished:

Type I: consists of a short uni or bicellular stalk and a large uni or bicellular head (Fig. 1/2). Type II: is very small with a short unicellular stalk and a unicellular head. This type of trichome is smaller than other trichomes. In type II we found three subtypes of capitate hair, subtype A with an oblong head, subtype B with cup-shaped head and subtype C with curved head (Figs. 1/3, 1/4, 1/5). Type III: is large with a long stalk consisted of one to three cells, a neck cell and a large unicellular head which may be cup-shaped

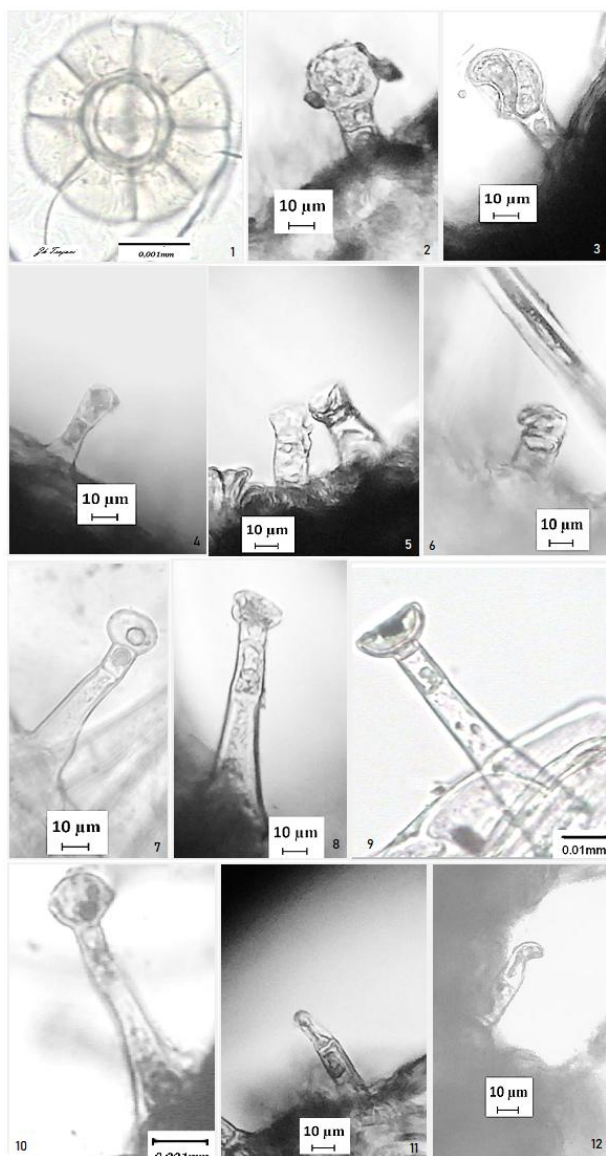
(subtype III A) or round shaped (subtype III B) (Figs. 1/6 and 1/7). Type IV: is very large with a very long stalk one to four cells, a neck cell and a unicellular head which may be cup-shaped or round shaped (Figs. 1/8 and 1/9).

Three types of glandular hairs have been found in *S. triloba*, peltate, capitate and finger shaped trichomes (digitiform). Peltate trichome consists of a basal cell, a short unicellular stalk, and a large secretory head with 8 secretory cells, the same is reported for *S. fruticosa* Mill, in the Libyan region which consists of a basal cell, a unicellular stalk, and a large head composed of eight secretory cells arranged in a circle [12] (Fig. 2/1).

Regarding capitate trichomes we noticed variation in the morphology of the head and the stalk. We noticed five types of capitate glandular trichomes:



**Fig. 1** Glandular trichomes in *Salvia officinalis* L. Dhermi. (1) peltate trichome; (2) capitate type I; (3), (4), and (5) capitate type II; (6) and (7) capitate type III; (8) and (9) capitate type IV.



**Fig. 2** Glandular trichomes in *S. triloba* L. Dhermi. (1) peltate trichome; (2) and (3) capitate type I capitate trichome; (4), (5), and (6) type II capitate trichome; (7) and (8) capitate type III ; (9) and (10) type IV capitate trichome; (11) and (12) digitiform trichome.

Capitate type I trichome consists of a basal cell, with bicellular stalk and a large unicellular head (Fig. 2/2) or a large bicellular pear-shaped head (Fig. 2/3). Capitate type II possesses a basal cell, unicellular stalk and a unicellular head. In this type we noticed three subtypes: subtype A with ovoid unicellular head, subtype B with cup-shaped unicellular head and subtype C with curved unicellular head (Figs. 2/4, 2/5, 2/6).

Type III: is large with a long stalk consisting of one to three cells, a neck cell and a large unicellular head which may be cup-shaped (subtype III A) or round shaped (subtype III B) (Figs. 2/7, 2/8). Type IV: is very large with a very long stalk one to four cells, a neck cell and a unicellular head which may be cup-shaped or round shaped (Figs. 2/9, 2/10).

Another type of trichome found in *S. triloba* was finger shaped trichome that consists of a basal cell, stalk with one or two cells, and an apical cell which is not clearly distinguished from stalk cells (Figs. 2/11, 2/12). According to Ref. [12] this type of capitate trichome has been defined as digitiform trichome.

#### 4. Conclusions

*S. officinalis* and *S. triloba* showed variations and similarity in the micromorphology of leaf glandular trichomes. In the two species leaves both peltate and capitate glandular trichomes were found. Peltate trichomes consisted of a basal cell, one stalk cell and a large multisecretory head in *S. officinalis* L.

In *S. triloba* L. peltate trichomes possess a basal cell, a short unicellular stalk, and a large secretory head with 8 secretory cells. Both species have shown similarity in four types of capitate glandular trichomes. Both species have been distinguished:

Capitate type I, consists of a short uni or bicellular stalk and a large uni or bicellular head.

Capitate type II, is very small with a short unicellular stalk and an oblong unicellular head. This type of trichome is smaller than other trichomes. In type II we found three subtypes of capitate hair, subtype A with an oblong head, subtype B with cup-shaped head and subtype C with curved head. Capitate type III, is large with a long stalk consisting of one to three cells, a neck cell and a large unicellular head which may be cup-shaped (subtype III A) or round shaped (subtype III B). Capitate type IV, is very large with a very long stalk one to four cells, a neck cell and a unicellular head which may be cup-shaped or round shaped. In *S. triloba* L. we found the fifth (V)

type capitate trichome like finger shaped called digitiform trichome, not found in *S. officinalis* L.

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