MELLIFERA RESEARCH ARTICLE

# Pollen morphology of *Lythrum salicaria* L.

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**A B S T R A C T**

In this study, pollen morphology of *Lythrum salicaria* L. belonging to the aromatic genus *Lythrum* (Lythraceae), which has widely medicinal benefits were examined with light microscopy (LM). According to the investigation by light microscope (LM), pollen grains of the species is radially symmetrical, isopolar, oblate-spheroidal, heteroaperturate (3 colpori-3 pseudocolpi) and psilate.

In our opinion, the palynological features of the taxon might be helpful to investigate the taxon in various palynological, taxonomical and pharmaceutical researches.



**Key words:** Lytraceae, *L. salicaria*, light microscope, palynological, taxonomical researches.

## Introduction

The Lythraceae consist about 24 genera and 500 species which mostly tropical herbs, occasionally shrubs or trees comprising [1]. The genus *Lythrum* L. (Lythraceae) is spread throughout the world. It is represented by around 30 species, 10 of which are found in Europe. In Turkey, Lythraceae family is represented by two genera (*Lythrum* and *Ammannia* L.) and nine species belong to *Lytrum* [2].

*L. salicaria* is Euro-Sib. Element [2]. *L. salicaria* is originally Eurasian, but during the 19th century it was spread via the ballast of European ships not only to Europe but also into North and South America, as well as Australia. Its English name is "blooming sally", "purple willow-herb", "rainbow weed" and "purple loosestrife". It is known in German as "Blutweiderich", in French "Salicaire", in Romanian "răchitan" and in Swedish "fackelblomster" , in Turkey "Tıbbi hevhulma"[3- 6]. *L. salicaria* is known as a medicinal plant from the ancient Greek and Roman times and it has been an important drug for centuries [7].

The flowers are visited mainly by bumble bees, but also by lepidoptera, honey bees, solitary bees and syrphid flies [8].The bees visit *L. salicaria* are in bloom between June and August [2]. Furthermore, it grows in small, discrete patches on sand bars and gravel banks in canopy

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openings of flood plain forests with *Populus alba* L. but is also observed on lake banks, in dry river beds, ditches, and among rocks [9].

Antioxidant, antimicrobial, and hypoglycemic effects of *L. salicaria* have been reported [10-13].

There are no reports on the pollen morphology of *L. salicaria* from Turkey.

## Materials and Method

*Locality*

Materials of this study were collected in 2014 from Giresun-Güre–Batlama river. Giresun is located in the eastern part of the Black sea region (40°54´K and 38°25´D). According to the grid system applied by Davis [2], Gure (Giresun) is located in the A7 frame.

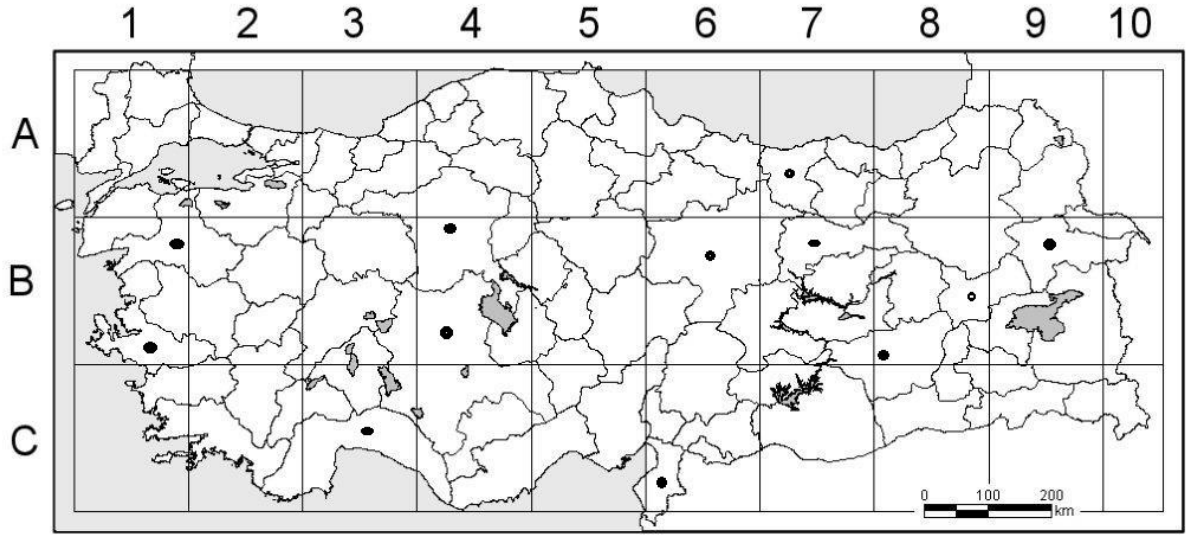


**Figure 1.** Geographical distribution of *L. salicaria* in Turkey

*Pollen Sample*

The light microscopy (LM) observations with their measurements were made on pollen from mature anthers, which have been prepared according to the Wodehouse method [14]. The measurements of the pollen grains of *L. salicaria* were taken on 30 pollen grains from the species. P: polar axis, E: equatorial diameter, Amb: diameter of polen at the polar view, Clg: length of colpus, Clt: latitude of colpus, PClg: length of pseudocolpus, PClt: latitude of pseudocolpus, Plg: length of porus, Plt: latitude of porus, t: distance between colpi ends, were measured from 30 fully developed grains per sample under the Nikon Eclipse Ci microscope (1000×). Results are provided as minimum, maximum and mean ± standard deviations. P/E ratios were also calculated. In addition, the ornamentation was established. All the statistical analyses of the palynological characters were made by the SPSS package program. The terminology used is of Erdtman [15] and Punt et al. [16].



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## Results and Discussion

Palynological description of *L. salicaria* (Fig. 2) was made based on the quantitative and qualitative morphologic results. It is radially symmetric, isopolar, heteroaperturate, oblate-spheroidal (P/E 0.93) (Fig. 3) and polar axis (P) 19.33±1.70 µm, equatorial axis (E) 20.76±1.81 µm. Amb hexagonal. Exine 2µm thick, nexine is thinner or as thick as sexine. Exine ornamentation is psilate. Distance between colpi ends 2.73±0.73 µm. Apertural system 6-zono-heteroaperturate: three pseudocolpi 12.03±0.66 µm long, 2.5±0.50 µm wide, three colpori 15.26 ±0.82 µm long, 8.13±1.07 µm wide, pore 3.43 ± 1 µm long-wide; margins of the pseudocolpi and colpori granulate, distinct margin and terminal edges acute, The pori situated at midpoint of colpus, are circular and with distinct margin. Annulus thickness is 1 µm, slightly protruding with granulations frequently visible on side of annulus ((Fig. 3, Table 1).

**Figure 2.** *Lythrum salicaria*

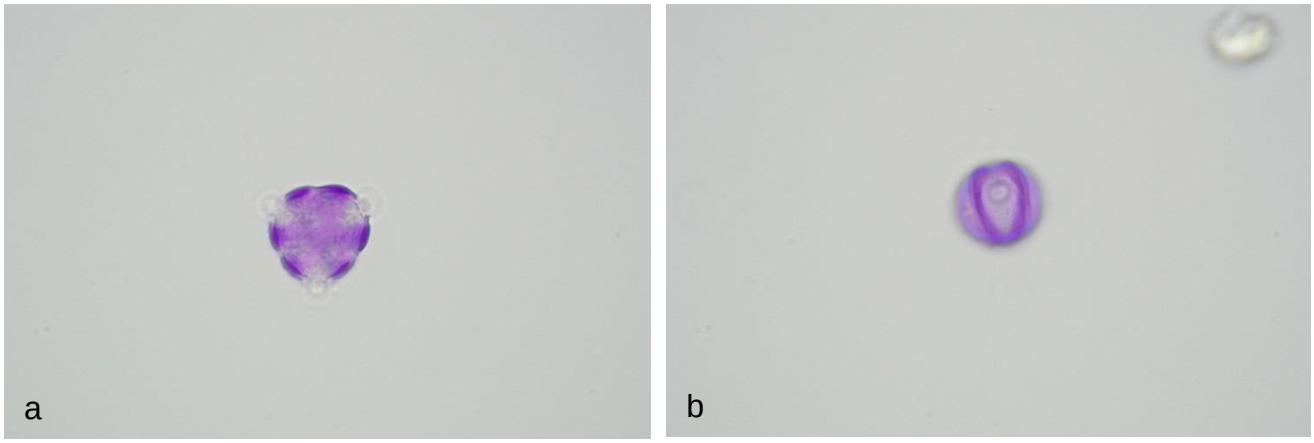


**Figure 2.** *L. salicaria* a: Polar view; b: equatoral view



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**Table 1.** The palynological measurements of *L. salicaria* (M: median, Var.: variation, S: standart deviation)

| | | | | | |
|---|---|---|---|---|---|
| P/E | **Oblate spheroidal** | 0.93 | Exine (µm) | M | 2 |
| | | | | S | 0 |
| | | | | Var. | 2 |
| P(µm) | M | 19.33 | Sexine (µm) | M | 1.35 |
| | S | 1.7 | | S | 0.23 |
| | Var. | 15-25 | | Var. | 1-1.50 |
| E (µm) | M | 20.76 | Nexine (µm) | M | 0.65 |
| | S | 1.81 | | S | 0.23 |
| | Var. | 17-25 | | Var. | 0.5-1 |
| Clt (µm) | M | 8.13 | PClt (µm) | M | 2.5 |
| | S | 1.01 | | S | 0.5 |
| | Var. | 7-10 | | Var. | 2-3 |
| Clg (µm) | M | 15.26 | PClg (µm) | M | 12.03 |
| | S | 0.82 | | S | 0.66 |
| | Var. | 14-17 | | Var. | 11-13 |
| Plt (µm) | M | 3.43 | Amb (µm) | M | 19.93 |
| | S | 1 | | S | 1.46 |
| | Var. | 2-5 | | Var. | 18-23 |
| Plg (µm) | M | 3.43 | t (µm) | M | 2.73 |
| | S | 1 | | S | 0.73 |
| | Var. | 2-5 | | Var. | 2-5 |



Lythraceae is a europalynous family [15]. General pollen characters of the family Lythraceae are radially symmetrical, isopolar, colporate or heterocolpate, sub-prolate or prolate often oblate-spheroidal. Sexine thicker than or as thick as nexine. Tectum reticulate-rugulate or scabrate to sub-psilate.

Perveen and Qaiser [17] examined species representing 5 genera of the family Lythraceae from Pakistan by light and scanning electron microscope. According to this research, Lythraceae is an eurypalynous family. Pollen grains are generally free, radially symmetrical, isopolar, colporate or heterocolpate. Shape of pollen grains are sub-prolate or prolate often oblate-spheroidal. Sexine thicker than or as thick as nexine. Tectum reticulate rugulate or scabrate to sub-psilate. The pollen morphology of the family Lythraceae is significantly helpful at generic and specific level. On the basis of apertural types 2 distinct pollen types viz., *Lagerstroemia indica*-type and *Ammannia baccifera*-type are recognized. Pollen grains of *L. salicaria* is oblate-spheroidal and in terms of aperture types belonginig to *Ammannia baccifera* type.

Graham et al. [18] investigated 12 genera of the Lythraceae is described, using light microscopy( LM), scanning (SEM) and transmission electron microscopy (TEM). According to them, the pollen of *Lythrum* is uniform and distinguished by the three prominent granular pseudocolpi alternating with the three apertures in which the colpi are also granular. The tectum is finely striate with the long axis of the striae mostly parallel to the polar axis.

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Guers [19] has established that, within the genus Rotala (Lythraceae), species ocur which are characterized respectively by three colporate apertures with three indistinct pseudocolpi, and by three colporate apertures with three distinct pseudocolpi.

In Paldat [20] *L.salicaria* pollens are monad, medium-sized (26-50 μm), isopolar, spheroidal, circular, prolate, lobate, 3 colporate, heteroaperturate, aperture membrane ornamented, ornamentation SEM: striate, TEM tectum: eutectate, columellate, compact-continuous.

Our palynological results are concardant to previous research about Lythraceae and *Lythrum* pollen investigations. Pollen grains of *L. salicaria* are radially symmetric, isopolar, heterocolpate, oblate-spheroidal, psilate (LM).

## Conclusion

In Turkey, *L. salicaria* has a common name "Tıbbi hevhulma" and has been traditionally used as medicine all over the World. Pollen morphology of *L. salicaria* is determined. The remarkable property of this species separating from other species is heteroaperturate (3 colpori-3 pseudocolpi).

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## *Lythrum salicaria* L. Polen morfolojisi

**Öz:** Bu çalışmada, geniş medikal kullanımı olan aromatik *Lythrum* L. (Lythraceae) cinsine ait *L. salicaria* L. polen morfolojisi ışık mikroskobu (LM) ile incelenmiştir. Yapılan incelemelere göre, bu taksona ait polenler radyal simetrik, izopolar, oblat-siferoid, heteroapertür (3 kolporat-3 pseudokolpat), psilat özellik göstermektedir. Bu taksonlara ait palinolojik özelliklerin çeşitli palinolojik, taksonomik ve farmasötik botanik çalışmalarında taksonların daha doğru teşhis edilmesine yardımcı olacağını düşünmekteyiz.

**Anahtar kelimeler:** Lytraceae, *L. salicaria*, ışık mikroskobu, palinolojik, taksonomik araştırmalar.



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**Appendix**

***L. salicaria*** L., Syn: *L. tomentosum* DC,; *L. cinereum* Gris. Stout, ± densely pubescent perennial; stems 20-180 cm, winged, sparingly branched. Leaves 10-70 mm, ovate to narrowly lanceolate, truncate to subcordate at base, sessile. Inflorescence a ± dense verticillate spike. Flowers 3-8, in axillary cymose whorls, trimorphic; hypanthium 4-5 mm, broadly tubular in flower and fruit; epicalyx segments 2.5-3-5 mm, subulate; sepals 0.5-1 mm, deltate; petals 8-12 mm, purple: stamens 12. Capsule 3-4 mm, ovoid, included within the hypanthium.
FIowering time: 6-8.
Habitat: Wet places by lakes and streams, dry river beds, etc., 100-2000 m.
Distribiton: Europe [2].

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