Examination of Pollen Morphology of Some Exotic Trees and Shrubs Found in the Parks and the Gardens of Edirne (European Turkey) I.

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Abstract

This study was undertaken to identify some exotic shrubs and trees found in the parks and the gardens in Edirne and to examine morphology of their pollen. In the present work five plant species were studied in this respect, namely: *Tamarix parviflora* (Tamaricaceae), *Campsis radicans* (Bignoniaceae), *Prunus serrulata* (Rosaceae), *Laburnum anagyroides* (Fabaceae) and *Lagerstroemia indica* (Lytraceae). Pollen grains belonging to these species were examined with Olympus BH-2 light photomicroscope as regards some morphological features, principally: pollen shape; size; aperture characters; sculpture and structure of the exine.

Key words: Turkey, Edirne, exotic plants, pollen morphology, light microscope

INTRODUCTION

Pollen grains found in a high concentration in the atmosphere affect many people and cause allergic diseases. To take precaution against polen allergies it is necessary to know the type of the allergic pollens found in the atmosphere of the region and to determine their concentration at different seasons [1-7]. Such kinds of data can be obtained only by preparing the pollen calender of the region [8-9]. In order to prepare the pollen calendar of the region, vegetation and detailed pollen morphology of plants found in the region must be known very well [2]. Since many of the palynological studies are based on the detailed knowledge of the pollen morphology, in this study the pollen morphology of some of the exotic threes and shrubs found in the parks and gardens in Edirne was examined. We hope this study will contribute to the preparation of pollen atlas of Edirne and it will also provide important contributions to the studies related to the treatment of allergic diseases.

MATERIALS AND METHODS

Plant specimens were collected between 2003-2005 and deposited in herbarium of Trakya University, Faculty of Science and Arts, Department of Biology (EDTU). For palynological studies newly blossomed flowers were fixed in acid-alcohol (3:1) and stored in small bottles. In addition to this some of the pollen sample were saved in the paper envelopes and labeled. Pollen grains were prepared for light microscopy by using woodhouse's methods [10]. Furthermore some pollen grains were threated with KOH for five minutes and then mounted in glycerine jelly which is stained with basic fuchsine. Some sample were also mounted in lactofenol-anilin blue.

Pollen grains were examined palynologically with Olympus BH-2 light photomicroscope and measured under the microscope by using micrometric slides as regards following properties: polar length (P); equatorial diamater (E); length and wide of the colpi; diameter and length of pores and exine thickness. These measurements were based on 15-50 readings for each pollen sample Photomicrographs of pollen grains were also taken with the same photomicroscope. The measurements were made by micrometric slides. The terminology used is in accordance with Erdtman [11], Faegeri and Iversen .

RESULTS

1. Tamarix parviflora DC.

Origin of sample: Campus of Trakya University– Edirne.

Collection date and Collector: 28.03.2005, Sevil Tütüncü.

Pollen grain characterıstıcs (Fig. 1c-j)

Pollen Type: Tricolpate

Pollen Shape: Subprolate, P/E = 1.

Exine: Average thickness is 1.28 µm.

Intine: Average thickness is 0.53 µm

Apertures: Colpi are long and narrow with tapering ends, border of colpus is well defined.

Tectum: Pollen Semitectatae. Ect = end

Ornamentation (Sculpture): Microreticulate.

P: 19.45 µm ± 2.05 µm.

E: 15.28 µm ± 2.89 µm.

Clg: 13.8 µm ± 1.4 µm.

Clt:3.96 ± 1.68 µm.

t:4.18 µm.

***2. Campsis radicans* (L.) Seem**

Origin of Sample: Mega park – Edirne.

Collection date and Collector: 8.07.2004, Sevil Tütüncü.

Pollen grain characteristics (Fig.2 c-f)

Pollen type: Tricolpate.

Pollen shape: Sphaeroidea, P/ E = 0,99 (W)

Exine: Average thickness is 0.80 µm

Intine : Average thickness is 0.3 µm,

Aperture: Colpi are long and narrow with rounded ends, the borders of colpi are well defined.

Ornamentation: Reticulate.(Simple baculate).Tectal part of the ridges (muri) of the network supported by single rows of rods (bacules). In general brochi (lumen) of reticulum have the same size but becomes smaller towards the edge of furrows.

Tectum: Semitectate, Ect/end ≈ 2/1.

P: 27,2 µm ± 2,68 µm.

E: 27,5 µm± 2,18 µm.

Clg:20.9 µm ± 1.1 µm**,**

Clt: 3.1µm ±0.4 µm.

t:5.75 µm.

***3. Prunus serrulata* Lindl**.

Origin of Sample: Uğur Mumcu Park – Edirne.

Collection Date and Collector:15.04.2005-Sevil Tütüncü.

Pollen grain characteristics (Fig. 3c-j)

Pollen type: Tricolporate

Pollen shape: Spheroidal, P/E = 1.05

Exine: Average thickness is 1.18 µm.

Intine: Very thin and uniform. Average thickness is 0.37 µm

Apertures: Colpi are long and broad with rounded ends, the borders of colpi are not well defined. Polar triangle is regular.

Ornamentation: Striate. Thin and regular striation.

Tectum: Tectate (Eutectate). Ect/end = 3/1.

P: 29.3 µm ± 2.03µm.**E:** 28 µm ± 1.94 µm.

Clg : 21.85 µm. **Clt :**3.92 µm ± 1.17 µm.

t: 7.4 µm

***4. Laburnum anagyroides* Med.**

Origin of Sample: Campus of Trakya University –– Edirne.

Collection Date and Collector: 24.04.2005-Sevil Tütüncü.

Pollen grain characteristics (Fig. 4 c-f)

Pollen type: Tricolporate.

Pollen shape: Spheroidal, P/E =0,94.

Exine: Average thickness = 1.66 µm. **Intine:** Average thickness = 0.7 µm.

Apertures: Colpi are long and broad with tapering ends, the borders of colpi are not well defined. The pores are very small and have poorly defined margins.

Ornamentation: Microreticulate. Brochi (lumen) of reticulum have different size, especially very small around aperture.

Tectum: Tectate (Eutectatae),Ect/end ≈ 2/1.

P:23.08 µm ± 0.93µm.

E:24.4 µm ± 1.65 µm.

Clg: 17.25 µm ± 1.5 µm.

Clt: 6.9 µm ± 1.9 µm.

t: 7.12 µm.

***5. Lagerstroemia indica* L.**

Origin of Sample: Mega park – Edirne.

Collection Date and Collector: 8.07.2004, Sevil Tütüncü.

Pollen grain characteristics (Fig. 5 c-j)

Pollen type: Tricolporate.

Pollen shape: Spheroidal, P/E = 0.99 (W).

Exine: Average thickness .is 1.41 µm.

Apertures: Colpi are long and broad and their borders are poorly defined. Ends of colpi are not acute. Pores are very clear and situated at the midpoint of the colpus. Their shape is slightly oval. There is a 1-2 µm wide annulus around each pore.

Ornamentation: Verrucate.

Tectum: Semitectate (tectum is incomplete near the poles). Endexine is thick and becomes thicker around the pore.

P: 29.73 µm ± 1.53 µm.

E : 30.01 µm ± 1.62 µm.

Clg: 25.87 µm. **Clt:** 5.5 µm ± 0.60.

Plg : 4.2 µm ± 0.47. **Plt:** 3.5 µm ± 0.68.

t: 7.62 µm

DISCUSSION

Tamarix parviflora DC. had not been studied before (We could not find literature about the pollen morphology of *Tamarix parviflora*), but from the same genus *Tamarix gallica* had been studied with SEM by Halbritter [13]. The results of our and Halbritter's studies showed that the pollen morphology of these two species is similar. In both of the *Tamarix* species, the pollen grains are 3-colpate, structure of tectum is semitectate and ornamentation is microreticulate. But the pollen grains of *Tamarix parviflora* is subprolate whereas the ones of *Tamarix gallica* are spheroidal.

Campsis radicans had been studied before with SEM by Halbritter [14]. Results of our study is similar to these ones given by Halbritter. In both studies pollen grains are tricolpate, tectum layer is semitectate and ornamentation is reticulate. In addition to this study, *Campsis radicans* had also been studied by Başaran et al. in 1995 [15] with light microscopy. In this study, the pollen sample has been taken from the botanic garden of the Science faculty of the Istanbul University. The results of

this study is identical to the results of our study excepting the structure of tectum. In our study, we interpreted the structure of tectum as semitectate but Başaran et al. had been stated the structure of tectum as intectate.

Laburnum anagyroides had been studied before with SEM by Halbritter [16]. Results of our study is similar to the results of the study done by Halbritter. In both studies pollen grains are spheroidal, tricolporate, tectum layer is eutectate, and ornamentation is microreticulate.

Lagerstroemia indica had been studied by Graham et al. in 1987 [17] using light microscopy, scanning (SEM) and transmission electron microscopy (TEM). In their study the pollen samples has taken from Texas, China, Oklahoma and India. Results of our study is similar to the results of these authors. In both studies pollen grains are spheroidal and tricolporate, tectum layer is semitectate and ornamentation is verrucate.

ABBREVIATIONS

P:Polar axis ; **E:** Equatorial axis;

Clg: Colpus length; **Clt:** Colpus wide

Plg: Porus length; **Plt:** Porus wide

t: The length of one side of the polar triangle

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REFERENCES

[1]. Aytuğ, B.,Yaltırık,F., Efe, A. 1995. Plants of Turkey falling allergic pollens. In: National Palinology Congress, 21-23. December, Istanbul 1995, pp. 201-212.

[2]. Aytuğ, B., Efe, A., Kürşad, C. 1990. Allergic Pollens of Trakya. Acta Pharmaceutica Turcica**,** 32: 67-88.

[3]. Bıçakçı, A., Olgun, G., Aybeke, M., Erkan, P. & Malyer, H. 2004. Analysis of Airborne Pollen Fall in Edirne, Turkey. Acta Botanica Sinica, 46(10): 1149-1154.

[4.] Bıçakçı, A., İnceoğlu, Ö., Sapan, N., Malyer, H. 1996. Airborne Pollen Calendar of the Central Region of Bursa (Turkey). International Journal of Aerobiology, 12: 43-46.

[5]. Yurdukoru, S.,1979. Allergic Pollens Found in the Atmosphere of Samsun. Ankara Medical Journal, 1,37-44.

[6]. İnce, A., 1994. Analysis of Allergic Pollens Found in Atmosphere of Kırıkkale. Tr.J. Of Botany, Ankara, 18:43-56.

[7]. İnceoğlu, Ö., Pınar, N. M., Şakiyan, N., Sorkun, K. 1994. Airborne Pollen Concentration in Ankara, Turkey. Grana, 33:158-161.

[8]. Aytuğ, B., 1973. Pollen Calender of İstanbul region. Periodical of Istanbul University Faculty of Forest, 23:(1), 1-33.

[9]. Bıçakçı. A., İphar, S., Malyer, H.,Sapan, N., 1995. Pollen Calender of Mudanya. Periodical of Uludağ University Faculty of Medicine, 1-2-3, 17-21 (In Turkish)**.**

[10]. Wodehouse, R.P., 1959. Pollen Grains, Hofner Publishing co, New York.

[11]. Erdtman, G., 1964. Palynology, in Turil, W. B., Wistas in Botany, vol. 4: 23-54, NewYork.

[12]. Faegri, K., Iversen, J., 1989. Textbook of Pollen Analysis, Ed. 4th, Alden Press, London, 225-233.

[13]. Halbritter H. 2000 onwards. *Tamarix gallica*. In: Buchner R, Weber M. PalDat – a palynological database: Descriptions, illustrations, identification, and information retrieval. (Accessed 10.07.2005) http://paldat.botanik.univie.ac.at/

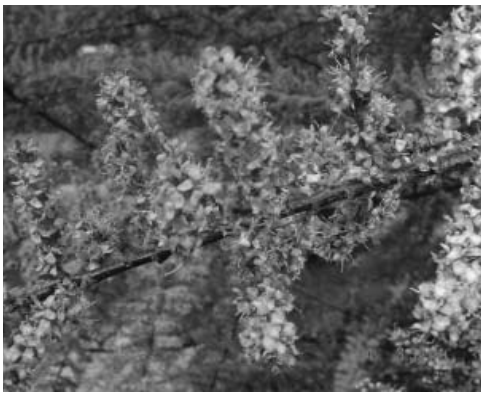
[14]. Halbritter H. 2000 onwards. *Campsis radicans*. In: Buchner R, Weber M. PalDat – a palynological database: Descriptions,illustrations, identification, and information retrieval. (Accessed 10.07.2005) http://paldat.botanik.univie.ac.at

[15]. Başaran S, Aydın Ş, Kaya. Z. 1995. Pollen Morphology of Some Ornemantal Plants: National Palinology Congress, 21- 23 December, Istanbul 1995, pp 14-43.

[16]. Halbritter H. 2000 onwards. *Laburnum anagyroides*. In: Buchner R, Weber M. PalDat – a palynological database: Descriptions, illustrations, identification, and information retrieval. (Accessed date: 10.07.2005) http://paldat.botanik.univie.ac.at

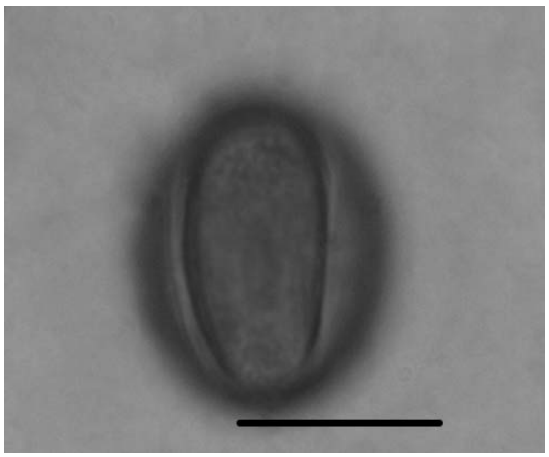
[17]. Graham A., Nowicke J. W., Skvarla J. J., Graham S. A., Patel V., Lee S., 1987. Palinologyand Sistematics of the Lythraceae II. Genera Haitia Through Peplis. Amer. J. Bot. 74(6): 829-850.

(1a)



(1b)

Figure 1a-1b. Flowers of Tamarix parviflora.



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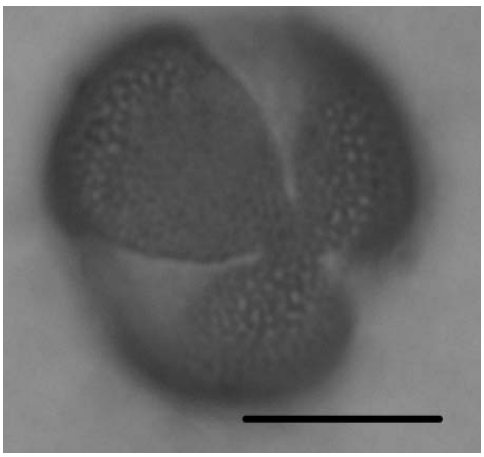

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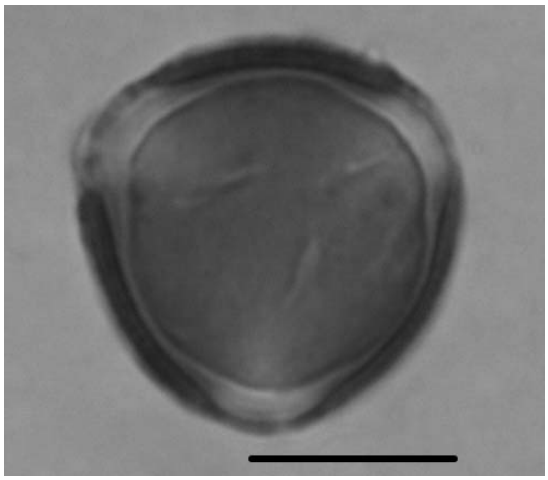

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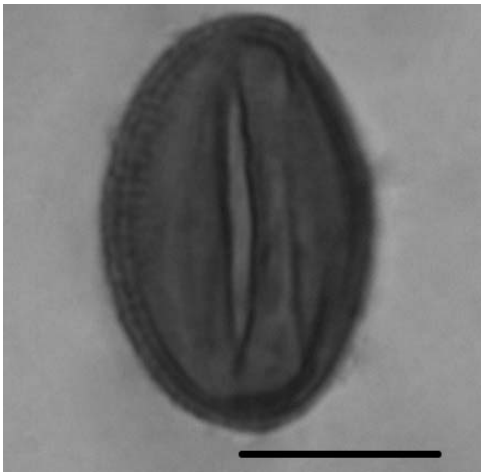
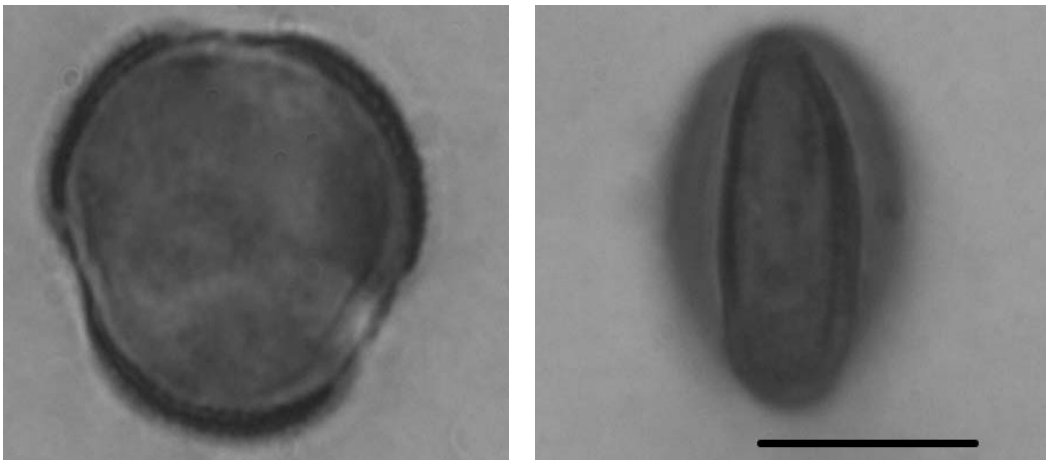
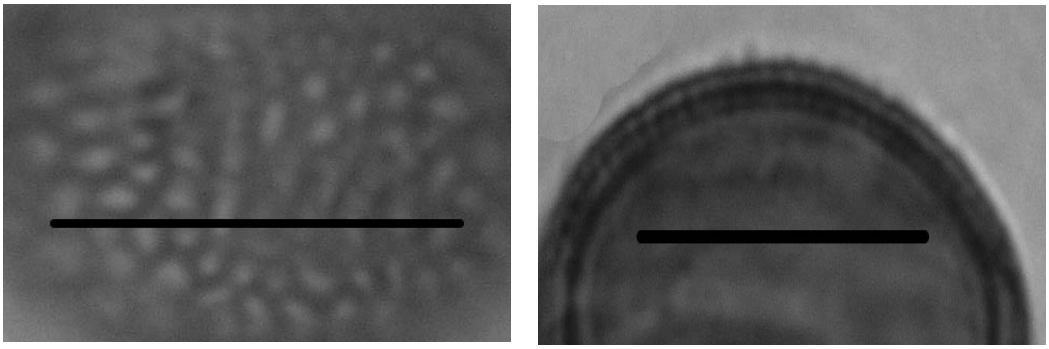


(1f)

Figure 1c-1f. Light micrographs of pollen grains of *Tamarix parviflora* (stanied with basic fuchsine): c. Equatorial view; d**.** Polar view and ornamentation; e. Polar view; f**.** Detail of aperture. Scale bar = 10 µm.



(1g) **(1h)**



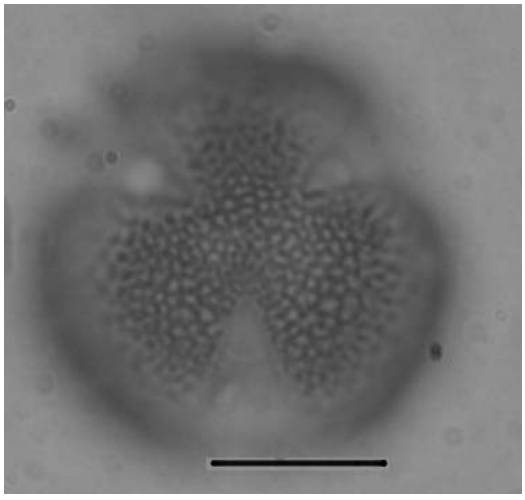
(1i) **(1j)**

Figure 1g-1j. Light micrographs of pollen grains of *Tamarix parviflora* (Stained with basic fuchsine): g. Polar view; h**.** Equatorial view; i. Ornamentation; j. Detailed view of exine and intine layer.
Scale bar = 10 µm.

(2a)

(2b)

Figure 2a-2b. Flowers of *Campsis radicans.*



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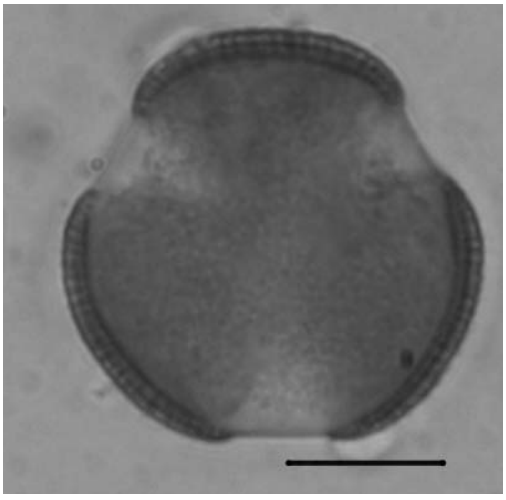
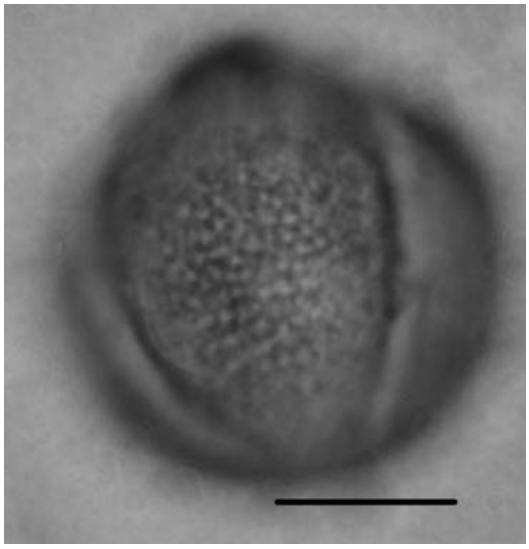


(2d)



(2e)

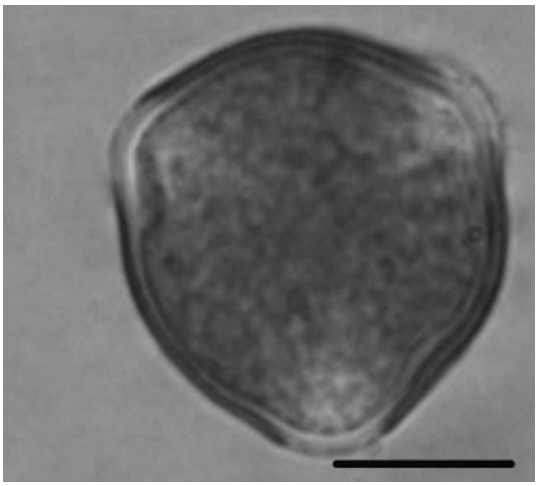
(2f)

Figure 2c-2f. Light micrographs of pollen grains of *Campsis radicans* : c. Polar view and exine ornamentation; d. Polar view and detail of exine layer; e. Equatorial view; f. detail of aperture(colpus). Scale bar = 10 μm.

(3a)

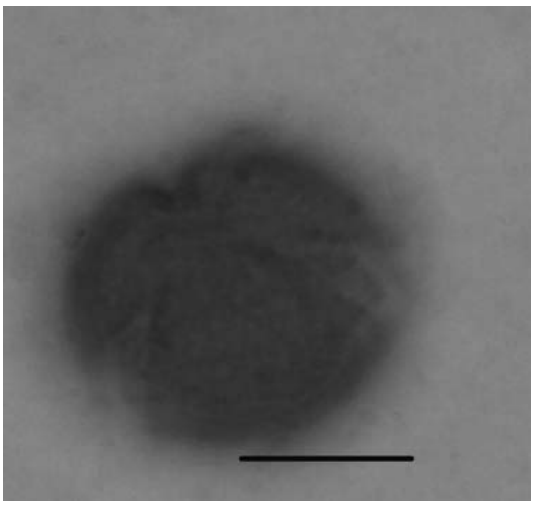
(3b)

Figure 3a-3b. Flowers of *Laburnum anagyroides*.



(3c)

(3d)



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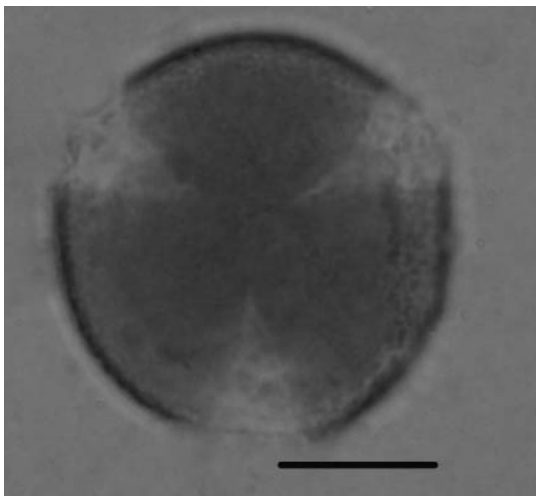


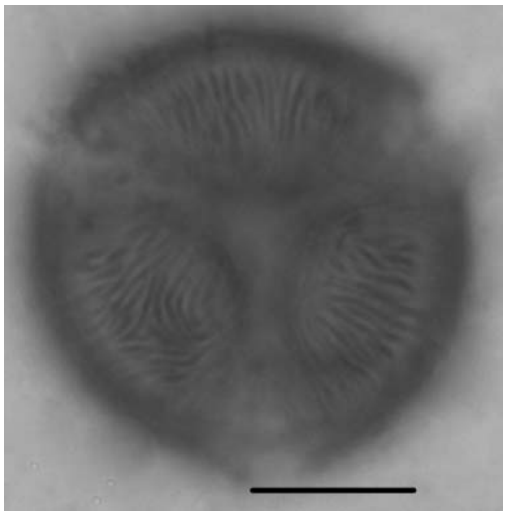
(3f)

Figure 3c-3f. Light micrographs of pollen grains of *Laburnum anagyroides* c. Polar view and ornamentation; d. Equatorial view; e. Apocolpium f. Polar view and ornamentation Scale bar = 10 µm.

(4a)

(4b)

Figure 4a-4b. Flowers of *Prunus serrulata.*



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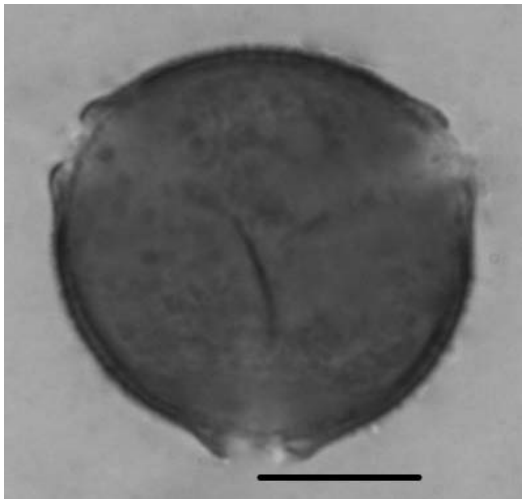
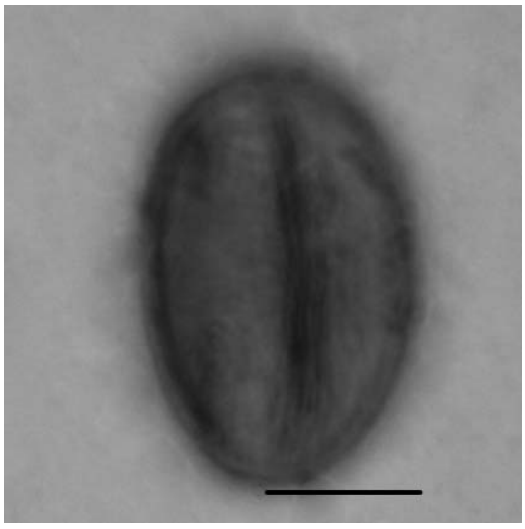


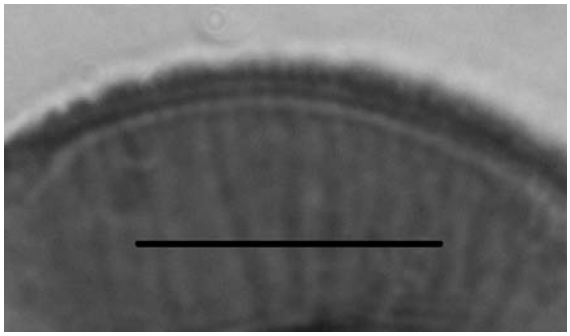
(4d)

(4e)

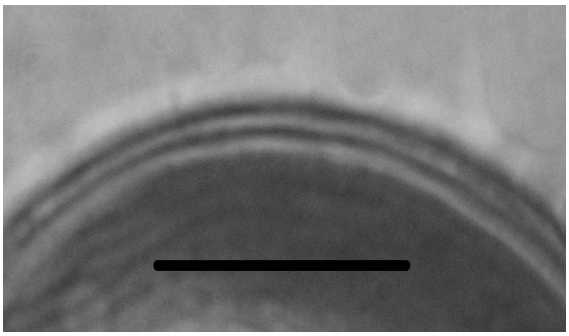


(4f)

Figure 4c-4f. Light micrographs of pollen grains of of *Prunus serrulata*: c. Polar view and exine ornamentation; d. Polar view; e. Equatorial view; f. Detail of aperture(colpus). Scale bar = 10 µm.



(4g)



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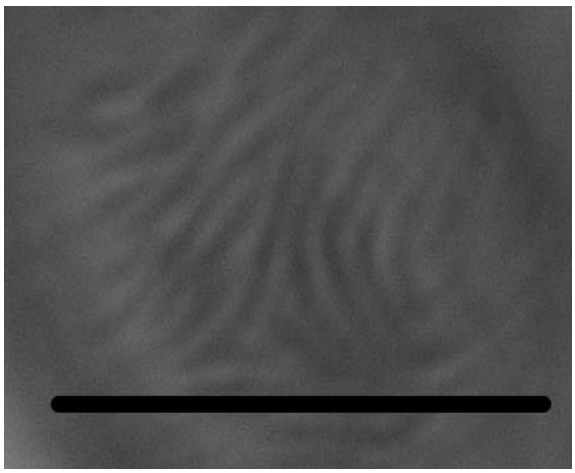


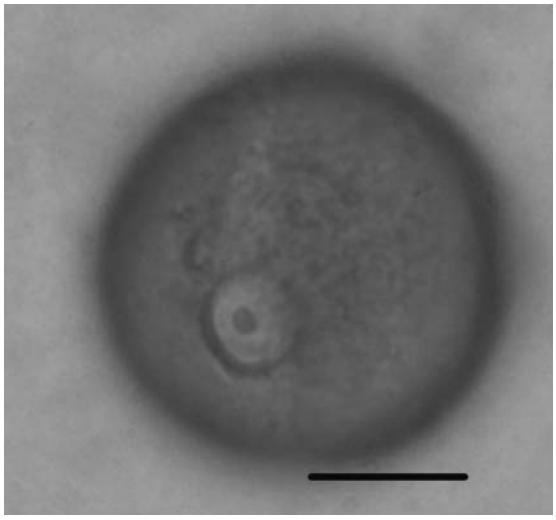
(4i)

Figure 4g-4i. Light micrographs of pollen grains of of *Prunus serrulata* g-h. Detail view and exine of intine layer and exine ornamentation; i. Detailed view of ornamentation.

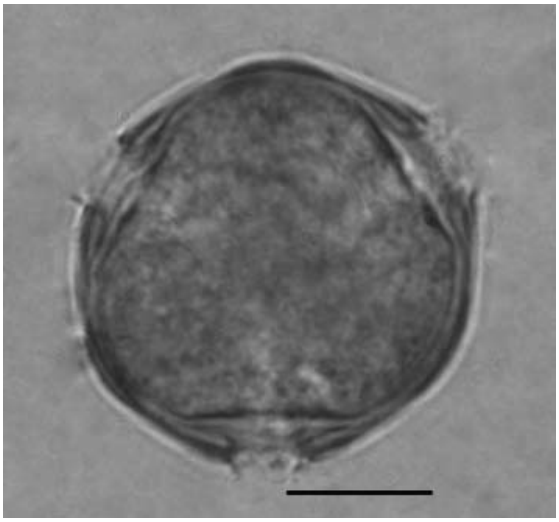
(5a)

(5b)

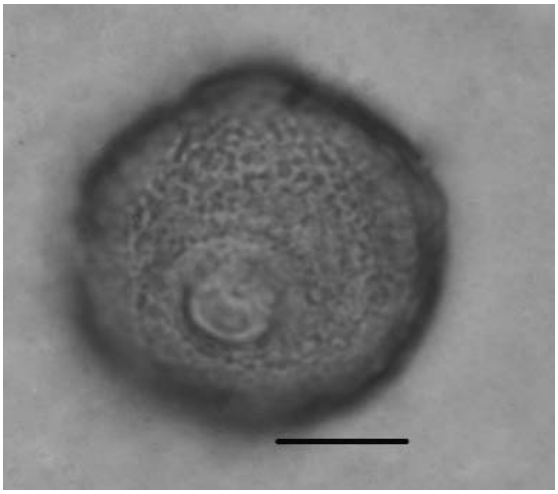
Figure 5a-5b. Flower s of *Lagerstroemia indica*.



(5c)



(5d)



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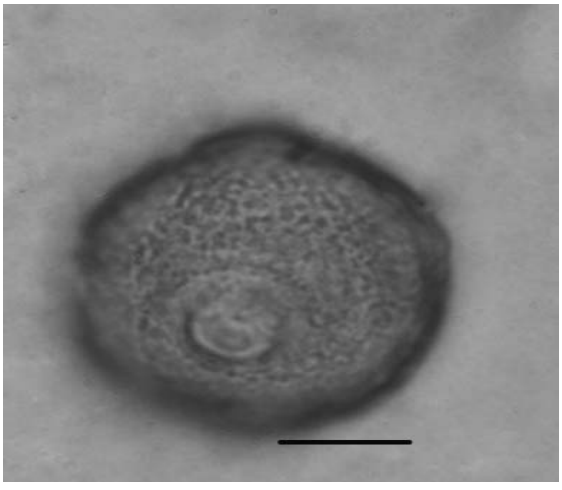
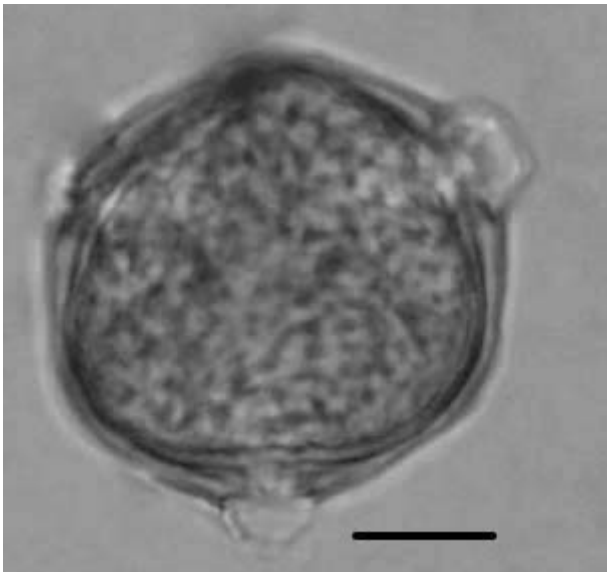
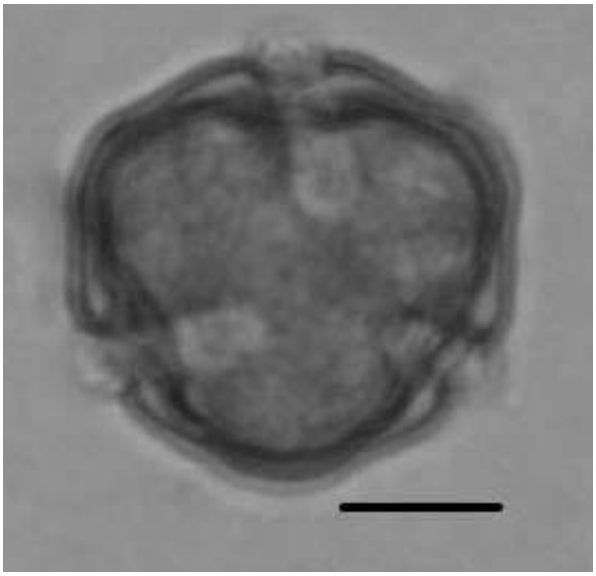


(5f)

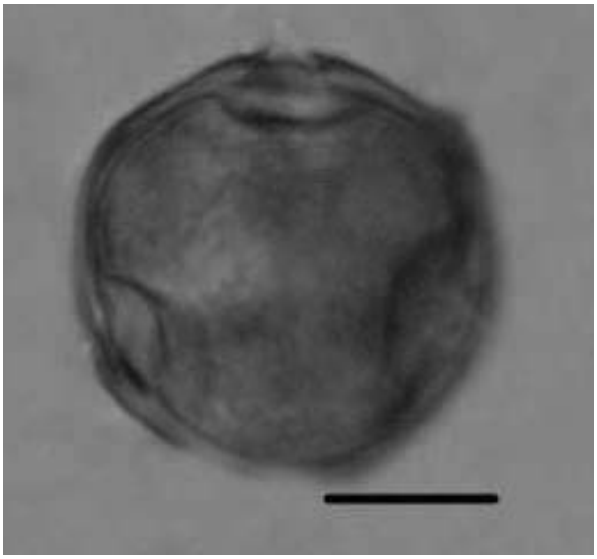
Figure 5c-5f. Light micrographs of pollen grains of *Lagerstroemia indica* c. Equatorial view and aperture; d. Polar view; e. Equatorial view**;** f. Detail of aperture (porus). Scale bar = 10 µm.



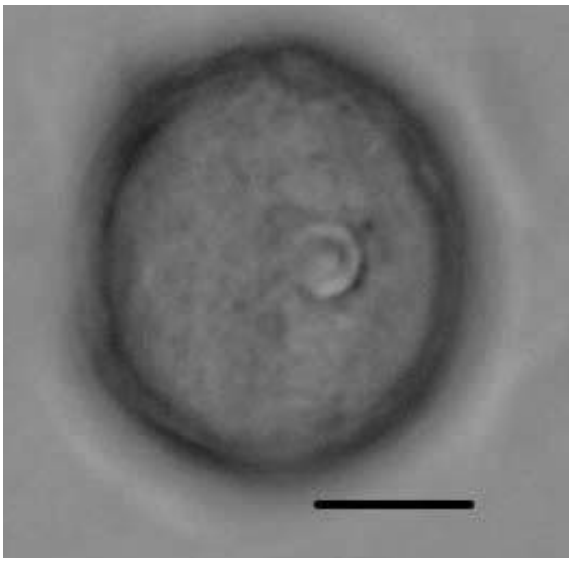
(5g)



(5h)



(5i)



(5j)

Figure 5g- 5j. Light micrographs of pollen grains of *Lagerstroemia indica* (Stained with basic fuchsin). g. Polar view and ornamentation; h. Polar view; i. Polar view and aperture**;** j. Detail of aperture (pore). Scale bar=10µm.