Int. J. Curr. Res. Biosci. Plant Biol. 2015, 2(7): 83-87

EXCELLENT PUBLISHERS

International Journal of Current Research in Biosciences and Plant Biology

ISSN: 2349-8080 Volume 2 Number 7 (July-2015) pp. 83-87

www.ijcrbp.com

Original Research Article

Ultrastructure of Pollen Grains of the Genus *Phlomis* L. (Lamiaceae) in Jordan

Sawsan Oran*

Department of Biological Sciences, Faculty of Science, University of Jordan, 11941, Amman-Jordan

**Corresponding author.*

Abstract

The pollen grains morphology of 6 species of *Phlomis* L. (Lamiaceae) for plant samples collected from Jordan has been studied, using scanning electron microscopy (SEM). The description of the shape, apertures, and sculpturing system for the exine is given. The study using SEM revealed the shape of the different species which ranges from prolate-spheroidal to elliptical or elongate; tricolpate apertures, foveolate; and the sculpturing system is reticulate. The description and micrographs for the studied taxa are included. The results of the present study are found to be taxonomically supportive to the morphological evidence.

Keywords

Lamiaceae

Micromorphology

Phlomis

Pollen grains

Taxonomical evidence

Introduction

The use of electron microscopy technique is proved to be a supportive tool for studying the ultrastructure of pollen grains with regards to the morphological details that is providing a taxonomical evidence for the characteristics of pollen grains for the different taxa of flowering plants. The potential of pollen morphology as an additional character was described by (Harley, 1992).

The pollen morphology of pollen grains of the family Lamiaceae (mint family) has been quit studied for many taxa using the SEM; the pollen morphology of 60 genera of Lamioideae and Pogstmonoideae sensu Cantino et al. and two genera of uncertain subfamilial affinities was surveyed by Abu Asab et al. (1994), the scanning electron microscopy of pollen in some Turkish *Teucrium* L., a number of 32 taxa were studied for their pollen grains exine sculpturing which showed two types of sculpturing verucate to reticulate, Pollen morphology of *Origanum* L. (Labiatae) taxons in Turkey was investigated for 22 taxa of the genus *Origanum* using light and SEM microscopy and the study showed homogenicity between the members of the *Ocimum* taxa studied by Akyalcin (2003).

Another study for pollen and seed morphology of 19 species of the genus *Marrubium* (Lamiaceae) using SEM was carried out by Akgul et al. (2008), three types of the sculpturing system were found these are reticulate, psilate-perforate and granulate, the ultrastructure of pollen grains for the taxa of *Salvia* (Lamiaceae) in Jordan and the neighboring countries were examined by Oran (1996), using light and SEM microscopy, all the studied species have hexazonocolpate, with a shape of spheroidal prolate or oblate, the exine is characterized by primary and secondary reticulation and as a result of this study some species were recognized as synonyms.

The pollen morphology of the genus *Stachys* (Lamiaceae) in Iran was studied and found to be systematically implacable for separating species of *Stachys*; the pollen

morphology and exine structure of 10 species of *Mentha* (Lamiaceae) were investigated by Celenk et al. (2008) using light and SEM microscopy the exine was reticulate, this study indicated valuable taxonomic applications; The micromorphological studies of *Lallemantia* L. (Lamiaceae) species growing in Turkey using scanning electron microscopy were investigated, "the fine details are characteristics enough to differentiate the pollen between species" (Dinc et al., 2009). A palynological study of endemic taxa from Cyprus including *Phlomis cypria* Post var. *cypria* (Lamiaceae) was investigated by Yildiz et al. (2009); the pollen grains of *Phlomis cypria* var. *cypria* were described as trizonocolpate, prolate, semitectate and with reticulate ornamentation. A palynological study for the genus *Phlomis* in Iraq and their taxonomic uses were studied by Al-Omar et al. (2009).

Pollen morphology of 21 taxa of the family Lamiaceae in Mangolia was studied by Bazarrugehaa et al. (2012), the sculpturing system ranges from tuberculae, microreticulate, bireticulate or polish, the study was of taxonomic significance. A palynological study for the genus *Ballota* in Egypt was carried out by Osman (2012), the study of pollen grains in his study was taxonomically useful.

Taxonomic implications of pollen exine morphology in infrageneric classification of *Scutellaria* (Lamiaceae) was explained by Jamzad et al. (2013), this study showed that the exine ornamentation is a diagnostic character for the infrageneric classification of *Scutellaria*. Biosystematics evidences were carried out by Celep et al. (2014) for the endemic Turkish *Salvia quezelii* (Lamiaceae) and their taxonomic implications, the pollen and other tools were taxonomically significant.

In this current study the morphological characteristics of pollen grains surface of 6 species of the genus *Phlomis*, *P. syriaca*, *P. herba-venti* subsp. *pungens*, *P. platystegia*, *P. brachyodon*, *P. kurdica* and *P. viscosa* in Jordan were studied using SEM microscopy.

Materials and methods

- Pollen grains were collected from herbarium specimens from the herbarium at the University of Jordan (AMM) for the taxa of *Phlomis* recorded in Jordan with their numbers of the herbarium specimen as indicated in Table 1, the taxa examined were *P. syriaca* 492, *P. herba-venti* subsp. *pungens* 1549, *P. brachyodon* 96, *P. platystegia* 6, *P. kurdica* 8383 and *P. viscosa* from a flower of a specimen loaned from Kew herbarium, number 015873.

- Samples of pollen grains (Table 1) were studied using electron microscope (SEM) Nikon/JEOL Neoscope JCM-5000 at Plant Anatomy lab, Monsanto Center, Missouri Botanical Garden, ST. Louis, Missouri, USA. The pollen grains of *P. kurdica* (Fig. 1B) were examined using the scanning electron microscope at Geology Department at the University of Jordan.

- Pollen grains were placed, spread on stups, and then coated with gold using sputter coating Denton Desk V at botany lab, Monsanto center, Missouri Botanical Garden.

- The stups then were placed on the SEM to be examined and the morphological characteristics were observed and micrographs were obtained for each pollen grain.

- Micrographs for the pollen samples were prepared (Fig. 1 A-F) and the ultrastructure description of pollen grains was given Table 1.

- Morphological descriptions were given for the surface of each pollen grain as described in Table 1 according to Erdtman (1945).

-Micrographs for Pollen grain of *Phlomis* taxa in Jordan are illustrated in Figs. 1 A-F.

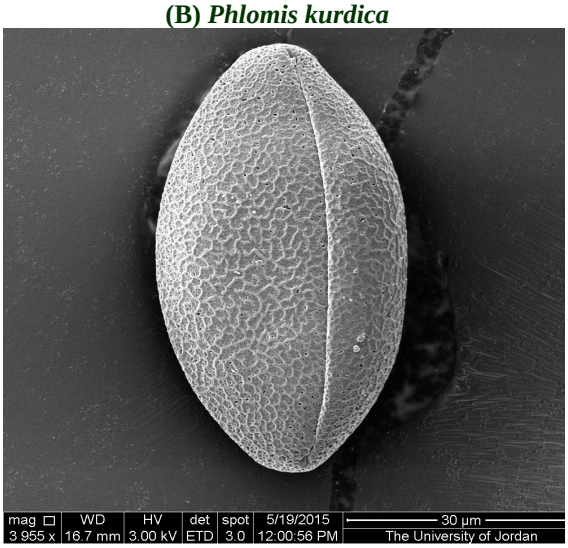
Table 1. Showing description the pollen grains of *Phlomis* taxa recorded in Jordan.

Taxa names	Herbarium numbers	Shape of pollen	Type of aperture	Exine ornamentation
P. brachyodon	AMM, 96	Spherical (prolate)	Tricolpate	Reticulate
P. kurdica	AMM, 8383	Elliptical-elongate	Tricolpate	Reticulate
P. platystegia	AMM, 6	Oblong-elliptical	Tricolpate	Reticulate
P. herba-venti subsp. *pungens*	AMM, 1594	Elliptical-elongate	Tricolpate	Reticulate
P. syriaca	AMM, 492	Spherical-prolate	Tricolpate	Reticulate
P. viscosa	K, 0158738	Elongate-elliptical	Tricolpate	Reticulate

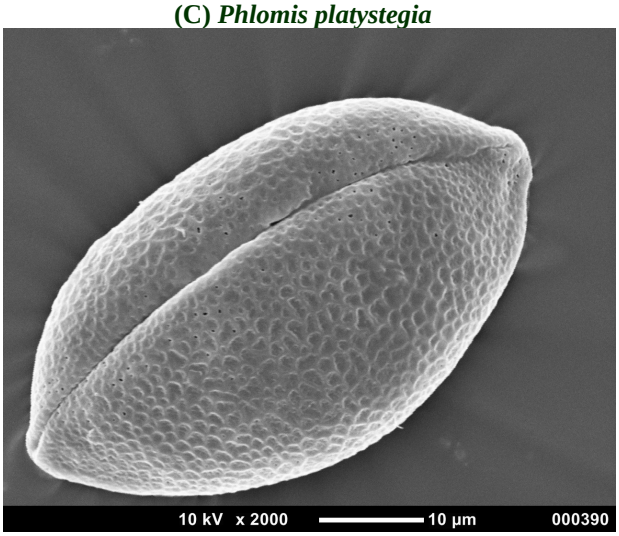
Fig. 1: Micrgraph of pollen grains of *Phlomis* species in Jordon.

(A) *Phlomis brachyodon*

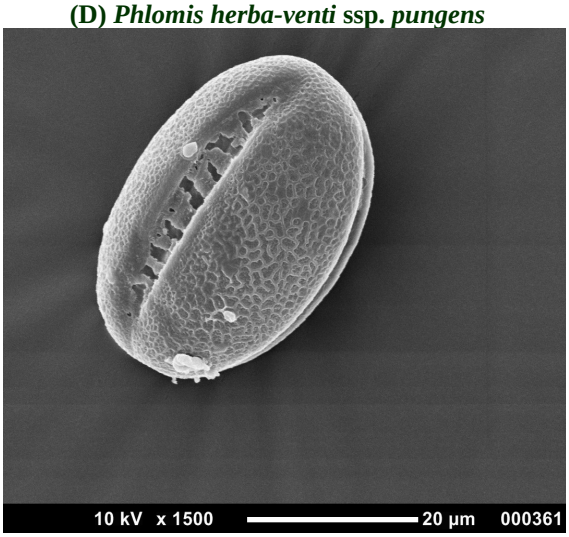
(B) *Phlomis kurdica*



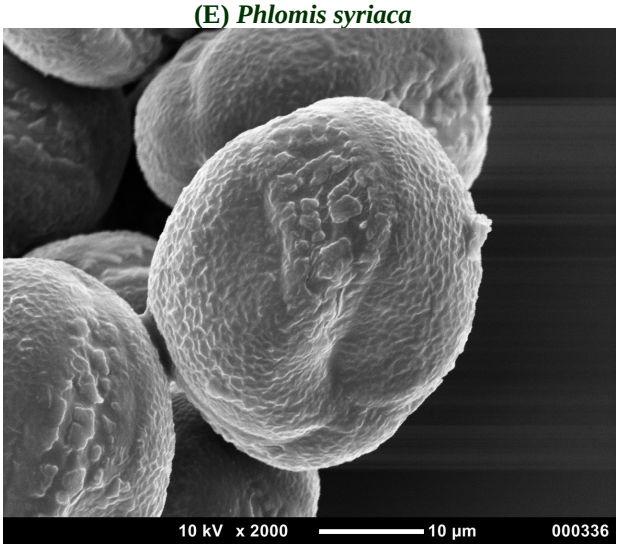
(C) *Phlomis platystegia*



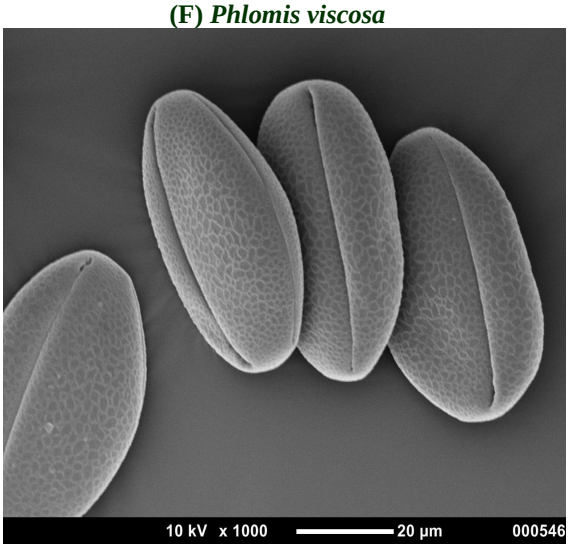
(D) *Phlomis herba-venti* ssp. *pungens*



(E) *Phlomis syriaca*



(F) *Phlomis viscosa*



Results and discussion

The study of the pollen grains for the species of the genus *Phlomis* in Jordan showed that the shape of the studied pollen are ranging from prolate to spheroidal, or elongate to elliptical; the apertures are tricolpate for all studied taxa and the exine is reticulate, Table 1. The observed shapes of different taxa are prolate, or spheroidal to elliptical -elongate; the apertures are of the type tricolpate and the sculpturing system of the exine is reticulate, the colpi are foveolate. The results obtained are shown in Figs. 1 (A) to 1 (F), the description of *Phlomis* pollen grain morphological characteristics are shown in Table 1.

In this study the use of SEM revealed morphological characteristics of the pollen grains exine for the different studied species of *Phlomis* in Jordan. The shape, number of apertures and the sculpturing system provided added supportive taxonomic evidence to the morphological characteristics of the species of *Phlomis* in Jordan.

The characteristics of *Phlomis* pollen grains showed similarities with regards to pollen grains using the SEM, the different studied species showed similar sculpturing system, as well as the apertures, the shape is varied from rounded to elongate or elliptical. However minor differences are revealed using SEM for the different species of *Phlomis* in Jordan.

The taxonomical re-evaluation which is currently taking place by Oran (2015) and for a new key to be re-constructed for different species of *Phlomis* in Jordan, therefore this study is providing an extra supportive evidence for the new taxonomic study and confirmed the similar affinities or similarities with the taxonomic study of the different recorded species of the genus *Phlomis* in Jordan. More biosystematics evidences are required for the different taxa of *Phlomis* as well as of the family Lamiaceae in Jordan, which could be of great value for providing data that would be useful in schemating a phylogenetic shape for different taxa of Lamiaceae.

Acknowledgement

The author is appreciating the financial support of the deanship of Scientific Research, University of Jordan, Amman for supporting grant number 1611, and the financial support of the University of Jordan during my sabbatical year 2014-205, USA; appreciation to Missouri Botanical Garden, St. Louis, Missouri, USA, for the use of SEM and all other offered technical facilities during my sabbatical year, I would like to thank Dr. Rosa del C. Ortiz-gentrz, Monsanto center at Missouri Botanical Garden for her kind technical assistance. I acknowledge the invitation of the Department of Biological Sciences at Washington University in St. Louis. Thanks are also due to Miss Asma Bzoor research assistance, University of Jordan.

References

Abu-Asab, M.S., Cantino, P.D., 1994. Systematic implications of pollen morphology in subfamilies Lamioideae and Pogosteonoideae (Labiatae). Ann. Missouri Bot. Garden 81(4), 653-686.

Akgul, G., Ketenoglu, O., Pinar, N.M., Kurt, L., 2008. Pollen and seed morphology of the genus *Marrubium* (Lamiaceae) in Turkey. Ann. Bot. Femmici. 45,1-10.

Akyalcin, H., 2003. Pollen morphology of *Origanum* L. (Labiatae) Taxons in Turkiye. Asian J. Plant Sci. 2, 28-41.

Al-Omar, M.M., Al-Najjar, N.R., 2009. Palynological study of *Phlomis* L. (Labiatae) spp. Grown in Iraq and its taxonomic uses. Iraqi J. Sci. 11-14.

Bazarraagchaa, B., Myoung, L.S., Yuon, L.H., 2012. Pollen morphology of the family Lamiaceae in *Mangolia*. J. Korean Nat. 5(2), 169-179.

Celenk, S., Tarimcilar, G., Bicakci, A., Kaynak, G., Malyer, H., 2008. A palynological study of the genus *Mentha* L. Lamiaceae. Bot. J. Linn. Soc. 157, 141-154.

Celep, F., Kahraman, A., Atalay, Z., Doğan, M., 2014. Morphology, anatomy, palynology, mericarp and trichome micromorphology of the rediscovered Turkish endemic *Salvia quezelii* (Lamiaceae) and their taxonomic implications. Plant Syst. Evol. 300(9), 1945-1958.

Dinc Muhittin, D., Pinar, N.M., Dogu, S., Yildirimli, S., 2009. Micromorphological studies of *Lallemantia* L. (Lamiaceae) species growing in Turkey. Acta Biol. Cracoviensia series Botanica. 51(1)**,** 45-54.

Erdtman, G., 1945. Pollen morphology and plant taxonomy IV. Labiatae, Verbenaceae, and Avicenniaceae. Svensk. Botanisk. Tidskrift. 39, 279-285. Tr. J. Bot. 23, 379-382.

Harley, M.M., 1992. The potential value of pollen morphology as an additional taxonomic character in subtribe Ociminae (*Ocimum*: Nepetoideae: Labiatae). In: Advances in Labiatae Science (Eds.: Harley, R.M., Renolds, Y.). Royal Botanic Gardens, Kew. pp. 125-138.

Jamzad, Z., Nejad, M.H., 2013. Taxonomic implications of pollen exine morphology in infrageneric classification of *Scutellaria* (Lamiaceae). Nordic J. Bot. 32, 233-244.

Oran, S.A., 1996. Ultrastructure of pollen grains of the genus *Salvia* L. (Labiatae in Jordan and the neibhouring countries (Palestine, Syria, and Lebanon). Dirasat. Nat. Engin. Sci. 24(3), 393-408.

Oran, S.A., 2014-2015. Taxonomy of the genus *Phlomis* in Jordan. In preparation.

Osman, A.K., 2012. Comparative anatomical and palynological studies on genus *Ballota* (Lamiaceae) from Egypt. J. Med. Plants Res. 6(47), 5797-5812.

Yildiz, K., Gucel, S., Dadandi, M.Y., 2009. A palynological investigation of Endemic Taxa from Northern Cyprus. Pak. J. Bot. 41(3), 991-1007.