The morphology of some allergenic pollens of the Leguminosae Family in Kermanshah province (West of Iran)

Abstract

One of the most important allergens is pollen and a wide range of allergenic plants are in Leguminosae family .In this study; four fresh allergen pollen of this family including Yellow *Melilotus officinalis* (L.) Desr. (Sweet-Clover), *Spartium junceum* L. (Spanish broom), *Robinia pseudoacacia* L. (Black Locust) and *Trifolium repens* L. (White clover) were taken from nature of Kermanshah. The pollen grains were studied by Light Microscopy (LM) for all studied species. In addition, the pollen grains of *S. junceum* were studied by Scanning Electron Microscopy (SEM). Results showed that the pollen grains of these genera were isopolar, spheroidal or subprolate and prolate, medium-size, tricolporate, triangular polar view, oval equatorial view and with microtuberculate or microreticulate ornamentation. Therefore, the genera of Fabaceae family is very heterogeneous based on pollen grains features.

Keywords: Allergenic plants, exine Surface ornamentation, Fabaceae, Pollen grain, Papilionaceae, Tricolporate.

1. INTRODUCTION

Kermanshah Province, situated in western Iran, spreads over an area of 25,000 km². It lies between lat. 45.5° and 48° E, long. 33.7° and 35.3° N. The province is bounded on the north by Kurdestan province, on the south by Ilam province, on the southeast by Lorestan province, on the east by Hamedan province and on the west by Iraq country [1]. Several palynological works had done in this area and included: [2] studied five genera of *Vicieae* tribe by using electron microscopy and compared this data the other Fabaceae tribes. The pollen grains of *Melilotus indica* (Linn.) were investigated by using LM and TEM as allergen pollen [3]. [4] presented an illustrated collection of Iranian plants and allergen pollens. Allergenic effects of *Spartium junceum* L. and *Lagerstroemia indica* L. were investigated by [5]. The Identification of allergen pollens were done in Kermanshah province by [6] and [7]. *Vicia hyrcanica* Fisch. et C.A. Mey. from Fabaceae family examined by Light Microscope and the pollen of this species is isopolae and trizonocolporate. Pollen morphology of four species of *Lathylus sativus* L. were studied by [8] and showed that the pollen grains were

medium to large size, oval and elongated oval with reticulate exine ornamentation. [9] studied pollen analysis of nineteen Chinese honeys. They identified sixty one pollen types from thirty three plant families in Natural Honeys. Among the studied species, the pollen of *Robinia pseudoacacia* L.*, Sophora japonica* L. were Fabaceae type [10] investigated the pollen morphology of sixteen *Trifolium* taxa in Istanbul by using the data obtained from LM observations which of nine taxa were taken by SEM. The pollen grain *Melilotus bicolor* as an endemic species from Turkey were investigated by [11]. In this research, the pollen grains are generally trizonocolporate, radially symmetrical, isopolar and subprolate. Sculpturing is usually microreticulate or, rarely, rugulate in the meridional optical section, and microreticulate in the polar optical section [11]. The pollen morphology of *Melilotus bicolor* Boiss. & Balansa. belongs to the tribe *Trifolieae* was studied by [11]. According to this study, the pollen grains were generally trizonocolporate and microreticulate ornamentation. The obtained list of allergenic plants by [12], the pollen of *Melilotus officinalis* (L.) Desr. and *Trifolium repens* L. had a weak allergen, and Black Locust (*Robinia pseudoacacia* L.) had a moderate allergen effect. The aim of our reseach has been provided to identify a micromorphological survey for four allergen species from Fabaceae family.

2. MATERIAL AND METHODS

Fresh pollen grains were taken from available cultivable plants in Kermanshah nature. The pollen grains were acetolyzed according to [13] and mounted in glycerine jelly. The colpi features and exine surface ornamentation studied using Dino capture camera mounted on a Leitz light microscope HM-LUX3 model with a magnification of 400, also at least 25 pollen grains measured in polar and equatorial view. Measurements were recorded using both a 40 x objective, and a crossed micrometer eyepiece graticule. The pollen data for all species examined are summarized in Table 1. for Light Microscopy. The anther of Spanish broom (*Spartium junceum* L.) samples were used to study of pollen grain by Scanning Electron Microscopy (SEM). Then, the pollen grains located on sampling stanchion and gold sprayed on pollens. At the end, Spanish broom pollen grains studied using Philips scanning electron microscope model XL30 of Netherland. Micrographs with a magnification of 10000 prepared from Spanish broom pollen grains image. Descriptive terminology follows [14], [15] and [15].

3. RESULTS AND DISCUSSION

Pollen features of studied species are:

Yellow Sweet-Clover (*Melilotus officinals* (L.) Des*r.*): Pollen grain, isopolar, prolate, medium (23.7.±2 µm), tricolporate (Fig. 1A), the general outline is elliptical spheroidal or triangular, equatorial view elongated oval, polar axis dimensions 30.3-23.6-20.5 µm, equatorial axis

dimensions 27.7 - 18.4 - 14.5 µm, P/E (polar axis/equatorial axis) 1.28, microtuberculate or psilate ornamentation

Black Locust (*Robinia pseudoacacia* L.): Pollen grain isopolar, spheroidal, elongated oval (Fig. 1B), medium (27.8 ± 1.9 µm), tricolporate, the general outline; polar view triangular (Fig. 1C), equatorial view elongated oval, polar axis dimensions 31.9 – 27.8 -23.0 µm, equatorial axis dimensions 29.7 - 26.3 - 22.9 µm, P/E 1.05, with tubercular or microechinate surface ornamentation.

Spanish broom (*Spartium junceum* L.): Pollen grain isopolar, subprolate, medium (35.2 ± 2.1 µm), tricolporate, the general outline; prolate spheroidal or triangular (Fig. 1D), equatorial view oval (Fig.1E), polar axis dimensions 30.6-35.2-40.2 µm, equatorial axis dimensions 24.4-30.8-36.8 µm, P/E 1.14, with microreticulate surface ornamentation (Fig. 2A). Muri solid with 0.2 – 1.0 µm wide. The Lumina are 0.1 – 0.9 µm in diameter (Fig. 2B).

White clover (*Trifolium repens* L.): Pollen grain, isopolar, subprolate, medium (21.7 ± 1.7 µm), tricolporate, the general outline; prolate spheroidal or triangular (Fig. 1G), equatorial view broad oval (Fig. 1F), polar axis dimensions 17.7-21.7-22.0 µm, equatorial axis dimensions 16.2-18.4-22.0 µm, P/E 1.17 with microtubercular or psilate ornamentation.

DISCUSSION

[17] considered Papilinaceae as the subfamily in Fabaceae family and following features noted for studied pollen grains (450 genera of Europe); pollen grains tricolporate, poro-colporate and porate. Also they studied another species of *Melilotus* pollen grain in which is similar to *M. officinalis* in aspect of size and colpi type (tricolporate). [2] demonstrated that Fabaceae family pollen grains in studied genera are like as follow: In *Arachis L., Onobrychis* Adans*, Hedysarum* L. tricolpate*,* and in Genera *Galega* L., *Sophora* L.*, Thermopsis, Lupinus* L.*, Genista* L.*, Laburmum* Medic. tricolporate ,and in *Ononis* L., *Medicago* L.*, Trifolium* L.*, Melilotus Lotus* L.*, Colutedea* L.*, Chesneya* Lind.*, Oxytropis* DC.*, Glycyrrhiza* L.*,* triporate. In majority of genera have reticulate ornamentation, and perforate ornamentation observed in *Lathyrus, Medicago, Colutea,* and striate ornamentation in *Coronilla, Glycyrrhiza.*

The exine surface ornamentation in studied genera is similar to [2] investigation. According to Gapotchka; the pollen of *Trifolium, Ononis, Melilotus* in Trifolieae tribe are similar each other; on the other hand, the pollen grain of *Medicago* is almost similar to *Lotus in* Loteae tribe*.* However, *M. officianalis* in tudied species has microtuberculate and psilate ornamentation; in spite of [2] who introduced it as reticulated one. In addition, results obtained pollen grain of *Spartium junceum* L*.* using SEM from Kermanshah region scanning

electron microscopy showed that pollen grain is spheroid, tricolpate and microreticulate ornamentation.

M. bicolor as an endemic species from Turkey with microreticulate or, rarely, regulate ornamentation were seen [11]. In our research, microtuberculate or psilate ornamentation was observed in *M. officinals*. Thus, this character in this genus is varied and specified in species level.

Both *R. pseudoacacia* and *T. repens* had a moderate allergen effect [12]. In our research *R. pseudoacacia* had specific pollen micromorphological characters include: spheroidal shape and with tubercular or microechinate surface ornamentation. Also, prolate spheroidal or triangular shapes with microtubercular or psilate ornamentation were seen for *T. repens.*

S. junceum L. had identified by by [5] as major allergen pollen type in west of Iran. The microreticulate surface ornamentation and subprolate shape as qualitative characters were distinct for this species.

COMPETING INTERESTS

The authors of this manuscript declare that they have no conflict of interests.

AUTHORS' CONTRIBUTIONS

The authors designed this research, conducted the laboratory work, and wrote the manuscript. All of the authors read and approved the final manuscript.

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Table. 1. Palynomorphological data of the investigated species by Light Microscopy.

No.	Specific name	Pollen size (µm)	polar axis (P) (µm)	equatorial diameter (E) (µm)	P/E	Form
1	Melilotus officinalis (L.) Desr.	23.6±2	20.5-23.6-30.3	14.5-18.4-27.7	1.28	prolate
2	Robinia pseudoacacia L.	27.8±1.9	23.0-27.8-32.0	23.0-26.3-29.7	1.05	spheroidal
3	Spartium junceum L.	35.2±2.1	30.6-35.2-40.2	24.4-30.8-36.8	1.14	Subprolate
4	Trifolium repens L.	21.7±1.7	17.7-21.7-22.0	16.2-18.4-22.0	1.17	Subprolate

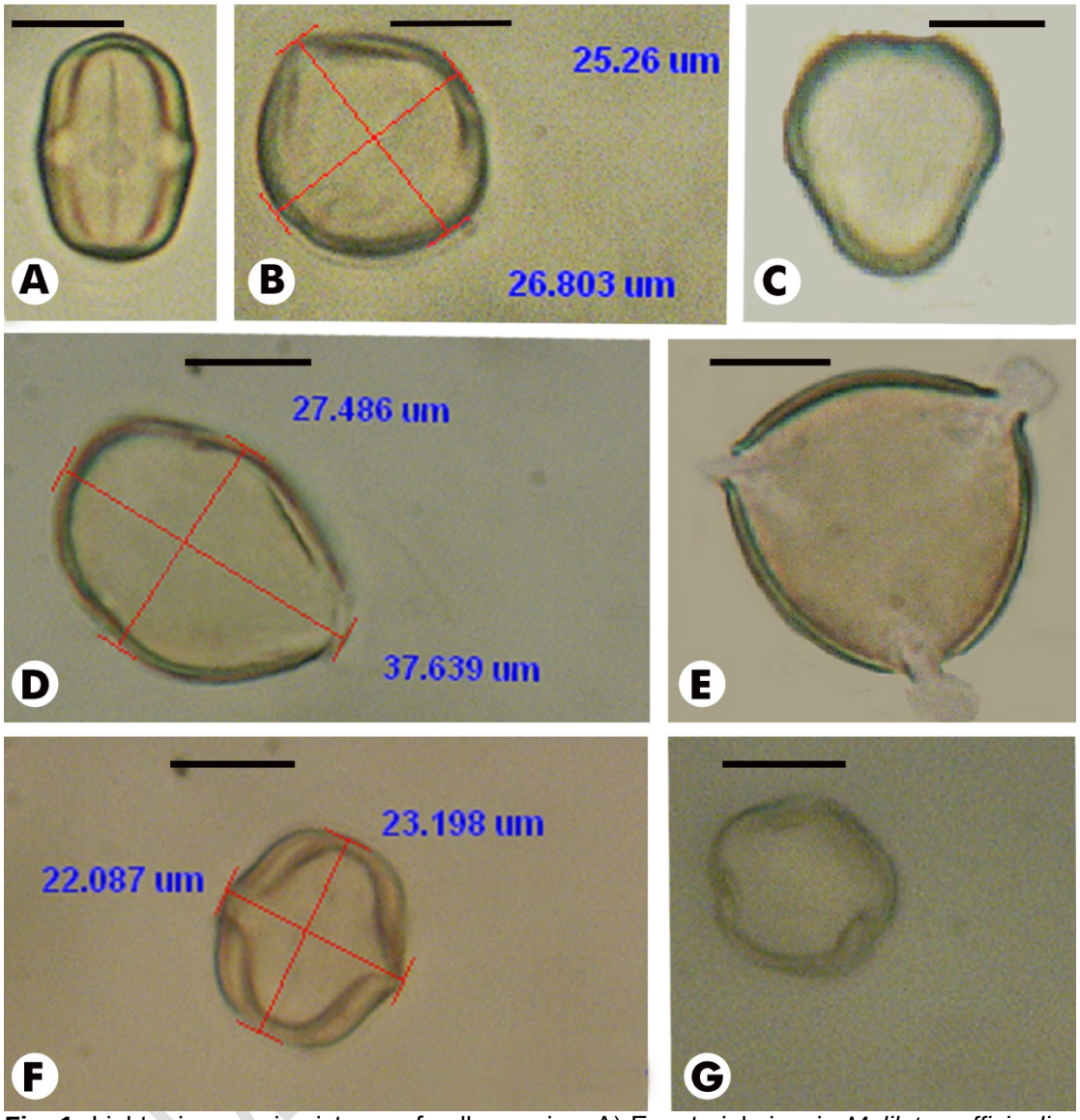

Fig. 1: Light microscopic pictures of pollen grains: A) Equatorial view in *Melilotus officinalis* (L.) Desr.; B) Equatorial view of *Robinia pseudoacacia* L. C) Polar view in *R. pseudoacacia* L.; D) Equatorial view in Spartium junceum L., E) Polar view in *Spartium junceum* L.; F) Equatorial view in *Trifolium repens* L.; G) Polar view in *T. repens* L. (Scale bar=10 µm).

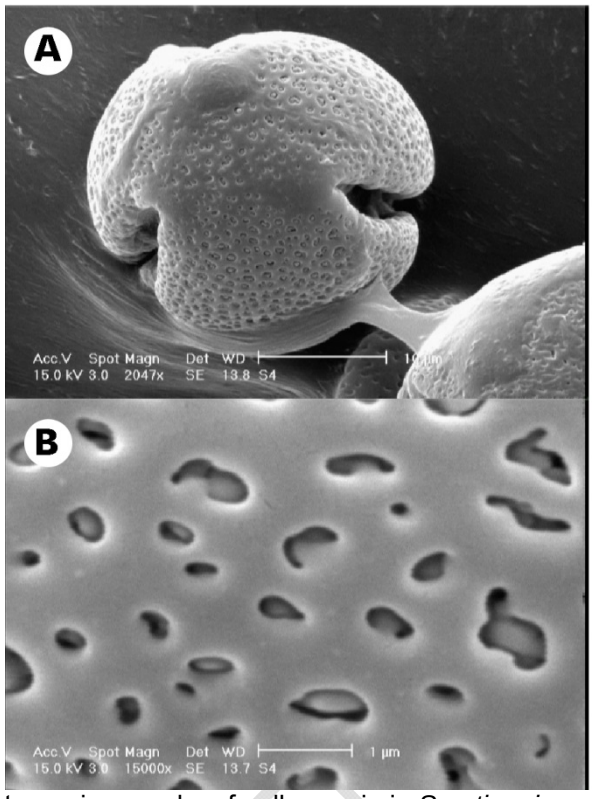

Fig. 2. Scanning electron micrographs of pollen grain in *Spartium junceum* L.: A) Polar view; B) microreticulate ornamentation exine in detail.