MICROMORPHOLOGICAL STUDY FOR POLLENS AND SEEDS FOR FIVE SPECIES BELONG TO BRASSICACEAE FAMILY IN IRAQ

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ABSTRACT

This study was aimed to investigate the micro-morphological characteristics of pollens and seeds for five species of the Brassicaceae family in Iraq belonging to the genus *Lepidium*, and species of *Lepidium sativum* L., *L.ruderale* L. , *L.perfoliatum* L., *L.aucheri* Boiss, and *L.latifolium* L. The characteristics of the pollen grains included the shape of the grain, the length of the equatorial and polar axis, the distance between the two grooves and the groove length , as well as the grain surface configuration. The seeds spherical in shape, while the other species were elongated in shape. As for the seeds, they were studied by the Dissect microscope and the scanning electron microscope (SEM), and all their morphological characteristics were studied the shape, dimensions (length and width), colors, as well as the presence of the mucous layer, that all the seeds of the species contained a mucous layer, but they varied in their thickness, and the surface configuration of the seed surface varied between zigzag reticulate, reticulate different shapes, pitted reticulate, and elongated reticulate.

Keywords: pollen grains, SEM, Reticulate , *Lepidium*., mucous layer.

دراسة مظهرية دقيقة لحبات اللقاح وبذور خمسة انواع عائدة للعائلة الصليبية في العراق

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المستخلص

**تناولت الدراسة الصفات المظهرية الدقيقة لحبات اللقاح والبذور لخمسة انواع من العائلة الكرنبية في العراق تابعة لجنس *Lepidium* والانواع هي L. *sativum* و *L.latifolium* , *L.aucheri Boiss* , *L.perfoliatum* , *L.ruderale*
شملت صفات حبات اللقاح شكل الحبة وطول المحور الاستوائي والقطبي و المسافة بين الاخدودين وطول الاخدود فضلا عن الزخرفة السطحية للحبة واظهرت النتائج ان جميع الانواع ذات زخرفة سطحية شبكية وايضا ذات طراز ثلاثي الاخاديد ,وتميزت حبات لقاح النوع *L.latifolium* بانها كروية الشكل اما بقية الانواع فكانت متطاولة الشكل, اما البذور فدرست بالمجهر التشريحي والمجهر الالكتروني الماسحSEM لجميع صفاتها المظهرية من حيث الشكل والابعاد (الطول والعرض) والالوان وكذلك وجود الطبقة المخاطية وأوضحت الدراسة ان جميع بذور الانواع حاوية على الطبقة المخاطية الا انها تتباين من حيث سمكها وتغايرت الزخرفة السطحية لسطح البذرة بين شبكية متعرجة وشبكية مختلفة الاشكال وشبكية منقرة وشبكية متطاولة، وكانت اشكال البذور بين البيضوية المجنحة وغير المجنحة او قرصية مجنحة او متطاولة غير مجنحة .**

الكلمات المفتاحية: حبات اللقاح، مجهر الكتروني، شبكية، جنس الرشاد، الطبقة المخاطية

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INTRODUCTION

Brassicaceae family is one of the large and widespread families in the northern hemisphere (5, 18), with an approximate number of 380 genera and 3000 species in the world, while in Iraq it is represented by about 80 genera and 177 species (12) It is called the (Mustard family) according to the legal designation of Brassicaceae, which is derived from the genus *Brassica* L. (which is one of its genera). Where it is believed that the *Brassica* plant is one of the oldest cultivated plants known to mankind, dating back to 1500 BC (2). Wild and locally cultivated plants are considered an important national wealth with multiple benefits, the most important of which are medical, food and industrial uses, which requires studying them and identifying their types to give them a clear picture (25,13). Brassicaceae family is also considered one of the important families, as it includes many economic plants (3,9) from an industrial point of view, some of them are used in the manufacture of soap, where camelina oil is extracted from the *Camelin sativa* plant (4), but from a medical point of view, (8) mentioned when reviewing the medical importance of 10 species of the Brassicaceae family, and the black mustard was *Brassica nigra* one of them Where it contains glycoside sangarine as an effective substance, from which mustard oil is obtained by the action of the myrosinase enzyme, and other proteins and gelatinous substances. The medical uses of this plant summarized by high blood pressure and treating preventing of atherosclerosis (29,31). The study of pollen grains is one of the accurate phenotypical characteristics of high taxonomic value and is very important (11,14) The phenotypic characteristics of pollen grains also contributed significantly to solve complex and overlapping problems between taxonomic ranks (1, 15, 24) The study of the morphological shape of seeds is also important in taxonomic work, it was used for the purpose of solving many taxonomic problems as well as finding evolutionary relationships (22, 16, 27) Seeds also have microscopic characteristics that are one of the important factors for identifying plant material (6) Many taxonomic studies have been conducted on this family in Iraq, including (21,10 ,7 ,23) and these studies included phenotypic traits that were identical to what was reported in this study.This study was aimed to investigate the morphology characteristics of pollen grains, as well as to study different characteristics of seeds by anatomical microscope and electron microscope for the species under study in order to obtain new information added to this family in order to provide important taxonomic data.

MATERIALS AND METHODS

This study was relied on dry herbarium samples deposited in the herbarium of University of Baghdad - College of Science (BUH) , as well as fresh samples from the fields of University of Kufa - Najaf As for the pollen, it was according to the method of (20) Samples were examined, photographed, and results were recorded.

RESULTS AND DISCUSSION

Pollen: The pollen grains of the studied species belonging to the genus *Lepidium* were characterized as tricoiporate, while the polar view was characterized by its circular, three-lobed shape.Tri-lobus with the difference in the location of the grooves between the species. As for the equatorial view, the pollen grains were elliptical in shape, ranging from broad to narrow elliptical, with lateral symmetry, meaning that the right side resembles the left side, and the pollen grain may taper at the edges in some species. As for the surface decoration, it was reticulated for all types under study, and this was confirmed by (28,30). Data in table (1) shows the quantitative and qualitative characteristics of pollen grains, Plate (1) shows the polar and equatorial view of the pollen grain for each species, depending on the value of the ratio between the two axes (polar and equatorial) , pollen grain shapes were determined and divided into two groups :Elongated, and includes the following species *L.sativum, L.ruderale, L.aucheri* Boiss, *L.perfoliatum* and spherical in shape and includes the type *L.latifolium.* Seed characteristics are very important for isolating and diagnosing species between genera (18,28).

Seeds: The seeds of the genus *Lepidium* were studied with Dissect microscope and with scanning electron microscope (SEM). There was a discrepancy between the studied species

in dimensions (length and width), as well as color, shape and the surrounding mucous layer, this layer in the seeds of the species *L. perfoliatum* type, have a thicker layer, as well as differences in the surface configuration for the electron microscope, and the shapes ranged between oval and elliptical, as shown in Table (2) and Plate(2).

Results of SEM: The results of the samples, which visualized by electron microscopy, they showed the following:

1. *L.sativum* seeds are oval in shape, configuration is a zigzag reticulate, as shows in Plate(3) and Figure (1)

2. *L.ruderale* seeds are ovoid with unequal sides and are wingless. The surface configuration is reticulated in different shapes, as in Plate(3) and Figure (2).

3. *L.perfoliatum* seeds, ovoid, winged, reticulated, zig-zag, pitted, as in Plate (3) and Figure (3).

4. *L.aucheri* Boiss Seeds are elongated in shape, without wing, while the surface configuration is an elongated reticule at the edges, while the center is a square reticule, as in Plate (3) and Figure (4).

5. L.latifolium seeds are ovoid, winged,with a pitted surface configuration, as in Plate (3) andFigure (5).

Table1. The quantitative and qualitative characteristics of pollen grains of the genus *Lepidium*, using a light microscope, measured by a micrometer

Species	Polar view	Equatorial view		Colpus		Wall thickness	Messocolpium	P/E	Shape
		Polar axis	Equatorial axis	Length	Width				
L.sativum	**39.37**	**91.87**	**52.5**	**70**	**65.62**	**7**	**96.25**	**1.7**	**Prolate**
***L*.ruderale**	**61.25**	**74.37**	**43.75**	**56.87**	**53.37**	**7.87**	**91.85**	**1.7**	**Prolate**
L.perfoliatum	**56.87**	**83.12**	**43.75**	**70**	**52.5**	**6.75**	**83.12**	**1.9**	**Prolate**
L.aucheri	**48.12**	**70**	**39.37**	**65.62**	**56.62**	**11.37**	**87.5**	**1.8**	**Prolate**
L.latifolium	**33.75**	**56.88**	**39.4**	**52.5**	**52.5**	**5.68**	**65.62**	**1.44**	**spheroidal Prolate**

Table 2. The dimensions and shapes of seeds under the Dissect microscope, measured in mm

Species	Dimensions of seeds in millimeter		Shape	Color
	Length	Width		
***L.sativum* L.**	**2.2**	**1.2**	**Elongated oval**	**Dark brown**
L.ruderale	**1**	**0.85**	**Elongated elliptic**	**Dark brown**
***L.perfoliatum* L.**	**1.65**	**1.1**	**Oval**	**Light brown**
***L.aucheri* Boiss**	**1.05**	**0.6**	**Elongated oval**	**Light brown – yellow**
L.latifolium	**0.35**	**0.2**	**Oval**	**Light brown**

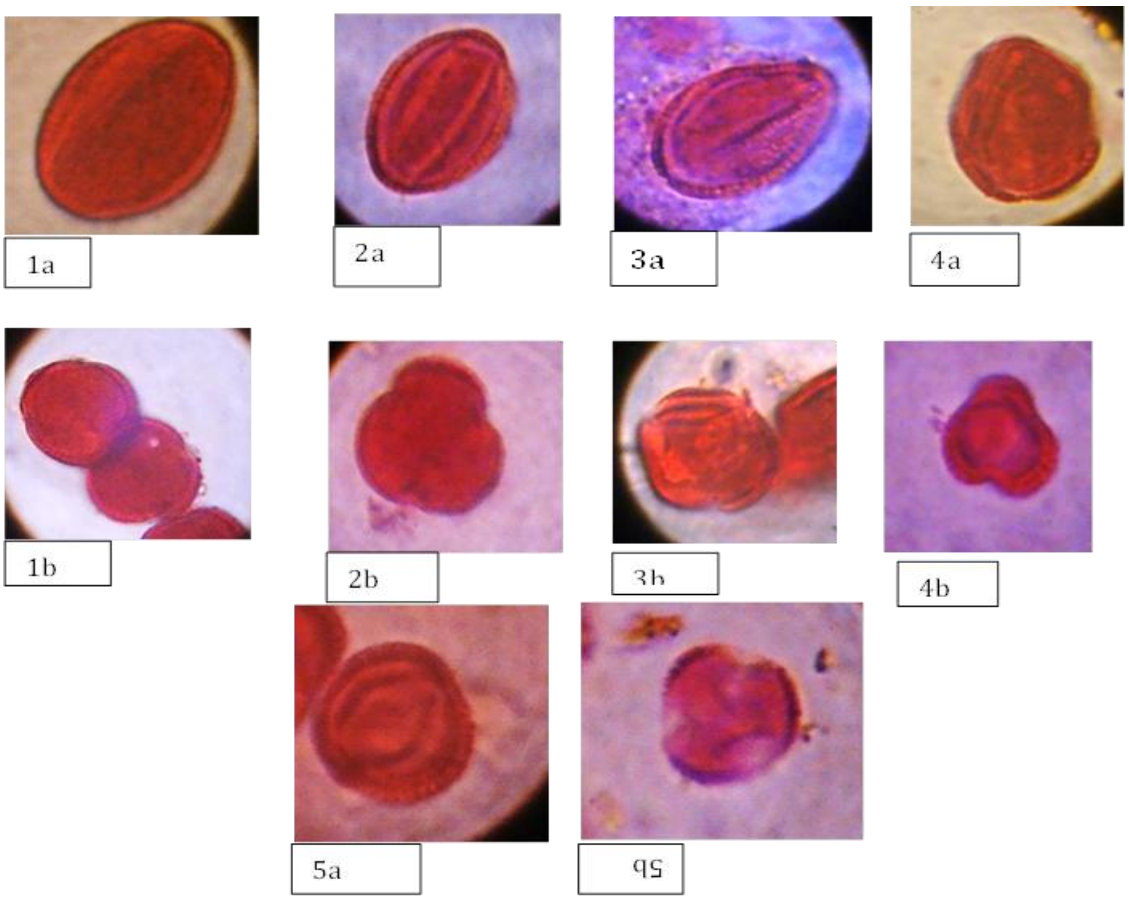

Plate 1. Morphological characteristics of Pollen grains by using a light microscope (LM)
A: Equatorial view B: Polar view (350X)
1. L.sativumm, 2. L.ruderale, 3. L.perfoliatum, 4. L.aucheri Boiss,
5. L.latifolium

Plate 2. Shows the shapes of seeds under the dissect microscope

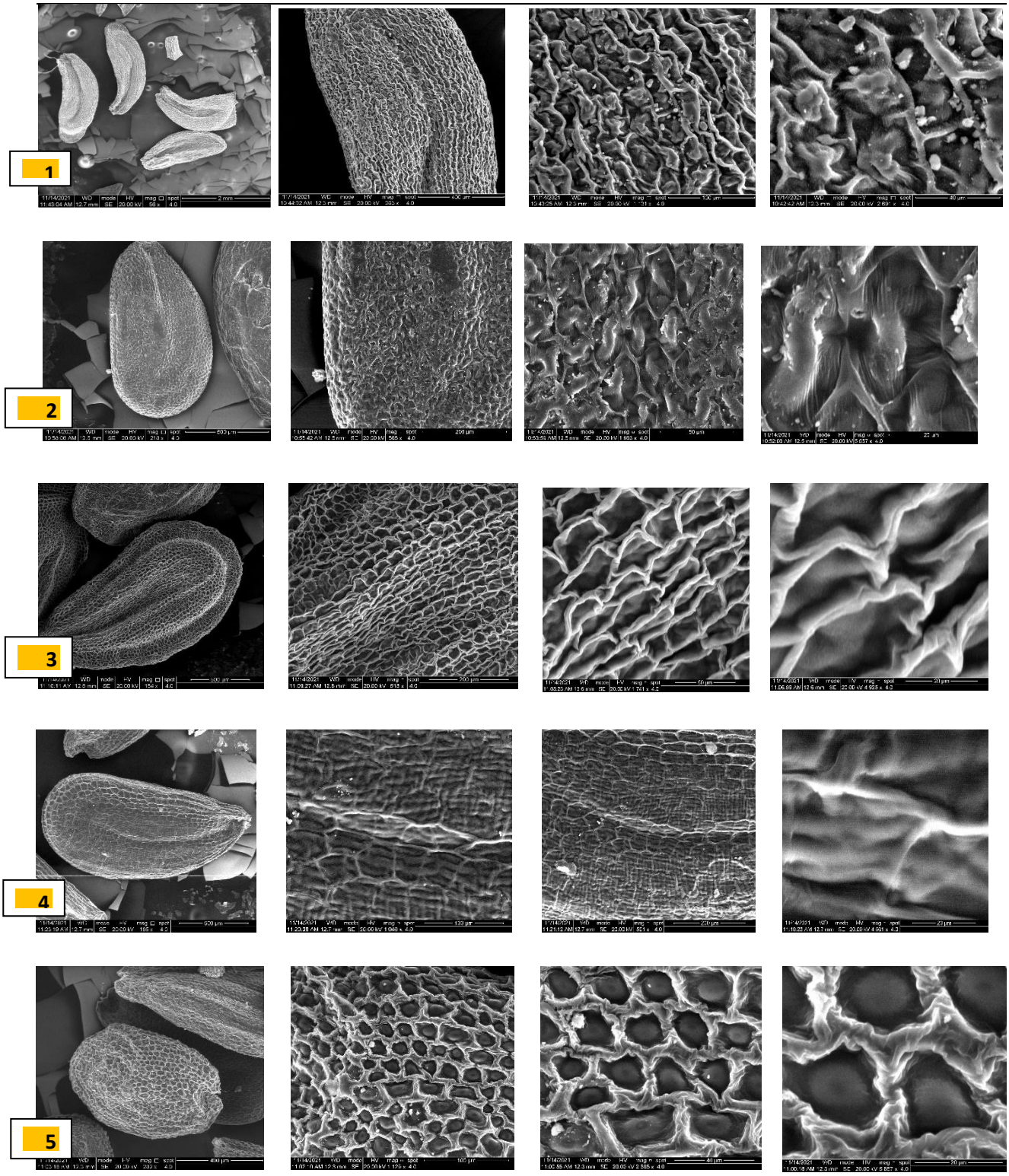

Plate 3. The shapes and surface configuration of seeds under SEM

1-L.sativum **2-*L.ruderale*** **3-*L.perfoliatum*** **4-*L.aucheri Boiss*** **5-*L. latifolium***

CONFLICT OF INTEREST

The authors declare that they have no conflicts of interest.

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