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Morphological Investigations on Mericarp of Some Taxa of *Erodium* Genus in Libya

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Abstract: In this study, mericarp morphology of *Erodium* L.'Herit genus investigated for fruit characters are especially diagnostic value for systematic studies. The mericarp morphology of *Erodium ciconium* (L.) L'Hérit, *E. malacoides* (L.) L'Hérit, *E. cicutarium* (L.) L'Hérit and *E. moschatum* (L.) L'Hérit were determinated for the first time. Some species of *Erodium* have plumose mericarp awns, whereas these species display non-plumose awns. Mericarp surface of these taxa were found both short and long bristles and these bristles have nearly semicircular rim surrounding each bristle. *E. ciconium* mericarps display with short and long bristles vertical on mericarp bodies, whereas both long and short bristles adpressed-setose were found other three species. *E. malacoides*, *E. cicutarium* and *E. moschatum. E. malacoides* and *E. moschatum* mericarps have one pit and one furrow, *E. cicutarium* mericarps have one pit and one shallow furrow whereas *E. ciconium* was found only one pit.

Key words: Erodium · Geraniaceae · Mericarp · Morphology · Libya

INTRODUCTION

The genus *Erodium* L'Hér. Belonging to Geraniaceae family [1, 2] represented by 5 genera [3] and about 800 species found mainly in temperate and warm temperate regions of both hemispheres. Geraniaceae are placed in the Geraniales. *Erodium* is the third largest genus of Geraniaceae with 75 species [1, 4, 2]. *Erodium* Annual or biennial, rosette forming herbs distributed in the temperate and subtropical regions of the world [5]. *Erodium* species are common weeds, but are used in traditional medicine because of its astringent properties [6]. Mericarps hairy with stiff, antrorse hairs, separating from the a stylar column (rostrum) and awn spirally twisted towards the base, falcate and not twisted above, stiffly plumose along the adaxial surface, reactive to atmospheric humidity thus working the mericarp into the soil. Approximately 40 of them are widespread throughout the Mediterranean region [7], defined as the center of biodiversity of the genus [8]. The importance of leaves and mericarps properties was highlighted for the genus Erodium [9].

In many studies, Erodium genus of fruit characters distinctive and have benefited from the importance of fruit character. Southwestern distributed in Asia, 35 Erodium taxa of another study that examined Erodium genus of fruit size and shape according to Erodium and are classified under two subspecies including Barbata [10].

MATERIALS AND METHODS

The present work was based on intensive field work upon several visits between the periods of 2005 to 2011. The plant collections were treated following the general Herbarium techniques then deposited in the Cyrenaica Herbarium (CHGU) at the Botany Department (Sciences faculty, Benghazi University). Fruits from each taxon were examined by using Light microscope and pictures were taken. Specimens belonging to Erodium taxa were taken from different localities and dried in appropriate manner to make herbariums.

Accession details for studied species are displayed in the followed List:

List of the studied taxa of the Libyan *Erodium* species and their localities.

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No	Taxa	Locality
1	*Erodium arborescens* (Desf.)Wild.	Garyounis area Al Makilly and ALtamimy.
2	*E. cionium* (L.) L' Herit	Garyounis area.
3	*E. cicutarium* (L.) L' Herit	Toucara, Wadi Darna , and Almabny
4	*E. gruinum* (L.) L' Herit	Garyounis area, Al Makhilly and Altamimy
5	*E. hirtum* (Forsk.)Wild.	Garyounis, Wadi Darna and Altamimy.
6	*E. laciniatum* subsp. *laceantum* (Cav.)Wild.	Benghazi University, Misrata, wadi Ahnioa, Mezda and Altamimy.
7	*E .laciniatum* subsp. *pulveratum* (Cav.)Wild.	Garyounis area, Garian and Misrata.
8	*E. malacoides* (L.) L' Herit	Garyounis, Albamba and Alftaih.
9	*E. moschatum* (L.) L' Herit	Benghazi university, Misrata, Wadi Ahnioa and Altamimy.
10	*E. neuradifolium* Delile	Garyounis, Almabny, Altamimy, Alabiar and Toucara.

RESULTS

The fruit consists of 5 mericarptan and has a long beak-like extension. This extension is actually a structure that emerges as a result of the prolongation of the stillness of the fruit.

***Erodium arborescens* (Desf.) WILD:** Fruits brown, 7-8 cm long; Covered by scattered long and short hairs. The mericarp has very narrow non glandular apical pits, two grooves under the pits covered by long hairs. The beak has 4-7 twists at maturity (Fig.1 A).

***E. cionium* (L.) L' Herit**: Fruits light brown to dark grey, 6-10 cm long; Covered by scattered long hairs. The mericarp has narrow non glandular apical pits covered by glandular hairs, no grooves under the pits. The beak has 4-7 twists at maturity (Fig.1 B).

***E. cicutarium* (L.) L' Herit:** Fruits dark brown, 4-7cm long; with a few spread hairs. The mericarp has relatively wide non glandular apical pits covered by glandular hairs. Has deep groove under the pits. The beak has 5-7 twists at maturity and covered by short and long hairs (Fig. 1C).

***E. gruinum* (L.) L' Herit:** Fruits dark brown, 6-12 cm long; covered by a dense hairs. The mericarp has deep non glandular apical pits covered by glandular hairs and has two wide grooves under the pits. The beak has 2-5 twists at maturity (Fig.1 D).

***E. hirtum* (Forsk.)Wild:** Fruits dark brown, length of 6-10 cm long; covered by scattered hairs. The mericarp has small and narrow non glandular apical pits and has two grooves under the pits. The beak has 3-4 twists at maturity (Fig. 1E).

***E. laciniatum* subsp. *laceantum* (Cav.) Wild:** Fruits light brown, 4-6 cm long; with spread hairs on the surface. The mericarp has non glandular deep and narrow apical pits. The beak has 10-14 twists at maturity (Fig. 2F).

***E. laciniatum* subsp. *pulveratum* (Cav.)Wild:** Fruits light brown, 4-7 cm long; with spread hairs on the surface. The mericarp has non glandular deep and narrow apical pits. The beak has 14-17 twists at maturity (Fig. 2G).

***E. malacoides* (L.) L' Herit:** Fruits dark brown, 3-5 cm long; covered by long hairs. The mericarp has wide glandular apical pits and has large groove under the pits. The beak has 4-5 twists at maturity (Fig. 2H).

***E. moschatum* (L.) L' Herit:** Fruits brown, 3-6 cm long; covered by long and short hairs. The mericarp has wide glandular apical pits and has large wide groove under the pits. The beak has 6-8 twists at maturity (Fig. 2 I).

***E. neuradifolium* Delile:** Fruits brown, 3-5 cm long; with scattered hairs. The mericarp has wide non glandular apical pits and has large groove under the pits. The beak has 6-7 twists at maturity (Fig. 2 J).

DISCUSSION

From the results, the morphological characters of the fruits of Erodium taxa centered on the fruits color, length, hairs type, the characters of the apical pits, grooves and the characters of the beak. The color was light brown in *E. hirtum*, *E. laciniatum* subsp. *laceantum* and *E. laciniatum* subsp. *pulveratum*; dark brown in *E. cicutarium*, *E. gruinum* and *E. malacoides* and brown in the remainder taxa. The length of the mericarps ranges between 3-12 cm. The hairs scattered on the surface with different lengths in *E. arborescens*, *E. cionium* and *E. moschatum*; with equal length in the remainder taxa; dense hairs in *E. gruinum.*

The characters of apical pits of fruits was important characteristic; it was narrow and non-glandular as in *E. hirtum*, *E. laciniatum* subsp. *laceantum* and *E. laciniatum* subsp. *pulveratum*, very narrow as in *E. arborescens*; wide non glandular apical pits as in *E. cicutarium*; wide glandular as in *E. malacoides* and *E. moschatum*. The apical pits deep as in *E. laciniatum*

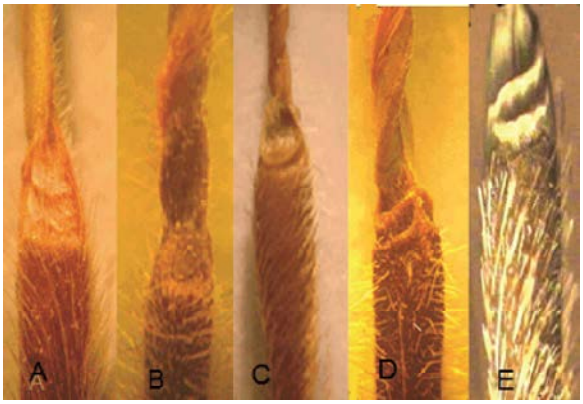

Fig. 1: Shows the apical pits, grooves and types of hairs. A-*E. arborescens*; B- *E. cionium*; C- *E. cicutarium;* D- *E. gruinum*; E- *E. hirtum*

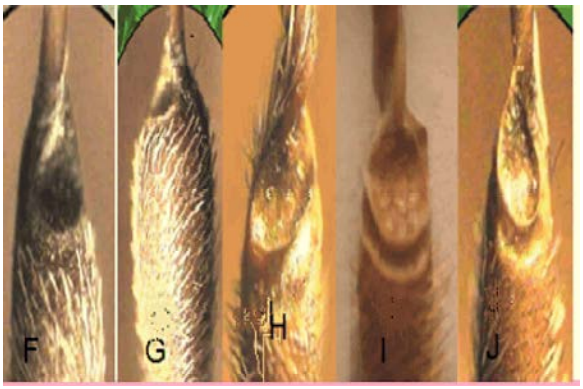

Fig. 2: Shows the apical pits, grooves and types of hairs. F- *E. laciniatum* subsp. *laceantum*; G- *E. laciniatum* subsp. *pulveratum*; H- *E. malacoides;* I- *E. moschatum*; J- *E. neuradifolium.*

subsp. *laceantum* and *E. laciniatum* subsp. *pulveratum*; the pits glandular as in *E. malacoides; E. moschatum*. The grooves present as in *E. arborescens*, *E. cicutarium, E. gruinum*, *E. hirtum E. malacoides, E. moschatum* and *E. neuradifolium*; the grooves absent as in *E. cionium, E. laciniatum* subsp. *laceantum* and *E. laciniatum* subsp. *pulveratum*. The number of the beak twists ranges 3-12; the lowest number was 3-5 as in *E. malacoides, E. moschatum* and *E. neuradifolium*; the highest number ranges between 14-17 at maturity.

From the results and according to the differences between Erodium mericarps, these characters which appeared in the results can be used in classification of the taxa related to *Erodium*. In addition to evaluate the genus description and its level in Libyan flora.

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