1. INTRODUCTION

*Corresponding Author: Ghalia T. El Rabiae, Department of Botany, Faculty of Science, Benghazi University, Libya

**Abstract:** Bellis L. Belonging to the family Asteraceae and has been included in subtribe Asterinae (tribe Astereae). In the present work, the morphological characters, stem, petiole and leaf anatomy, pollen micromorphology of Endemic Bellis sylvestrisvar. cyrenaica from Libya have been investigated on light and scanning electron microscope. Bellis sylvestrisvar. cyrenaica is an endemic species from Libya and limited information about the native taxon. All morphological, anatomical and palynological characteristics are firstly determined in this study. Palynology study showed that pollen characters were found medium size, oblate spheroidal, tricolporate and echinate ornamentation of the studied taxon. Seed micromorphological features were also given

**Keywords:** Endemic Bellis sylvestrisvar. cyrenaica., Asteraceae, Morphology, Anatomy, Palynology, Libya.
In Libya, according to the Flora of Libya the genus *Bellis* is represented by three taxa with two species and one endemic variety (Jafri, 1983). *B. sylvestris* var. *cyrenaica* endemic variety collected from Cyrenaica which is located in the Northeast of Libya. This taxon is a very distinctive but there is limited information about it.

*B. sylvestris* var. *cyrenaica*, the object of the present study is endemic plant in Libya look like *B. sylvestris* var. *sylvestris* from which differ by its leaves and peduncle. The present study aims to give as a first detailed account of the morphological, anatomical and palynological characteristics of *B. sylvestris* var. *cyrenaica* variety whether these data can be important from the taxonomic point of view (no study about the anatomy, palynology and micromorphology of *B. sylvestris* var. *cyrenaica* appear to be carried out until now.

2. MATERIALS AND METHODS

Five specimens were collected of *B. sylvestris* var. *cyrenaica* during their flowering and fruiting time, between 2017 and 2019. The research area was given in Fig. 1 according to Davis’s Grid system (Davis 1965-1985). Specimens were dried according to standard herbarium techniques and are deposited in the Herbarium of Cyrenaica Herbarium (CH) at the Botany Department, Sciences faculty, Benghazi University). The plant samples were preserved in 70% ethanol for anatomical analysis. Transverse sections of stem, petiole and leaf samples were prepared. Slides were observed with light microscope. For anatomical description, the terminology of Metcalfe and Chalk (1957) was used. Pollen grains were obtained from mature anthers of dried flowers and measured under a light microscope. The measurements of the polar axis (P), the equatorial diameter (E), the ornamentation, the number of apertures, the aperture type, the spine length, the spine width for 10 pollen grains were conducted under light microscope. The terms used for describing the Seed surface patterns have been adopted according to Koul et al. (2000). All photographs were taken at Central Laboratory of Alexandria University, Egypt.

3. RESULTS

3.1. Morphological Characters

*B. sylvestris* var. *cyrenaica* Béguinot in Atti Accad. Ven. Trent. Istr. 9:25,1916.

**Type:** Described from Libya: Cyrenaica

*B. sylvestris* var. *cyrenaica* perennial rosette herb, 4-18 cm long, with glaucous colored covered with density hairs (Fig. 1). Stems are short rhizomes, covered by hairs. The leaves are spathulate, 4-10 cm in length, exstipulate, petiolate up to 3 cm petiole, sinuate–dentate with obtuse apex, covered with glandular and non-glandular trichomes. Stems bearing one peduncle. Peduncle are monoecephalic, slender and 2-10 cm long. Involucre 22-27 arranged in two rows, lanceolate. Ray flowers ligules white with purplish tinge, 8-14 mm long. Disc corollas 2.5x1-1.5 mm long and yellow (Fig 1). Cypsela, brown, elongated oval shape, 1.8-2 mm long and 0.6-0.8 mm wide, quite strongly pubescent.

![Fig1. General morphology of Bellis sylvestrisvar. cyrenaica](image)
3.2. Pollen Morphology

Under light microscope, the pollen grains are isopolar, radially symmetrical and prolate-spheroidal. Their apertures are tricolporate; The ornamentation is echinate in the studied taxon. The spine base is determined as circular–elliptic to circular. The polar axis (P) ranged from 22-25 μm (23.5) μm and equatorial axis (E) ranged from 22-23μm (22.5) μm. The spine lengths ranged from 1.7 μm to 2.3 μm and the spine widths ranged from 1.2 μm to 1.95 μm. Under scanning electron microscope, the distance between spines ranged from 1.17 μm to 2 μm (Fig. 2).

![Fig.2. Scanning electron micrographs (SEM) of pollen grains of B. sylvestrisvar. cyrenaica.](image)

3.3. Seed Morphology

Seeds have ovate shape with reddish brown color. The size of seeds was 0.5- 0.7 x 0.2-0.4 mm. The seed coat ornamentation is reticulate (Figure 3 A, B).

![Fig.3. Scanning electron micrographs (SEM) of the seed. A-General appearance; B- Surface ornamentation of B. sylvestrisvar. cyrenaica.](image)

3.4. Anatomical Characters

**Stem:** The transverse section of the stem, the epidermis consists of 2-5 layered lignified irregular cells. There were eglandular hairs on the epidermis. Under the epidermis, the cortex contains multi layers of different sized and shaped parenchyma cells. The cortex cells rich by starch and organic material and ends with endodermis layer. The vascular system was of open collateral type. The pith was wide and composed of polygonal or oval parenchymatous cells (Fig. 4A, B).

**Leaves:** The transverse section of the leaf of studied taxon showed that the upper and lower epidermis composed of uniseriate cells with different sizes and shapes covered by thin cuticle. There were non-glandular multicellular, uniseriate hairs on both sides and anomocytic stomata. Mesophyll tissue was differentiated as palisade and spongy parenchyma cells. Under the upper epidermis, the mesophyll contains 3-4 layers of palisade parenchyma and 3-5 layers of spongy parenchyma. The vascular bundle was located solely in the parenchymal tissue in the middle vessel region. The xylem arranged in straight line in a single layer and face towards the upper surface, while the phloem faces the lower epidermis. (Fig. 4B-C).
**Peduncle:** Peduncle cross-section was Elongated carousel in shape. The epidermis was composed of one layer of different sized cells, with thickened outer walls and were covered with non-glandular, multicellular uniseriate hairs. Epidermis was followed by collenchymatous hypodermis and parenchymatous cortex. In the central cylinder 12-13 of collateral and open vascular bundles were arranged in a circle followed by hollow parenchymatous pith (Fig. 4 D).

Fig. 4. Light microphotographs of the transverse sections of Bellis sylvestris var. cyrenaica: A. Stem, B. Leaf, C. Stomata D. Peduncle; co-cortex, ep-epidermis, le-lower epidermis, p-pith, pp-palisade parenchyma, sc-storage cells, sp-spongy parenchyma, ue-upper epidermis, vb-vascular bundle.

4. **Discussion**

From searching literature, it is clear that no study to date has examined endemic *Bellis sylvestris* var. *cyrenaica* except general taxonomic properties of the taxon. The morphological properties of investigated taxon were in agreement with the description of the plant in Flora of Libya. The anatomical characters of the studied plant are reported for the first time in the present study. The findings of *Bellis sylvestris* var. *cyrenaica* were compared with anatomical studies made on the genus *Bellis* in literatures. The results of palynological study showed that the palynological characters obtained were generally similar to the results of Akyalçinet al. (2011).

**References**

[1] Ai-Douri, N.A., Al-Essa, L.Y., 2010: A survey of plants used in Iraqi traditional medicine. Jordan Journal of Pharmaceutical Sciences 3, 100–108.
[2] Akçin T.A., Akçin, A., 2010: Morphological and anatomical characteristics and taxonomical significance of achene micro-morphology of Achilleaphrygia and A. gypsicola (Asteraceae), endemic to Turkey. Nordic Journal of Botany 28, 65–73.
[3] Akyalçin, H., Arabaci, T., Yildiz, B., 2011: Pollen morphology of six Achillea L. sect. Achillea (Asteraceae) species in Turkey. Turkish Journal of Botany 35, 183–201.
[4] Avci, M., 1996: The floristic regions of Turkey and a geographical approach for Anatolian Diagonal. Review of the Department of Geography University of Istanbul 3, 59–91.
[5] Bremer, K., 1994: Bellis L. In: Bremer, K., Anderberg, A.A (eds.), Asteraceae, cladistics and classification, 202–233. Timber Press, Oregon.
[6] Calvo, J., Quintanar, A., Aedo, C., 2012: Typification of four species names of Bellis (Compositae). Nordic Journal of Botany 30, 668–670.
[7] Castro, M. M., Leitão-Filho, H. F., Monteiro, W. R., 1997: Utilização de estruturas secretoras na identificação dos gêneros de Asteraceae de um vegetação de cerrado. Revista Brasileira De Biologia 20, 163–174.
[8] Ciccarelli, D., Garbari F., Pagni, A. M., 2007: Glandular hairs of the ovary: a helpful character for Asteroideae (Asteraceae) taxon-omy? Annales Botanici Fennici 44, 1–7. Davis, P.H., 1965-1985: Flora of Turkey and The
Morphology, Anatomy, Palynology and Seed Micromorphology of Libyan Endemic Bellis Sylvestrisvar. Cyrenaica (Asteraceae)

East Aegean Island, vol. 1-9. Edinburgh University Press, Edinburgh.

[9] Fahn, A., 1979: Secretory Tissues in Plants. Academic Press, London.

[10] Frangiote-Pallone, S., De Souza, L.A., 2014: Pappus and cypsela ontogeny in Asteraceae: Structural considerations of the tribal category. Revista Mexicana de Biodiversidad 85, 62–77.

[11] Jafri, S. M, A. El Gadi. 1983: (Asteraceae) Flora of Libya. Al Faateh Univ. Tripoli. 107:1, 21

[12] Joujeh, R., Zaid, S. and Mona, S. 2019: Pollen morphology of some selected species of the genus CentaureaL. (Asteraceae) from Syria. South African Journal of Botany, 125, 196–201.

[13] Karahan, F. 2020: Morphology, anatomy, palynology and achene micromorphology of Bellis L. (Asteraceae) species from Turkey. Acta Bot. Croat. 79(1),59-67.

[14] Karakaş, F.P., Karakaş, A., Boran, Ç., Türker, A.U., Yalçın, F.N., Bilensoy, E., 2012: The evaluation of topical administration of Bellis perennis fraction on circular excision woundhealing in Wistar albino rats. Pharmaceutical Biology 50, 1031–1037. Kavalcıoğlu, N., Açik, L., Pinar, M., 2010: Comparative RAPD analysis and pollen structure studies of Bellis perennis.L. Turk J Journal of Botany 34,479–484.

[15] Koul, K.K., Nagpal, R. and Raina, S.N. 2000: Seed coat microsculpturing in Brassica and allied genera (Subtribe Brassicinae, Raphaninae, Moricandinae). Ann. Bot. 86: 385–397.

[16] Melikoğlu, G., 2015: The plants traditionally used to treatment of asthma in Turkey. Marmara Pharmaceutical Journal 19, 1–11 (in Turkish).

[17] Metcalfe, C. R., Chalk, L., 1950: Anatomy of the dicotyledons: leaves, stem, and wood in relation to taxonomy with notes on economic uses. vol. 2, Claredon Press, Oxford.

[18] Metcalfe,C.R., Chalk, L., 1957: Anatomy of the dicotyledons I. Clarendon Press, London.

[19] Mitich, L.W., 1997: English daisy (Bellis perennisL.). Weed Tech-nology 11, 626–628.

[20] Napp-Zinn, K., Eble., M., 1978: BeiträgezursystematischenAnatomie der Anthemideae: die Spaltöffnungsapparate. Plant Systematics and Evolution 130, 167–190.

[21] Shabestari, E.S.B., Attar, F., Riahi, H., Sheidai, M., 2013: Pollen morphology of Centaurea L. (Asteraceae) in Iran. Acta Bo-tanicaBrasilica 27, 669–679.

[22] Uysal, I., Onar, S., Karabacak, E., Çelik, S., 2010: Ethnobotanical aspects of Kapıdağ Peninsula (Turkey). Biological Diversity and Conservation 3, 15–22.

[23] Webb, D.A., 1976: Bellis L. and Bellium L. In: Tutin, T.G., Burges, N.A., Charter, A.O., Edmonson, J.R., Heywood, V.H., Moore, D.M., Valentine, D.H.,Walters, S.M.,Webb, D.A. (eds.), Flora Europaea 4, 111–112. Cambridge University Press, Cambridge.

Citation: Ghalia T. El Rabiae, Seham H. Elbadry, (2020). “Morphology, Anatomy, Palynology and Seed Micromorphology of Libyan Endemic Bellis Sylvestrisvar. Cyrenaica (Asteraceae). International Journal of Advanced Research in Botany (IJARB), 6(1), pp.25-29. DOI: http://doi.org/10.20431/2455-4316.0601004

Copyright: © 2020 Authors, This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.