



## A MORPHOLOGICAL COMPARATIVE STUDY OF SOME SPECIES OF THE BRASSICACEAE IN THE GOVERNORATE OF ERBIL-IRAQ

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### Abstract

The current research includes a comparative morphological study of four species, three of which belong to the *Lepidieae* clan: *Aethionema cordifolium* DC., *Biscutella ciliate* L., *Thlaspi perfoliatum* L., and one species belonging to the *Brassicaceae* clan, i.e. *Calepina irregularis* Asso. of the developing Brassicaceae family in Erbil governorate, north of Iraq. The study focused on the morphological characteristics of the roots, stems, leaves, fruits and seeds. All species had non-branched tap roots except the species *Thlaspi perfoliatum* which was characterized by branched tap roots. It also showed a distinct difference in the branching of stems in which the species *Aethionema cordifolium* was characterized by a lateral branching and species *Biscutella ciliate* with non-branched stems and *Calepina irregularis* and *Thlaspi perfoliatum* resembled each other by a branching from the top. A distinct difference was found in the shape, Apex and Base of the leaf. The leaves of all studied species were of the Sessile species, with a cordate blade in species *Aethionema cordifolium*, *Thlaspi perfoliatum* and *Calepina irregularis*, sagetate in species *Calepina irregularis* and oblong in species *Biscutella ciliate*. Flowers were similar in their characters and this confirms their belonging to one family and the between the words their classification. There was a marked difference in the characteristics of fruits in which the fruits were winged silique fruits (Brassicaceae) in the species *Aethionema cordifolium* and cordate in *Thlaspi perfoliatum* and of two parts in *Biscutella ciliate* and ovoid in *Calepina irregularis*. There was also a clear difference in the shape, ornamentation, dimensions and colors of the seeds, and all species studied were characterized by crescent - shaped embryos.

**Keywords:** Morphological study, Brassicaceae family, plant classification.

### Introduction

The mustard family of *Brassicaceae* belongs to the *Brassicales* order and is considered one of the largest plant families. Its name was derived from being a source of mustard and is also called Mustard family, Cruciferae family or cabbage family since its flowers consist of four free alternating petals (Al-Masoud & AL- Shammry, 2017).

Most of its plants are herbaceous and some are shrubs. The family consists of about 372-388 genera and 3709-4060 species. They are spread all over the world, especially in the temperate and semi-temperate regions of the globe, and are more common in the Mediterranean regions (Charb, 2012). It has 80 genera and 177 species in Iraq. The importance of the family comes from being a source of many economic crops such as radish (*Raphanus sativus*), cabbage (*Brassica oleracea* var. *capitata*), cauliflower (*B. oleracea* var. *botrytis*), turnip (*B. rapa*), cress (*Lepidium sativum*) and ornamental plants, (AL-Mousaw, 1987; AL-Katib, 1988) and some of its plants have medical significance such as black mustard (AL- Abrahimi and AL-Shammry, 2013). The largest of its genera *Draba* includes 440 species, *Erysimum* 261 species, *Lepidium* 234 species, *Cardamina* 233 species and *Alyssum* 207 species (Townsend & Gusset, 1980); while the genera *Aethionema* consists of 60-70 species spread in large areas of Europe and the White Sea basin with 9 species in Iraq. As for the genera *biscutella* L., it consists of 10 species spread around the world and is one of the genera with one single species in Iraq. The genera *Calepina* is with one single species in Iraq, while the genera *Thlaspi* L. consists of 60 species spread in Europe and Asia and 3 species spread in Iraq. There is a lack and scarcity of morphological and anatomical studies of the species of this family, despite the fact that they appear in one of the Iraqi plant Encyclopedias (Flora of Iraq) and the existence of a few studies which focused on the characteristics of pollen and seeds such as study (AL-Masoud and AL-Shammry, 2017), study (AL-Abrahimi and AL-Shammry, 2013) which focused on the

anatomical characteristics of *Aethionema* genera leaves, study (Perveen *et al.*, 2004) which focused on pollen and its composition, while study (Saeedl *et al.*, 2016). Studied the chemical characteristics of the *Arabis* genera. As for study (AL-kaliby, 2012), it dealt with the wild species of the *Erysium* genera spread in Iraq, while study (AL- Ibraheemi, 2013) studied the *Aethionema* genera taxonomically and (Kasem *et al.*, 2011). Studied seeds and the nature of its coats in America. Thus, the present study is concerned with highlighting the phenotypic characteristics of four species spread in the northern region of the country in order to collect as much information as possible to be used in future taxonomic studies and to distinguish between the genera species under study.

### Materials and Methods

The present study examined four species collected from the mountainous areas in Erbil governorate of Kurdistan Iraq: *Aethionema cordifolium*, *Biscutella ciliate*, *Calepina irregularis* and *Thlaspi perfoliatum* during (4) field trips from February- May. The selected plant samples were diagnosed based on the Iraqi, Turkish, and Saudi plant encyclopedias (Townsend & Gused, 1980; Chamberlain, 1972; Mighad & Hammoud, 1978).

The phenotypic study of the different vegetative parts of the plant (root, stem and leaf) and reproductive parts (flower, fruit and seed) depended on the soft samples and examined under the dissecting microscope type Komax and the compound type Olympus compound under power (4x, 40x, 10x). The measurements were taken using the ruler and an ocular eye lens and photographing by the digital camera type Nikon (AL-Abide, 2016).

### Results and Discussion

- The results of the field study showed that all studied species were seasonal herbaceous plants growing wild between February and May (Plate-1).

- The results of the roots study showed that all the species under study were of taproots of the conical non-branched type except the *T. perfoliatum* species with branched taproots. Its length ranged between 2-8 cm (Plate-2) in which the least length was in *T. perfoliatum* species and largest length in *A. cordifolium* species. The similarity of the roots for all species under study is due to its growth in the mountainous area, the lack of surface water and the nature of the rocky soil. Since the roots are affected by environmental factors faster than the other parts of the plant, therefore, this makes the changes on it appear much faster.
- The *A. cordifolium* species is distinguished by a base branched stem, while *B. ciliate* species consists of a non-branched stem of the erect type that grows vertically over the soil. While *C. irregularis* and *T. perfoliatum* resemble each other by a branched stem from the top (plate .1). The distinction is due to this characteristic being affected by several environmental and genetic factors (Rudall, 1980).
- The study of leaves showed that all are of a simple stem, non-divided cordate shaped as in *A. cordifolium* and *T. perfoliatum* species and hastate as in *C. irregularis* species and *oblongas* in *B. ciliate*. All species were of acute tip (Plate -3), dentate blade, and truncate base as in *B. ciliate*, smooth blade and cordate base as in other species.
- The results of the current study showed similarity of the studied fruit species being of the *silicula* species, while there was a difference in the shape of the fruit with up turned cordate in the two species *A. cordifolium* and *T. perfoliatum* and large wings with cordate base in *A. cordifolium* species and small wings with acute base in *T. perfoliatum* species. The fruit was didymous and

orbicular in *B. ciliate* species and ovoid in *C. irregularis* species, while the average length of the fruit was 8 mm in *A. cordifolium* species, 6 mm in *B. ciliate* species, 5mm in *T. perfoliatum* species and 3 mm in *C. irregularis* species (Plate-4). The results of the current study are consistent with the description (Townsend & Gused, 1980).

- The study showed a difference in the shape, color, dimensions and surface ornamentations of the seeds. The seeds were oblong in *A. cordifolium* and *C. irregularis* species, lenticular in *B. ciliate* and *T. perfoliatum* species, brown colored in *A. cordifolium* species and light yellow in other species (Plate-5). The seed lengths ranged between 1.5-4 mm, in which the least length was in *A. cordifolium* and *T. perfoliatum* species and the highest length in *B. ciliate* species. The results of the current study also showed that there was a difference in the surface sculpture of the studied species. It was prominent granular in *A. cordifolium* species and faintly granular in *B. ciliate* and *C. irregularis* species and faintly striate in *T. perfoliatum* species (Plate -5). The number of seeds in the fruit also varied, reaching 6 seeds in *A. cordifolium* species, 5 seeds in *T. perfoliatum* species, one seed in each side of the fruit in *B. ciliate* species, and one seed in *C. irregularis* species. The differences in the forms, the sculptures and the dimensions of the seeds is due to the differences of the species studied which is one of the most important taxonomic characteristics adopted in the diagnosis of converged species, and the results of the current study are in agreement with study (AL-Masoud & AL-Shammary, 2017); while the embryos of the plant species studied were alike in that they were crescent shaped and yellowish brown colored (Plate -5).



*B. ciliate*



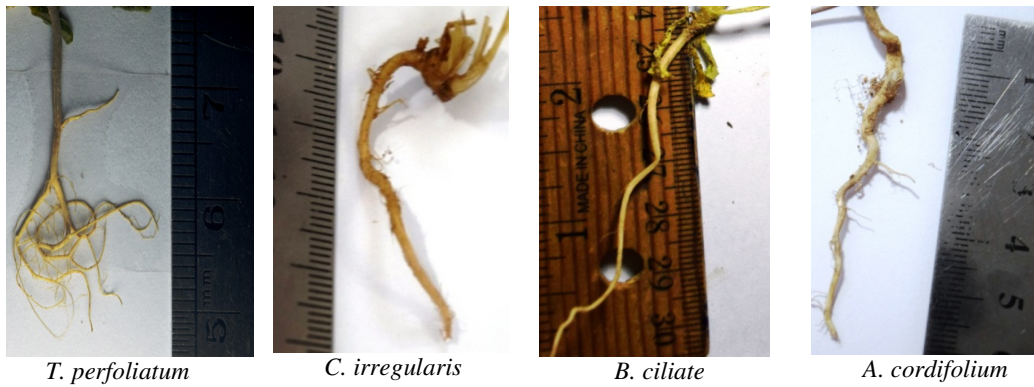
*A. cordifolium*



*T. perfoliatum*

*C. irregularis*

**Plate 1 :** The phenotypic characteristics of stems for plant species under study.



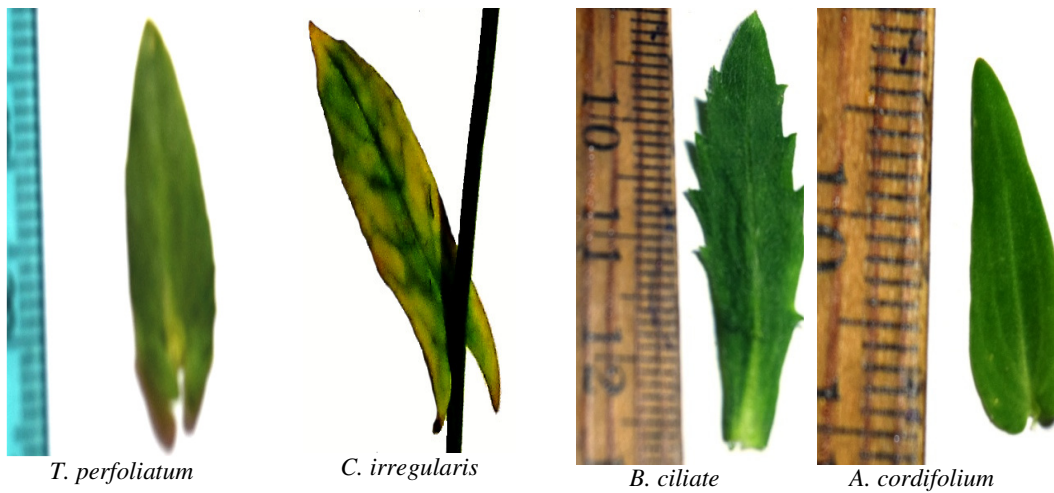
*T. perfoliatum*

*C. irregularis*

*B. ciliate*

*A. cordifolium*

**Plate 2 :** Phenotypic characteristics of roots for studied plant species.



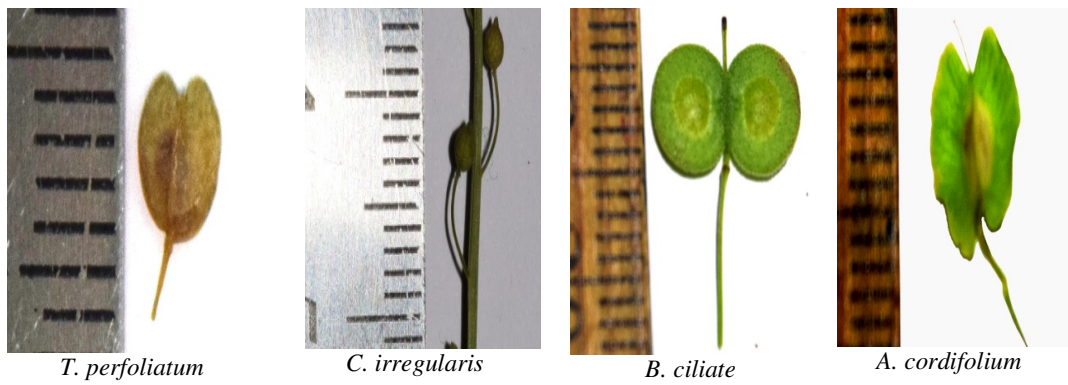
*T. perfoliatum*

*C. irregularis*

*B. ciliate*

*A. cordifolium*

**Plate 3 :** The phenotypic characteristics of leaves for studied plant species.



**Plate 4 :** The phenotypic characteristics of fruits for plant species under study.



**Plate 5 :** The phenotypic characteristics of the seeds and the surface sculpture of the plant species under study.

- 1-Phenotypic characteristics of seeds under 100 x magnification power
- 2- Surface sculpture of seeds under 200 x magnification power
- 3 - Method of seed contact with the septum
- 4- Phenotypic characteristics of the embryo.

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