COMPARATIVE TAXONOMICAL STUDY FOR REPRODUCTIVE PART OF EIGHT SPECIES BELONG TO BRASSICACEAE FAMILY IN IRAQ

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ABSTRACT

This study was aimed description of morphological features of fruits and seeds of eight species related to Brassicaceae family in Iraq, the study showed number of taxonomic differences as the silique was long in all studied except the species *Rorippa amphibian* (L.)b Besser was short, however the fruits varied in dimensions where the species *Turritis laxa* L. recorded the highest average length with (160 mm) while the species *R .amphibia* was record the shortest length (5 mm), in addition the colors ranged from green to brown. This study showed that all of the species was glabrous except *Arabis caucasia* Willd. was lanute-woolly. The configuration shapes were linear with except the species *Nasturtium officinale* W.T.Aiton. was elliptic and *R.amphibia* was ovoid, moreover, the characteristics of seeds were investigated as taxonomical important traits like dimensions, colors, number of seeds in fruit, surface configuration and the presence of wing, the number of seeds per species as *T. laxa* have about 75 seeds in one fruit with the highest rate recorded while lowest average number of seeds among species was 12 seeds in *Arabis nova*Vill.

Key words: silique, wing, configuration ,fruit, seed.

دراسة تصنيفية مقارنة للأجزاء التكاثرية لثمانية انواع تعود للعائلة الصليبية في العراق

***سكينة عباس عليوي لباب كاطع علي هديل رضاوي حسين**
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المستخلص

اشتملت الدراسة على الصفات المظهرية لثمار وبذور ثمانية انواع تعود لعائلة الكرنب (العائلة الصليبية) في العراق واظهرت النتائج عدد من الفروقات التصنيفية المهمة حيث كانت الخردلة طويلة في الانواع جميعا عدا النوع *Rorippa amphibian* (L).b.Besser كانت قصيرة, كذلك تغايرت الثمار في ابعادها حيث سجل النوع *Turritis laxa* L. اعلى معدل طول اذ بلغ (160) ملم بينما سجل النوع *Rorippa amphibian* اقصر معدل طول (5) ملم وتراوحت الوان الثمار من اللون الاخضر الى اللون البني وان الكساء السطحي للانواع جميعا املس عدا النوع *Arabis caucasia* Willd كان صوفي ذو شعيرات متشابكة وظهرت اشكال الزخرفة السطحية بشكل خطوط عدا النوعين *Nasturtium officinale* W.T.Aiton و*R.amphibia* كانتا اهليجيه وبيضاوية بالتتابع .فضلا عن مميزات البذور كصفات تصنيفية مهمة كالابعاد والالوان وعدد البذور في الثمرة الواحدة والزخرفة السطحية ووجود الجناح وسجل النوع *T. laxa* have اعلى معدل لعدد البذور اذ بلغ (75) بذرة في الثمرة الواحدة بينما سجل النوع *Arabis nova*Vill اقل معدل لعدد البذور حيث بلغ (12) بذرة.

الكلمات المفتاحية: خردلة، جناح، زخرفة سطحية، ثمرة، بذرة

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INTRODUCTION

Brassicaceae is an important family from Angiosperms due its many ecological and economical important taxa and several species that serve as model organisms (10). There are many opinions about the number of Brassicaceae (Cruciferae) family plants, Al-Musawi (6) mentioned that it includes (2500-3000) species distributed over (350 -380) genus, while Lawrence (24) mentioned that the family includes 2500 species distributed over 350 genera, and there are approximately 80 genera and 177 species in Iraq. The family includes (49) tribes contain 321 genus and 3660 species distributed around the world, especially in the northern hemisphere (25). Systematics agreed to adopt characteristics of macro- and microstructure of fruits and seeds are very significant for the diagnosis and isolation of Angiosperm taxa (23). The family Brassicaceae, about exo- and endomorphic characters to the seeds have been studied by (1,17,18,26), morphological characters to the family Brassicaceae like fruit seed and cotyledons have been used in the tribes classification of the family (13), morphology of seed coat texture is considered to be balanced characters and is little affected by external environmental conditions while the seeds develop and ripen in the fruit (11,12,15,21,23) investigated seed morphology as well as seed coat configuration of 32 Taxa related to the Family Brassicaceae by using LM and SEM , El-Naggar (16) study the relation between 26 taxa of family Brassicaceae in Egypt by using morphology characters involving fruit and seed characters. Bona (14) study the seed morphology characteristics of 14 taxa of *Lepidium* L. belong to Brassicaceae from Turkey by using light microscope and scanning electron microscope. Ozudoğru, *et al*. (27) study macro and micro-morphological characters for 9 species and 30 accessions seeds of *Ricotia* L. by using light (LM) and scanning electron microscopy (SEM) to appreciate the taxonomic rapport of these features . Hani *et al*.(20) study the morphology characteristics for some species of Brassicaceae (Cruciferous) in Algeria. Other researchers dealt with studies similar to this study in Iraq, such as (2,3,4,7,8,28,29)the information available about it is limited by publications (9,19,30).

MATERIALS AND METHODS

Morphological study: Eight plant samples were collected from herbal specimens which deposited in some Iraqi herbariums (BUH and BAQ) as the morphological features fruits and seeds (shapes, colors and dimensions) were examined for each species by dissecting and compound light microscope. All notes and measurements were recorded.

RESULTS AND DISCUSSION

Morphological study of fruits (Table 1)

Arabis caucasia: **Fruit type:** Silique
Fruit shape: Linear- oblong
Color: Green
Indumentum: Lanute – woolly
Surface configuration: Striate
Dimensions: The length range of fruits between (21-40) mm and width range between (1.5-2.5) mm while the valve length range between (15-30) mm and its width range between (1.5-2.5) mm, as for the beak length and width was 0.5 mm, and the pedicel length range between (5-9) mm while width range between (0.5-1) mm.

Arabis nova
Fruit type: Silique
Fruit shape: Linear
Color: Light brown color
Indumentum: Glabrous
Surface configuration: Smooth
Dimensions: the length of fruits range between (19-48) mm and width 0.5 mm, while the valve length range between (18-38) mm and width is 0.5mm, as for the beak length and width was 0.5 mm, and the pedicel length was range between (2-4.5) mm and width was 0.6mm

Arabis sagitatta
Fruit type: Silique
Fruit shape: Linear
Color: Light brown color
Indumentum: Glabrous
Surface configuration: Smooth
Dimensions: the length of fruits range between (18-28) mm and width was 1 mm, while the valve length range between (9-25) mm and width was 1 mm, as for the beak length and width was 0.5 mm, and the pedicel length was range between (1-3) mm while the width range between (1-1.25) mm

Barbarea plantaginea
Fruit type: Silique
Fruit shape:elongate Linear
Color: has brown color
Indumentum: was elongated Linear
Surface configuration: smooth fruit
Dimensions: the length of fruits range between (29-39) mm and width range between (0.5-1.5), the valve length range between (15-35) mm , width was between (0.5-1.5) mm , beak length range (1-2.5) mm and width range (0.5-1) mm while the pedicle length range (3-6.5) mm and width was 0.75 mm

Barbarea vulgaris
Fruit type: Silique
Fruit shape: Linear
Indumentum: surface was glabrous
Surface configuration: smooth fruit
Dimensions: The length of fruits range between(25-35) mm , width range (0.5-1.25) mm while valve length range (18-31) mm , width (0.5-1.25) mm as for beak length , width was 0.5 mm, pedicle length range (4-8) mm and width 0.5 mm.

Nasturium officinale
Fruit type: Silique
Fruit shape: elliptic shape
Indumentum: glabrous
Surface configuration: striate
Dimensions: the length of fruit range between (12-21)mm and width range (1.75-2.5)mm while valve range(15-23)mm and width (1.75-2.5)mm and beak length(0.5-1.25)mm , width was 1mm, pedicle length (5-7.5) mm and width (0.75-1.75)mm

Rorippa amphibia
Fruit type: Silique
Fruit shape: Ovoid shape
Indumentum: Glabrous
Surface configuration: Muricate
Dimensions: Length range of fruit between (5-9) mm , width (0.75-1.25) mm while valve range (1-2.5) mm , width (0.75-1.25) mm, beak length (1.5-2.25) mm , width (0.2-0.5) mm and pedicle length (4-8) mm , pedicle width (0.5-1.25) mm

Turitis laxa
Fruit type: Silique
Fruit shape: Linear shape
Surface indumentum: Glabrous
Surface configuration: Faintly reticulate
Dimensions: Length range of fruit between (90-160) mm , width (1-3.25) mm while valve range (30-110) mm, width (1-3.25) mm, beak length 0.5 mm , width 1mm,and pedicle length (5-14) mm, width (0.75-1.5) mm

Table 1. Quantitative characteristics of Fruits in the studied species measured in millimeters

Character / Species	Fruit Length(L)	Fruit width(W)	Ratio= L | W	Valve Length	Valve width	beak Length	beak width	Pedicle Length	Pedicle Width
A.caucasia	21-40 (32)	1.5-2.5 (2)	16	15-30 (25)	1.5-2.5 (2)	0.5	0.5	5-9 (7.5)	0.5-1 (0.75)
A.nova	19-48 (40)	0.5	80	18-38 (34)	0.5	0.5	0.5	2-4.5 (3)	0.5
A.sagittata	10-28 (25)	1	25	9-25 (19)	1	0.5	0.5	1-3 (2)	1-1.25 (0.75)
B.plantaginea	20-39 (33)	0.5-1.5 (1.25)	26.4	15-35 (28)	0.5-1.5 (1.25)	1-2.5 (1.75)	0.5-1 (0.5)	3-6.5 (5)	0.75
B.vulgaris	25-35 (32)	0.5-1.25 (0.75)	42.67	18-32 (27)	0.5-1.25 (0.75)	0.5	0.5	4-8 5.5	0.5
N.officinale	12-21 (16.5)	1.75-2.5 (2)	8.25	15-23 (18)	1.75-2.5 (2)	0.5-1.25 (1)	1	5-7.5 (6)	0.75-1.75 (1.25)
R.amphibia	5-9 (7.5)	0.75-1.25 (1)	7.5	1-2.5 (1.75)	0.75-1.25 (1)	1.5-2.25 (2)	0.2-0.5 (0.2)	4-8 (6)	0.5-1.25 (0.75)
T.laxa	90-160 (125)	1-3.25 (2.5)	50	30-110 (85)	1-3.25 (2.5)	0.5	1	5-14 (9.5)	0.75-1.5 (1)

Morphological study of seeds(table 2)
The study of seed show that have different shapes and many different traits help in taxonomy

***A.caucasia*:** Shape and color: Spherical shape with reddish –brown color
Seed surface configuration: Faintly reticulate
Number of seed in fruit: 13- 17
Seed dimensions: The seed length range between (1.25-2) mm and width (0.5-1.5) mm
Wing: Present

A.nova:

Shape and color: Ellipsoid shape with light brown color
Seed surface configuration: Faintly reticulate and pustular
Number of seed in fruit 12-18
Seed dimensions: The seed length range between (1-1.75) mm and width (0.5-1.5) mm
Wing: Absent

***A.sagitatta*:**
Shape and color: Ovoid and reddish brown color
Seed surface configuration: Alveolate
Number of seed in fruit: 18-24
Seed dimensions: The length range between (1.5—2.25) mm and (0.75-1.25) mm
Wing: Present

B.plantaginea:
Shape and color: Peariform shape and yellowish color
Seed surface configuration: Reticulate
Number of seed in fruit: 16-20
Dimensions: The length range between (0.75-1.5) mm and width (0.5-1.5) mm
Wing: Absent.

B. vulgaris
Shape and color: Ovoid shape and black color.
Seed surface configuration: Coarse reticulate
Number of seed in fruit: 17-25
Wing: Absent.
Dimensions: The length range between (1.25-2) mm and width (0.5-1.75) mm

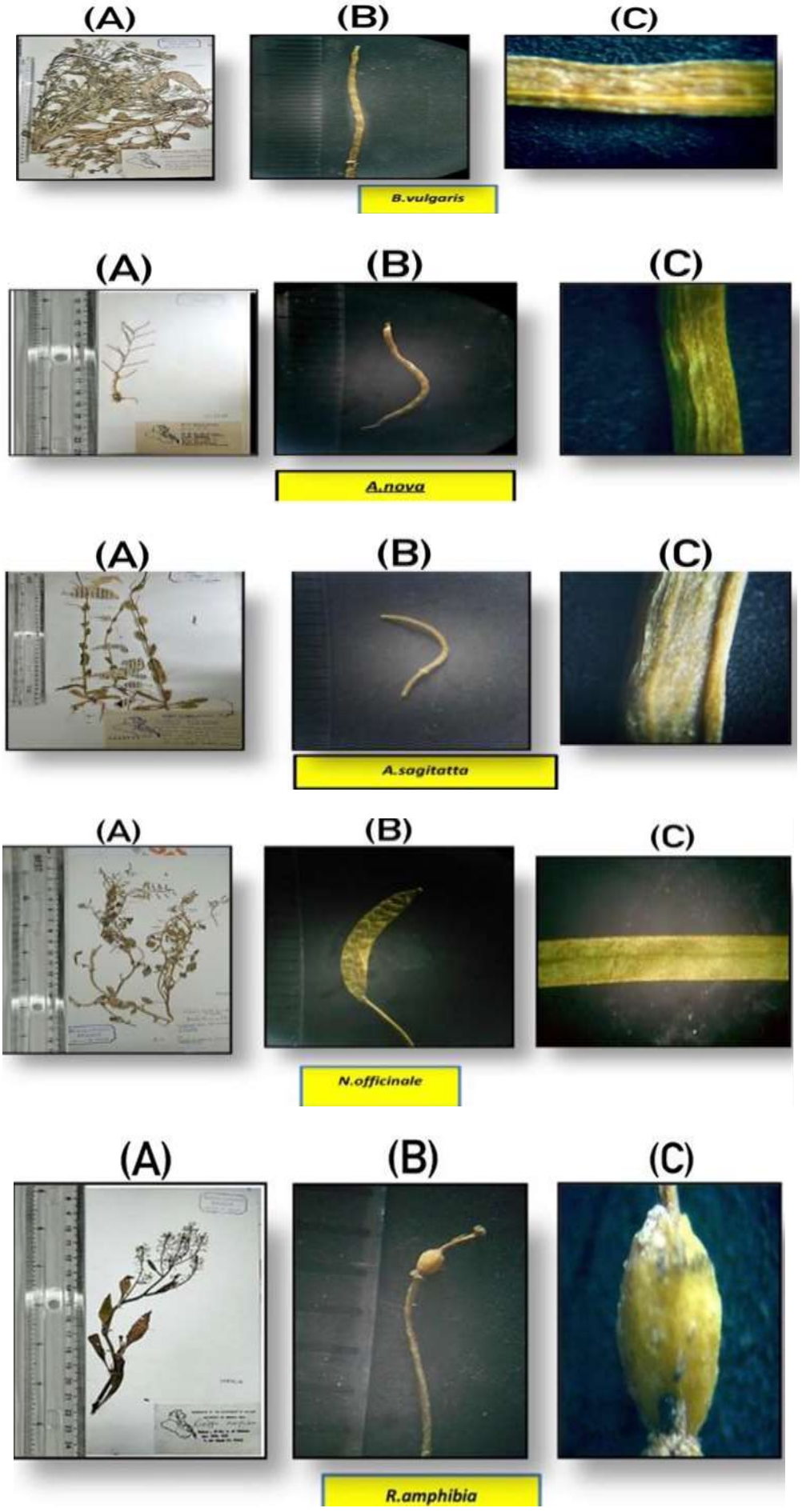
***N. officinale*:**
Shape and color: Ovoid and brown color
Seed surface configuration: Coarse reticulate
Number of seed in fruit: 30-48
Wing: Absent.
Dimensions: The length range between (0.75-1.25) mm and width (0.5-1.5) mm

7-*R.amphibia*
Shape and color: Peariform and brown
Seed surface configuration: Smooth
Number of seed in fruit: 20-35
Wing: Absent
Dimensions: The length range between (0.75-1.5) mm and width 0.5 mm

***T.laxa*:**
Shape and color: Spherical and reddish brown
Seed surface configuration: Reticulate
Number of seed in fruit: 50-75
Wing: Absent
Dimensions: The length range between (0.75-1.5) mm and width range between (0.5-1.25) mm.The longest seed reach 2.25 in *A.sagitatta* and the shortest seed was 0.75 in (*T.laxa*, *R.amphibia*, *N.officinale* and *B.plantaginea*) and the number of seed is differed between them as for the bigger number seeds for species was recorded in *T.laxa* about (75) seeds and the fewest one was recorded in *A.nova* about (12) seeds ,The *A.caucasia* and *A.sagitatta* are uniquely by have a wing while the other absent it and the seed configuration also have differed between species where the *A.sagitatta* has only alveolate configuration.

Table 2. the quantitative and qualitative characteristics of the seeds of the studied species measured in mm

Characters / Species	Seed dimension		Seed shape	Seed surface configuration	Wing presence	Seed color	No. of seed
	Length	Width					
A.caucasia	**1.25-2 (1.5)**	**0.5-1.5 (1.25)**	**Spherical**	**Faintly reticulate**	**+**	**Reddish brown**	**13-17 (15)**
A.nova	**1-1.75 (1.25)**	**0.5-1.5 (0.75)**	**Ellipsoid**	**Faintly reticulate and Pustular**	**-**	**Light brown**	**12-18 (14)**
A.sagittata	**1.5-2.25 (1.75)**	**0.75-1.25 (1)**	**Ovoid**	**Alveolate**	**+**	**Reddish brown**	**18-24 (21)**
B.plantagia	**0.75-1.5 (1)**	**0.5-1.5 (0.75)**	**Peariform**	**Reticulate**	**-**	**Yellowish brown**	**16-20 (18)**
B.vulgaris	**1.25-2 (1.5)**	**0.5-1.75 (1.5)**	**Ovoid**	**Coarse Reticulate**	**-**	**Black**	**17-25 (19)**
N.officinale	**0.75-1.25 (1)**	**0.5-1.5 (1.25)**	**Ovoid**	**Coarse reticulate**	**-**	**Brown**	**30-48 (38)**
R.amphibia	**0.75-1.5 (1)**	**0.5**	**Peariform**	**Smooth**	**-**	**Brown**	**20-35 (30)**
T.laxa	**0.75-1.5 (1.25)**	**0.5-1.25 (0.75)**	**Spherical**	**Reticulate**	**-**	**Reddish Brown**	**50-75 (55)**


(A)
(B)
(C)
B.vulgaris
(A)
(B)
(C)
A.nova
(A)
(B)
(C)
A.sagitatta
(A)
(B)
(C)
N.officinale
(A)
(B)
(C)
R.amphibia

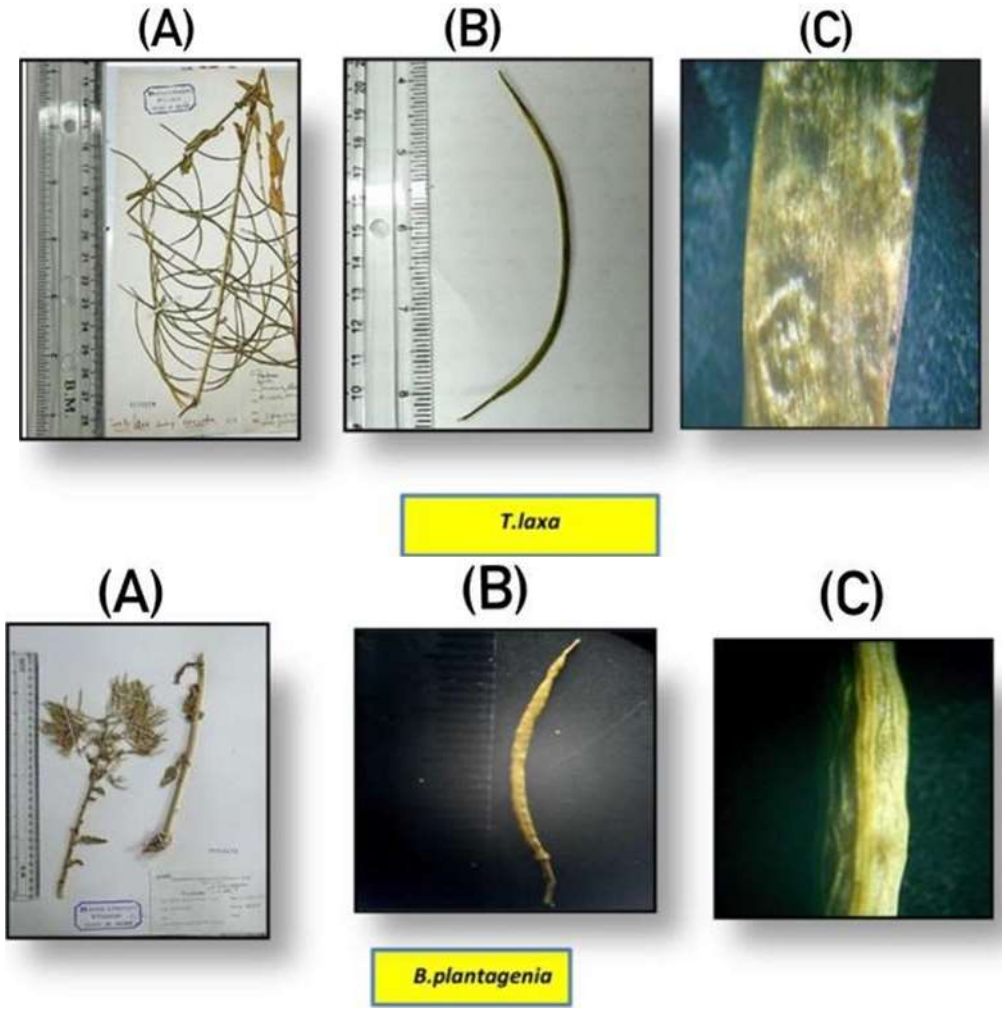


Figure 1. Morphological characters of fruit- A: whole plant, B: fruit C: surface configuration

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