THE TAXONOMICAL SIGNIFICANT OF COMPUTERD PHYLOGENETIC ANALYSIS AND MORPHOLOGICAL DATA IN SOME SPECIES OF POLYGONACEAE

H.R.H. Al-Newani [1] S. A. Aliway[2] R. K.H.Al-Masoudi[2]
Lecturer Assist. Prof . Assist. Lecturer
[1]Dept. Bio-Coll. Sci, Mustansiriyah University Email: sphh@uomustansiriyaha.edu.iq
[2]Dept. Biology-Coll. Sci, University of Baghdad

ABSTRACT

This research dealt with study of cladistics taxonomy of five species related to the genus *Rumex* L. and *Polygonum* L. from family polygonaceae in Iraq by using Mesquite software V.2.75. This research support strongly delimiting the species *P. aviculare* L. and *P. lapathifolia* L.as suggested in floras publication while *R. dentatus* L. is setted in single group whereas *R. vesicarius* L. and *R. conglomeratus* Murray were included in the same group. Also, this study involved characteristics of shape, dimensions, color, and ornamentation of seeds and fruits as the seed forms were ranging from lenticular to trigonous. In terms of size calculations, the seeds of *R. vesicarius* was recorded the higher range (4.0- 4.5) mm in length while, *P. aviculare* recorded the lowest (1.5-1) mm in length. However, the shape was lenticular in *P. lapathifolia* and trigonous in the remaining species. Color of seeds and surface ornamentation is recognized. fruits shape is an important characters in identification of selected species as two groups are distinguished: persistent tubercules tepals which are spine teeth in *R. dentatus* and tongue like shape in *R. conglomeratus*, the second group is persistent tepals which are papery in *P. lapathifolia*, biconvex in *P. aviculare* and cordate to winged as in *R. vesicarius* beside that, colors, dimensions and surface nature is also recorded.

Key words: Iraq, Polygonum, Rumex, cladiastic taxonomy, trigonous, fruits, seeds

مجلة العلوم الزراعية العراقية -2020 :51 (6):1517-1524 النويني وآخرون

الاهمية التصنيفية لبرنامج التحليل الحاسوبي و دراسة الصفات المظهرية في تشخيص انواع من العائلة الراوندية

هديل رضاوي حسين النويني سكينة عباس عليوي رشا خالد حسين
مدرس أستاذ مساعد مدرس مساعد
قسم علوم الحياة– كلية العلوم –الجامعة المستنصرية قسم علوم الحياة – كلية العلوم – جامعة بغداد

المستخلص

تناول هذا البحث دراسة تصنيفية لخمسة أنواع نباتية تعود للجنسين Polygonum و Rumex تنتمي للعائلة الراوندية باستعمال برنامج Mesquite V. 2.75 حيث دعم هذا البحث بقوة انعزال الأنواع L *P. aviculare* و *P. lapathifolia* اكما اقترح من قبل العديد من منشورات الفلورا بينما وضع *R. dentatus* L. في مجموعة مستقلة اما الانواع *R. vesicarius* L و Murray *R. conglomeratus* ادرجا في نفس المجموعة. أيضا ، شملت هذه الدراسة خصائص الشكل والأبعاد واللون وزخرفة البذور واثمار حيث كانت أشكال البذور تتراوح من عدسي إلى ثلاثي الزوايا اما من حيث قياسات الحجم ، تم تسجيل اكبر رقم في بذور النوع *R. Vesicarius* (4.0 – 4.5) ملم في حين سجل النوع *P. aviculare* أدنى حد (1–1.5) ملم في الطول. اما من حيث زخرفة السطح كان الشكل عدسي في *P. lapathifoli* بينما كان ثلاثي الابعاد في الأنواع المتبقية كذلك تم تسجيل لون البذور وزخرفة السطح. اما بالنسبة لشكل الثمار فهي تعتبر صفة تشخصية مهمة في تحديد الأنواع المختارة حيث يتم تمييز مجموعتين: حيث تميزت الثمار بتراكيب تشبه الاسنان كما في *R. dentatus* بينما كانت تشبه شكل اللسان في *R. conglomeratus* اما المجموعة الثانية اما كانت بشكل ورقي في *P. lapathifolia* و ثنائية التحدب في *P. aviculare* بينما كانت قلبية الى مجنحة في النوع *R. Vesicariu s* كذلك تم تسجيل الصفات المظهرية الاخرى كلون وابعاد و زخرفة سطوح الثمار.

الكلمات المفتاحية: العراق, التصنيف العددي, العائلة الراوندية, ثمار, بذور

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INTRODUCTION

Number of publications suggested including the genus *Rumex* is in the tribe rumiceae and *Polygonum* in polygoneae together in the polygonaceae family which is from predominant plant families in the northern temperate regions while others are tropical or subtropical comprising of perennial herbaceous weeds, shrubs and vines trees (4,5,6,7,8,9). The family is generally 30 to 49 genera with about 750 species globally and approximately 33 species in Iraq (10,11,14,15).The genus *Rumex* has the highest diversity within Iraqi buckweed family with ten species distributed throughout Iraqi districts principally towards the mountain regions. However, in flora of Iraq eight species of *Polygonum* had been stated as perennial and mostly glabrous weeds in the north areas (1,2,3,10,12,17,16). *Polygonum* is heterogeneous complex taxonomically with various floras treatment as number of genera had been added or removed like *Persicaria*, Moreover, this species has a medical benefit to treat dysentery with bloody stools, UTI, bacteremia, endocarditis and meningitis (19,20,22). In 2000, Ronse Decraene et al documented the efficiency of fruit sculpturing to delimit the tribes of Pcrsicarieae and Polygoneae (20,21,23,24). On the other hand, an attempt had been made by Mosaferi and Keshavarzi to segregate of Iranian polygonaceae tribes based on morphological characters (18,21,24,25,26). The diversity of fruit nature and structure made it an interesting feature to taxonomists and recognized as good features for identification purpose (11,12,13,27).Numerical taxonomy is proved to be helpful in delimiting species more than conventional methods. As Tavakkoli et al (28,29) made a cladistics analysis to Calligonum and Pteropyrum from Polygonaceae and it was efficient in illustrating phylogenetic relationships. In spite of number of global research on fruit morphology of polygonaceae but there is still lacking data about Iraqi buckwheat family. So the present study aims to evaluate the taxonomic effect of cladistics taxonomy to delimit the studied species beside morphological data of the seeds and fruits of the genus *Polygonum* and *Rumex*.

MATERIALS AND METHODS

Sample Collections Specimens of this study were collected from herbarium specimens moreover, field trips have been done during collecting season in different places of Iraq from 2017-2018. Matured achenes and nuts have been examined under dissecting microscope for further identification (10,11). The phenotypic shape of the fruits and seeds in each species have observed beside that, the external features of the surface sculpturing of fruits and seeds by anatomical microscope have studied and recorded all the observations and measurements differences of selected species from family polygonaceae. Generally 5 samples were examined for each species according to their availability in the lab.

Table 1. Characters and character states

Characters	Character states
Life span	Annual
	Annual or biennial
Stem habitat	Erect
	Ascending to erect
Stem branching	Branched
	Non-branched
Stem color	Glaucous
	Green
	Greenish to reddish
Stem status	Swollen
	Non-swollen
Petiole length	Long
	Short
Ochreae shape	Tuncate
	Lacinate
Leaf duration	Deciduous
	Persistent
Panicle status	With clusters of racemes
	Without clusters of racemes
Racemes shape	Dense spike like
	Axillary
Nuts	Glossy
	Non-glossy

Numerical analysis

Morphological features have collected from fresh samples beside herbarium sheets deposited in BUH herbarium in addition, data have gathered from related publications (10,11,18,21). Among eleven distinctive characters illustrated in table 1 have been chosen to construct matrix of data by using Mesquite software V.2.75 (28).

RESULTS AND DISCUSSION

The phylogenetic tree has been carried out by mesquite software by using 25 characters state revealed delimited the species *Polygonum aviculare* from *Persicaria lapathifolia* while *R. conglomeratus* and *R. dentatus* is include in the same sister group. On the other hand, *R. vesicarius* is represented as separated group as illustrated in fig(1)and this assist the previous work by other scientists for this fact (10,11).

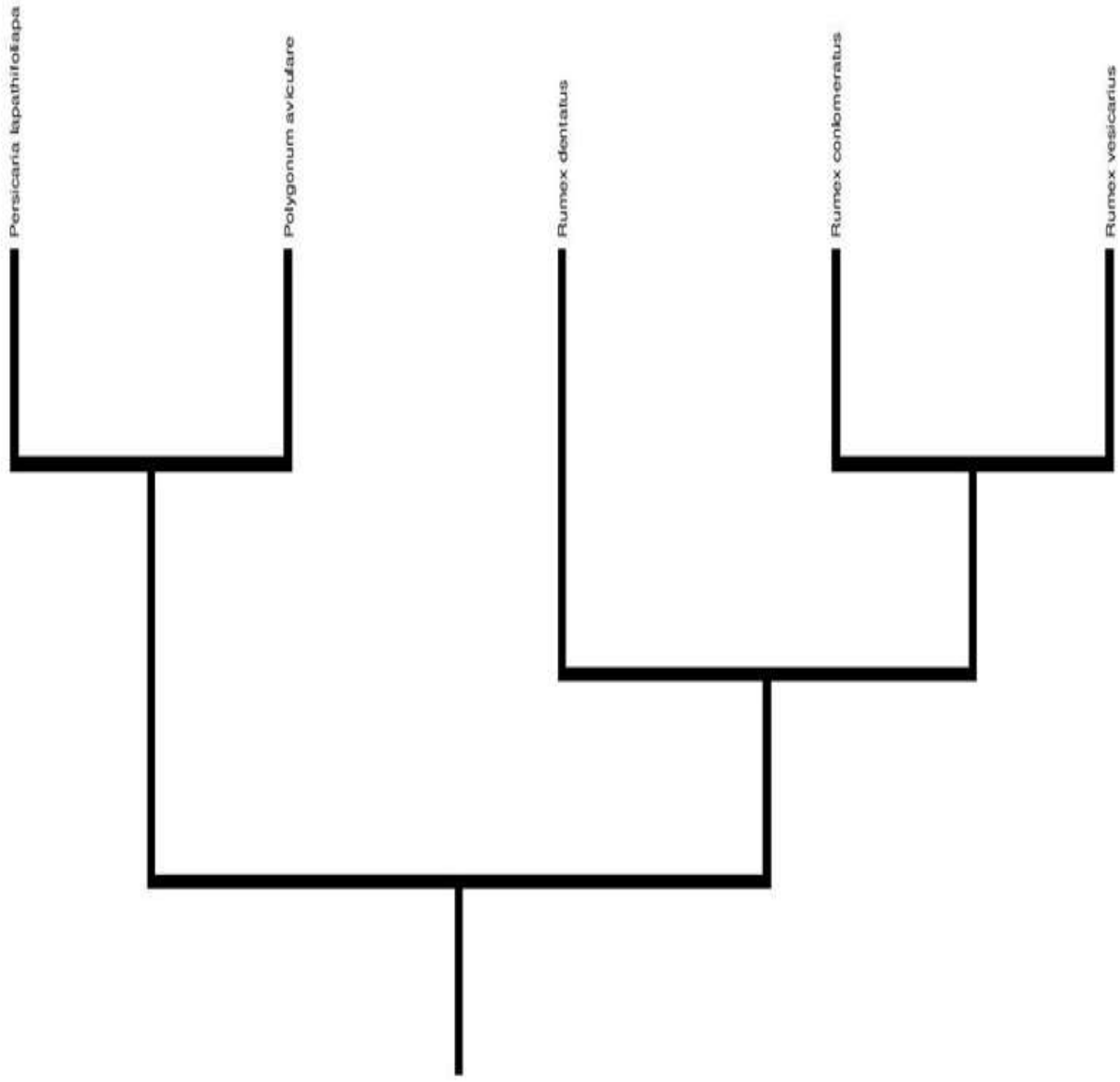

Fig.1 Tree of data matrix constructed by mesquite software

Fruit and seeds morphology

This study was examined fruits and seeds of selected species from polygonaceae family which showed differentiation among selected species by dimensions, color and surface sculpturing patterns. In terms of dimension calculations, the seeds of *Rumex vesicarius* was recorded the higher range(4.0-4.5)mm in length while *Polygonum aviculare* recorded the lowest one(1.5-1)mm in length. On the other hand, the highest average of length was (1.5-1.75) mm in *Rumex vesicarius* L. and lowest range was(1-1.25) in *Rumex conglomeratus* L. However, the measurement of width was varied from 0.75 mm. to in *P. aviculare* to 2.5 mm. in *R. vesicarius*. Regarding to seed shapes, two groups had been differentiated into as table (2): first group: seeds with lenticular shape include species *Persicaria lapathafolia* while the

second group included seeds with a trigonous shape for other remaining species. In terms of color seeds, there was gradient from brown color in *Polygonum aviculare* to dark brown in *Persicaria lapathafolia* and *Rumex dentatus* while black color is noticed in *Rumex conglomeratus* L. However, pale yellow is stated in *R. vesicarius*as in Fig (2).table(2).For surface texture all studied species were smooth as illustrated in table(2). The achene length of *P. aviculare* was 2 mm while *R. vesicarius* had higher rang (4.5-10.0) mm, although the length was (7.5-15.0)mm in *R. dentatus*. According to size parameters the smallest width found 0.75 mm in *P. aviculare* and the largest width was in 8 mm in *R. vesicarius*, where *P. lapathofolia*was1.75mm, *R. congolemeratus* was 2.5-3mm and 3-5.5mm in *R. dentatus* respectively. Out of five species, two types of fruits shape have been differentiated: persistent tubercules tepals which are spine teeth in *R. dentatus* and tongue like shape in *R. conglomeratus*, the second shape is persistent tepals which are papery in *Persicaria lapatafolia*, biconvex in *P. aviculare* and cordate to winged as in *R. vesicarius* as illustrated in Fig (3) table (3).In terms of color surface of fruits there was variation from light brown in all species of *Polygonum* and *R. dentatus* through dark brown into *Persicaria lapathafolia* and *R. conglomeratus* to light yellow in *R. vesicarius* as it usually pink when fruit is fresh as noticed in fig (4). However, the surface sculpturing is an important feature as graduated from granular in *P. aviculare* faintly netted bounded by small edges in *Persicaria lapathafolia* while there was serrated sculpturing in *R. dentatus* and *R. vesicarius* L. but it was smooth surface in *R. conglomeratus* L. as table (3), the proceeding study some species were heterogeneous in appearance.

Table 2. Seed morphological characters for selected species

Species	Dimensions (mm)		Shape	Color	Surface sculpturing
	Long	Width			
P. aviculare	**1.5-1**	**1-0.75**	**Trigonous**	**Brown**	**Smooth**
P. lapathifolia	**2.12 -2.15**	**1.25-1.125**	**Lenticular**	**Brown dark**	**Smooth**
R. dentatus	**2.25-2.0**	**1.5-1.75**	**Trigonous**	**Brown dark**	**Smooth**
R. vesicarius	**4.5-5.0**	**2.0-2.5**	**Trigonous**	**Pale yellow**	**Smooth**
R.conglomeratus	**1-1.75**	**1-1.25**	**Trigonous**	**black**	**Smooth**

Table 3. Fruits morphological characters of selected species

Species	Dimensions (mm)		Shape	Color	Surface Sculpturing
	Long	Width			
P. aviculare	**2.5-4.25**	**0.75-1.25**	**Biconvex**	**Light brown**	**Granular**
P. lapathifolia	**2.25**	**1.75**	**Papery tepals**	**Dark brown**	**Faintly netted**
R. dentatus	**3-9.5**	**3-5.5**	**Spine teeth**	**Light brown**	**Serrate**
R. vesicarius	**10.5-11**	**7.25-8.0**	**Cordate to winged**	**Light yellow**	**Serrate**
R.conglomeratus	**4.25**	**2.5-3.0**	**Tongue like**	**Dark brown**	**Smooth**

P. lapathifolia

P. aviculare

R. conglomeratus

R. dentatus

R. vesicarius

Fig 2. Seeds of selected species

P. lapathifolia

P. aviculare

R. conglomeratus

R. dentatus

R. vesicarius

Fig 3. Fruits of selected species

Fig 4. *Rumex versicarius* in the field

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