



## A taxonomical study of new cultivated types of *Malus* from the Rosaceae family in central of Iraq

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### Abstract

The breeding and cultivation of new apple cultivars are among the most charming and significant issues for apple researchers. The vegetative and reproductive traits studied of *Malus* species appear varying in many characters and can be used as a taxonomic feature to distinguish among the species and put in the groups, on the other hand, the leaves of plants show highly diverse and elaborate patterns of leaf venation. The venation in all species under study is pinnately reticulate that's mean the type is simple craspedodromos in all species where all secondary veins and their branches end at the edge also the study refers to the cascade venation pattern, Areoles, zones and segments of leaf lamina.

**Keywords:** leaves venation, *Malus*, rosaceae, taxonomy

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### INTRODUCTION

The genus *Malus* (common name: apple) has been considered as a one of the significant fruit within Rosaceae family, a number of species of apple and their hybrids are cultivated for their showy flowers and fruits (Phipps et al. 1990).

A number of species of apple and their hybrids are cultivated for their showy flowers and fruits, the spread of alien apples into the wild appears to be a recent phenomenon, but they are clearly increasingly spreading from cultivation and are now a characteristic feature of fields near urban areas they are also quite difficult to identify because they have many hybrids are cultivated (Reznicek et al. 2011). The interspecific hybridization and breeding gene pools among apple groups and their wild relatives have possibly had main roles in the evolution of the Rosaceae family (Katayama and Uematsu, 2003).

Therefore, the relationships, taxonomy, and diversity are very important to evolving the breeding strategies, save biodiversity and breeding efficiency, also when determined the genetic variability in *Malus* that cause easily for controlling characterizing genetic and the recording of new cultivars (Herrero et al. 1996 and Barkley et al. 2006).

Many taxonomic and genetic studies like (Noiton and Shelbourne, 1992; Hokanson et al. 2001; Stephan et al. 2003; Chagne et al. 2014; FAO, 2015) point out that the *Malus* has been economic significance and large

geographical distribution but the origin of it vague and ramified.

The References listed spread the *Malus* in many regions when they referred to one species of *Malus* in Flora of Syria, Palestine, Sinai, Iraq, Iran, and Turkey (Post, 1932; Townsend and Guest, 1966; Reching, 1969; Davis, 1972) on the other hand, Rao (2004) were mentioned 12 species of *Malus* in New Delhi flora belonged to Pomoideae subfamily.

The objectives of this study were investigated and identify the taxonomy features among new *Malus* cultivars cultivated in middle of Baghdad, Iraq.

### MATERIALS AND METHODS

Samples were collected for the taxa of the genus appearing in **Table 1** growing in Iraq during different developing stages from the field directly through October/ 2018 to May/ 2019 in middle of Baghdad and approximately visiting each site more than twice and trips were organized in all seasons of the year to visit the plants in different stages of growth, including the stage of vegetative growth, floral buds stage and the stage of reproductive.

Primary, specimens were studied in details for all parts of the plant by the dissecting microscope and

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**Table 1.** The list of taxa under study

Scientific name	Common name
<i>M. domestica</i> Borkh.	Red delicious apple
<i>M. domestica</i> var <i>ralls janet</i>	Ralls jennet apple
<i>Malus pumila</i> Mill.	Golden delicious apple
<i>M. pumila</i> var <i>domestica</i> (Borkh.) C.K. Schneid	Fuji apple
<i>M. sieversii</i> (Ledeb.) Roem.	Kazakhstan apple
<i>M. sylvestris</i> (L.) Mill.	Crab apple

**Table 2.** The vegetative and reproductive traits of *Malus* species

Characters	<i>M. domestica</i>	<i>M. domestica</i> var <i>ralls janet</i>	<i>Malus pumila</i>	<i>M. pumila</i> var <i>domestica</i>	<i>M. sieversii</i>	<i>M. sylvestris</i>
Leaf Apex	Acute	Acute	Obtuse	Mucronate	Mucronate	Acute
Leaf Base	Cunate	Cunate	Cunate	Oblique	Oblique	Oblique
Petals number	5	5	5	4	5	5
Petals color	white and some spots with pink color	white	white	white and the upper service have reddish to pinkish color	white	white with red spots
Sepals number	5	5	5	4	5	5
Stamens number	16 (8 long orange color and 8 short white color)	15 (3 short and the remain long orange color)	17 (lengths vary orange color)	15 (lengths vary yellow color)	19 (lengths are equal, 6 of it orange color and 13 yellow color)	19 (lengths are vary orange color)
Pistils number	1	5	5	4	4	5
Ovary shape	triangle	triangle	ovulate	jar	triangle	rectangle to elongated
Seed number	2-3	6	7	7-9	9	7
Seed color	light brown	brown	brown to reddish	brown to reddish	brown to reddish	light brown

compound microscope also photographed by the digital camera fixing on microscope model MC500.

## RESULTS AND DISCUSSION

### Morphological study

**Table 1** appears the taxa of *Malus* and the common name are known in Iraq.

The vegetative and reproductive traits studied of *Malus* species under study appear that all the species have green color of leaves and all margin of it are serrulate but the apex and base of leaves varied in shape (**Table 2**), also the calyx has 5 sepals separate and hairy in the species *M. domestica*, *M. domestica* var *ralls janet* and *M. sylvestris* but have 5 sepals conjunctive and hairy in the species *Malus pumila* and 4 sepals separate and hairy in the species *M. pumila* var *domestica* and *M. sieversii*. All species the ovary were inferior but in the species *M. domestica* and *M. sieversii* were half inferior (**Table 2**).

**Table 2** appears that the species *M. domestica*, *M. domestica* var *ralls janet* and *M. sylvestris* are the same leaf apex Acute and the species *M. pumila* var *domestica* and *M. sieversii* have the Mucronate leaf apex but the species *Malus pumila* have Obtuse leaf apex and this species alone in adjective of leaf apex (**Table 2**).

The leaf base of *M. domestica*, *M. domestica* var *ralls janet* and *Malus pumila* was Cunate, on the other hand, the species *M. pumila* var *domestica*, *M. sieversii* and *M. sylvestris* have the same leaf base Oblique (**Table 2**).

All the species have 5 of petals and sepals excepting the species *M. pumila* var *domestica* have 4 also all the

species have the same color of petals it is a white color with some pink spots in the species *M. domestica* and red spots in the species *M. sylvestris* but the species *M. pumila* var *domestica* distinguished as having color reddish to pinkish in the upper service of petals (**Fig. 1**).

It was found through the study that a distinction can be made between the types studied in an adjective stamens number because were vary in the number and length and color, show (**Table 2**).

Also can divide the species as groups by the pistils number to 3 groups (**Table 2**):

Group 1: have 1 pistil include the species *M. domestica*

Group 2: have 4 pistils include the species *M. pumila* var *domestica* and *M. sieversii*

Group 3: have 5 pistils include the species *M. domestica* var *ralls janet*, *Malus pumila*, and *M. sylvestris*.

The ovary shape also varies among the species and can be divided into 4 groups (**Table 2** and **Fig. 2**):

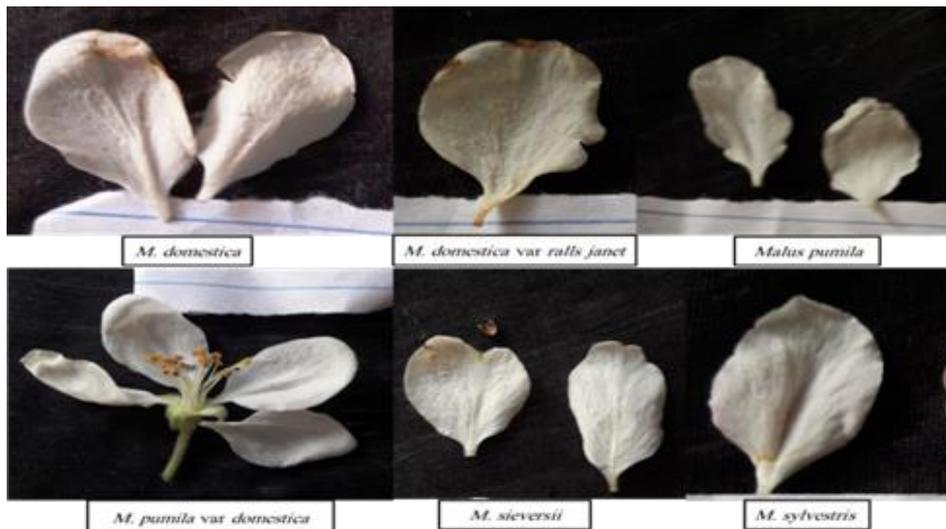
Group 1: have triangle shape include the species *M. domestica*, *M. domestica* var *ralls janet* and *M. sieversii*.

Group 2: have ovulate shape include the species *Malus pumila*.

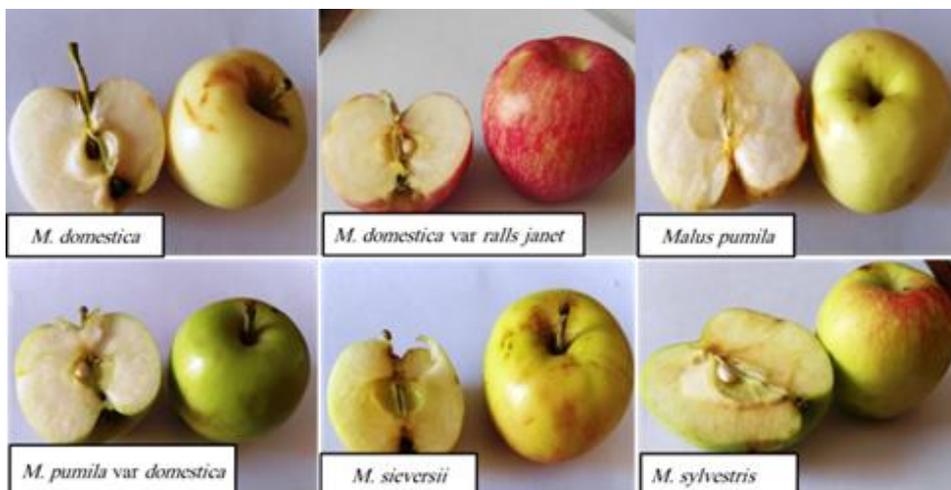
Group 3: have jar shape include the species *M. pumila* var *domestica*

Group 4: have a rectangle to elongated shape include the species *M. sylvestris*

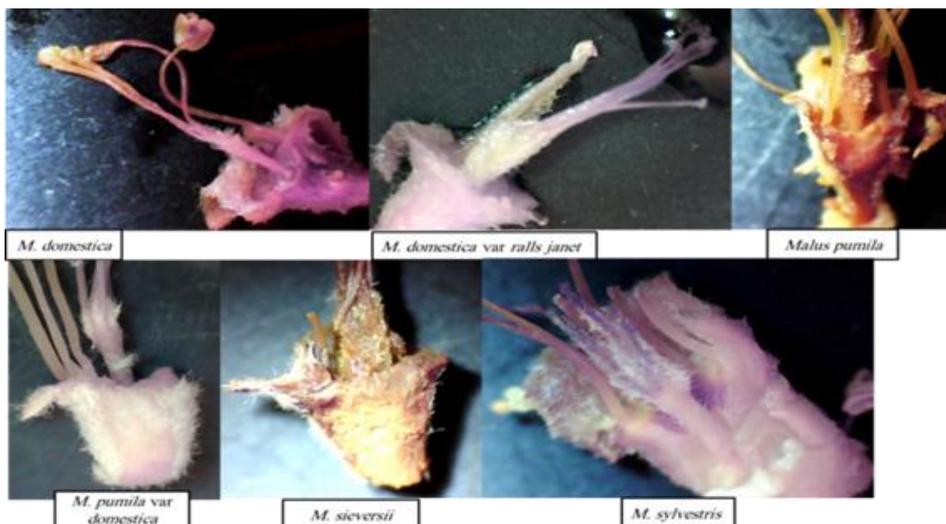
The fruits were pome in all species under study (**Fig. 3**).



**Fig. 1.** Petals shape of *Malus* species



**Fig. 2.** Pistils and Ovary shape of *Malus* species

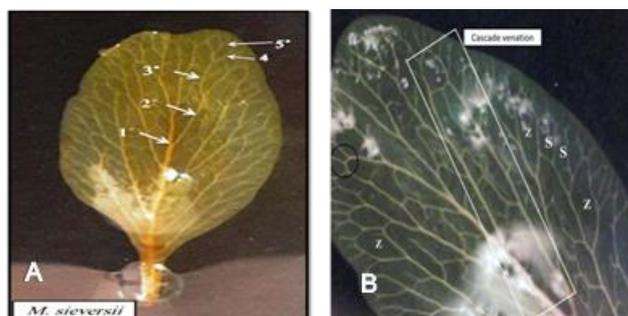


**Fig. 3.** Fruits shape of *Malus* species

The number and color of seeds are also different taxonomic characteristic of distinguishing between the species and can be used as an important studied species (**Fig. 4**).



Fig. 4.

Fig. 5. A, leaf petals venation of *Malus sieversii*. B, Leaf petals venation pattern of *Malus* species

### Venation study of leaves

The venation in all species under study is Pinnately reticulate that's mean the type is simple craspedodromos in all species where all secondary veins and their branches end at the edge (Fig. 5).

One medium vein perforated the blade penetrates known unicostate, with smaller secondary veins branched from it and spreading like random-reticulation. The Second-order venation in the all-present samples consisted cascade venation pattern this pattern refers to the shape of veins between two Second-order venation, in this type the branching may be straight or curved and the venation, which is the veinlets are not directly rolled up and some of their ends extend to intersect with the central vein and made space connected to it extending

along the middle vein and sides and the third veins type are lattice and percurrent (Fig. 5B).

The form of the convergence of the triangular axes between all secondary veins known Areoles was completing polygonal and the veinlet was not equal in size and shape. Also, the zones and segments of leaf lamina, Zone refers to the areas of the lamina like the channel of veins patterns and it may be divided into segments (Fig. 5B).

### CONCLUSION

In general, the present study refers to leaf architecture terminology of (Esau, 2006; Metcalfe and Chalk, 1979; Hickey, 1973).

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