Lepidium virginicum L. (Brassicaceae), a new record for the flora of Iran

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INTRODUCTION

Lepidium is one of the largest genera of the Brassicaceae consisting of about 260 species distributed worldwide, except Antarctica. It is regarded as one of the most natural genera in the family due to having angustiseptate fruits and simple trichomes when they are present (Al-Shehbaz, 2017).

According to Hedge (1968), six annual species of Lepidium are reported from Flora Iranica area (L. aucheri Boiss., L. sativum L., L. vesicarium L., L. perfoliatum L., L. pinnatifidum Ledeb. and L. ruderale L.). L. campestre (L.) R.Br. is added from Arasbaran protected area (Assadi, 1983). Moreover, two species from the genus Coronopus were moved to Lepidium as L. squamatum Forssk. and L. didymum L. (Al-Shehbaz, 2004; Fakhr Ranjbari, 2017). Therefore, total number of annual Lepidium species occurring in territory of Iran reaches eight.

Two populations of Lepidium virginicum were collected in the urban areas of Babolsar, Mazandaran Province during a floristic and phytosociological investigation in the lowland and submontane Hyrcanian region. The species is hereby reported for the first time for Iran.

MATERIALS AND METHODS

Fieldwork was carried out in May-August 2017. The morphological features of the species were noted from the plant material collected during the field studies. The specimens were identified using botanical literatures of Iran and other areas (Boissier, 1867; Bush, 1939; Hedge, 1965, 1968;
RESULTS AND DISCUSSION

Type: Herbarium Linneaus No. 824.18 (lectotype designated by Marais).

Mazandaran Province, Babolsar, on the road of Babolsar to Babol, Imam Khomeini str., 36° 41' 18.05" N; 52° 39' 02.55" E, -22 m a.s.l., 29 June 2017, L. Mamizadeh 8050-HUMZ.

Description
Annual herb, 15-40 cm long. Stems usually simple from base, erect, branched above, puberulent with antrorse/retrorse, sub-appressed indumentums, 0.07-0.2 mm long, deciduous in elder materials. Basal leaves not rosetted, early deciduous, obovate or spatulate. cauline leaves shortly petiolate; leaf blade ob lanceolate or linear, 1-3 cm ×2-5 mm, attenuate or subcuneate toward base, leaf margin entire to serrate, not lobed, antrorse puberulent along margins and midrib and rarely elsewhere. Inflorescence much elongated, with rather dense erect to ascending flowers; rachis and pedicels are puberulent with tiny curved, antrorse/retrorse, cylindric sub-appressed indumentums. Fruiting pedicels slender, spreading, 2.7-4.2 mm × 0.3 mm, glabrous abaxially. Sepals oblong to ovate, ca. 0.8 × 0.5 mm. Petals white, spatulate to oblanceolate, attenuate at base, 1 × 0.3-0.4 mm, rounded at apex. Stamens 2; filaments 0.8-1 mm long; anthers ca. 0.2 mm long. Fruit orbicular, glabrous, 2.5-3 mm in diam., narrowly winged apically, apex emarginate; apical notch ca. 0.3-0.5 mm long; width of the lower part of apical notch 0.2-0.3 mm long; style ca. 0.15-0.2 mm long, included in apical notch. Seeds reddish brown, ovate-oblong, narrowly winged, 1.5 × 0.9-1 mm, seed wing in the basal part 0.3-0.4 mm width.

Taxonomic remarks
*Lepidium virginicum* is closely related and frequently misidentified with *L. ruderale*, but differs from the latter by having petals, orbicular fruit and lyrate basal leaves (Table 1; Figs. 3). It also differs from *L. pinnatifidum* by having smaller style and glabrous fruits. Seeds are reddish brown and winged in *L. virginicum* vs. dullish yellow and wingless in *L. pinnatifidum* and *L. ruderale*. *L. virginicum* is classified in sect. Dileptium DC. This section is characterized by mostly winged fruit, free style, not amplexicaule leaves, 2-4 stamens. Based on a morphometric analysis of some species of this section, quantitative characters of density of the pedicels, length of stem hair, width of the silicle, width of the lower part of the apical notch, length of the beak and width of the wing in the basal part of the seed are regarded as diagnostic characters to distinguish *L. virginicum* from the most closely related species (Wąsowicz & Rostański, 2009).

Table 1. Comparison between *Lepidium virginicum* and its most similar species.

<table>
<thead>
<tr>
<th>Characters</th>
<th><em>L. virginicum</em></th>
<th><em>L. ruderale</em></th>
<th><em>L. pinnatifidum</em></th>
</tr>
</thead>
<tbody>
<tr>
<td>Leaves</td>
<td>lower leaves lyrate</td>
<td>lower leaves bipinnate</td>
<td>basal leaves pinnatifid</td>
</tr>
<tr>
<td>Petals</td>
<td>present, white, obovate-spataulate</td>
<td>absent</td>
<td>rudimentary (sometimes absent)</td>
</tr>
<tr>
<td>Fruit</td>
<td>orbicular, winged at apex, apical notch 0.2-0.5 mm</td>
<td>orbicular-elliptic, winged at apex, apical notch 0.1-0.2 mm</td>
<td>elliptic-oval to sub-orbicular, wingless, hardly emarginated</td>
</tr>
<tr>
<td>Style</td>
<td>0.1-0.2 mm, included in apical notch.</td>
<td>obsolete (or 0.1 mm, included in apical notch)</td>
<td>as long as notch or longer</td>
</tr>
<tr>
<td>Seed</td>
<td>reddish brown, winged</td>
<td>dark yellow, wingless</td>
<td>dark yellow or dark rufous, wingless</td>
</tr>
</tbody>
</table>
**Distribution and habitat**

*Lepidium virginicum* is native to N America and has been introduced and widely naturalized elsewhere (De Carvalho e Vasconcellos et al., 1993; Zhou et al., 2001). In Europe, this is one of the most widespread alien plants occurring in more than 80% of all European countries (Pyšek et al., 2009). The distribution of the species is still expanding (e.g. Protopopova et al., 1994; Ilyinska, 2014; Stoyanov & Vladimirov, 2015). The nearest recorded localities of the plant to Iran are NE Turkey (Davis et al., 1988) and Pakistan (Jafri, 1973).

**Phenology.** Flowering and fruiting from May to July.

![Fig. 2. Distribution map of Lepidium virginicum in Iran (●).](image_url)

![Fig. 3. Inflorescence (left) and seeds (right) of Lepidium virginicum.](image_url)
Determination key for annual/biennial Lepidium species of Iran

1-Fruits distinctly costate…………………………………2
1-Fruits without distinct veins……………………………3
2-Fertile stamens 6………………..L. squamatum
2-Fertile stamens 2………………..L. didymum
3- Fruiting pedicels adpressed…………………………4
3- Fruiting pedicels spreading………………….5
4- Fruits 2.5-3 mm long, cotyledons entire..L. aicheri
4- Fruits 5-6 mm long, cotyledons trifid..L. sativum
5-Stems with prominent turbinate swellings at nodes……………………L. vesicarium
5-Stems not as above…………………………………6
6-Cauline leaves apnexicaule……………………………7
6-Cauline leaves non amplexicaule…………………8
7- Cauline leaves ovate–orbicular, flowers yellow…………………..L. perfoliatum
7- Cauline leaves oblong–lanceolate, flowers white……………………..L. campestris
8- Fruits ovate, petals absent…………………L. ruderale
8- Fruits orbicular, petals present……..L. virginicum

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