A REVISION OF SENECIO L. (ASTERACEAE, SENECIONEAE), IN IRAN

E. Lotfi, M. Yousofi & M. Assadi

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The genus Senecio L. is reviewed based on the literature and available herbarium materials. A synopsis and identification key is provided to the 22 accepted taxa. Diversity centers and distribution maps of Senecio species in Iran are presented. Also the checklist of accepted species and synonyms including selected studied specimens are given. Furthermore, Senecio erucifolius subsp. erucifolius which has been collected from Azerbaijan province is reported as a new subspecies to Iran. This subspecies is compared with closely related subspecies S. erucifolius subsp. grandidentatus.

Elahe Lotfi (correspondence), Science Faculty, Payame Noor University, Najaf Abad Center, Najaf Abad. – Mehdi Yousefi, Payam Noor University of Isfahan, Department of Biology, P. O. Box 81393-671, Ashrafia Isfahan Blvd., Isfahan, Iran. E-mail: muosofi@yahoo.com. Mostafa Assadi, Department of Botany, Research Institute of Forests and Rangelands, Tehran, Iran.

Key words. Senecio, synopsis, Iran, taxonomy, new record, flora.

INTRODUCTION

The first author has been revising the tribe Senecioneae in Iran for her M. S. thesis and also draft of Flora of Iran (Assadi 1989). Senecio L. (Asteraceae, Senecioneae) is the largest genus of Asteraceae in the world with about 1500 species and with worldwide distribution (Matthews 1975). The species are distributed all over the world, especially in South Africa, Mediterranean floristic region and in temperate areas of Asia and America (Schischkin 1961). Nordenstam (1989) transferred some species of Senecio into the genus Iranecio B. Nord. and introduced 4 sections and 17 taxa including species and subspecies of this genus in Iran. The genus Senecio after Nordenstam (1989) draft of Flora Iranica has been subject of several studies, partly circumscription of the genus have been changed. Jeffrey (1992) based on anatomy character transferred species that belonged to Senecio Sect. Quadridentati Boiss. to the genus Iranecio. Also Pelser et al. (2006) and Nordenstam (2006) based on molecular systematic studies and Pelser et al. (2007) based on ITS phylogeny studies regarded the section Jacobaea (Mill.) Dumort. as a distinct genus, but as the circumscription of these groups are not quite clear and it has not been stabilized yet, in this paper only the genus Senecio sensu Nordenstam (1989) has been subject of studies and the genus Jacobaea Mill. is included in the genus Senecio.

Phytogeographically, the majority of the species of Senecio are found in Irano-Turanian region, a few species are found in Sahara-Sindian region and one species is found in Hyrcanian province of Euro-Siberian region. Some species of this genus have a limited distribution in Iran and grow individually or in the small isolated patches. These species are usually very rare or can be endangered. But some species, such
Table 1. Comparison of the number of species and endemics of *Senecio* L. in Iran and some neighboring countries.

<table>
<thead>
<tr>
<th>Country</th>
<th>No. of species</th>
<th>No. of endemics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Iran</td>
<td>21</td>
<td>6</td>
</tr>
<tr>
<td>Iraq</td>
<td>6</td>
<td>-</td>
</tr>
<tr>
<td>Turkey</td>
<td>42</td>
<td>15</td>
</tr>
<tr>
<td>Turkmenistan</td>
<td>3</td>
<td>-</td>
</tr>
<tr>
<td>Pakistan</td>
<td>7</td>
<td>-</td>
</tr>
<tr>
<td>Afghanistan</td>
<td>8</td>
<td>-</td>
</tr>
<tr>
<td>Armenia</td>
<td>2</td>
<td>-</td>
</tr>
</tbody>
</table>

as *S. glaucus* L., *S. vulgaris* L. and *S. vernalis* Walld. & Kit. (sect. *Senecio*), have widespread distribution in the country.

The aim of this paper is to revise the taxonomy of the genus in Iran, to present an identification key to the known taxa to Iran, and to give the sequence of the species and to report a new record of *Senecio* for Iran.

**MATERIAL AND METHODS**

By using existing Floras about 700 herbarium specimens in the herbarium of Research Institute of Forests and Rangelands (TARI), herbarium of Iranian Research Institute of Plant Protection (IRAN), herbarium of Ferdowsi University of Mashhad (FUMH), herbarium of Research Center of Natural Resources of Isfahan, herbarium of Tarbiat Moallem University (FAR) and herbarium of Department of Biology of Isfahan University were examined and were determined (taxonomically and morphologically).

**RESULTS**

In this paper the number of *Senecio* taxa increasing to 22, among them 6 species are endemic to Iran. The number of species and endemics of this genus in Iran and other neighboring countries are compared in table 1. The name of three species are excluded from the list of flora of Iran.

**Checklist of *Senecio* L. species**


Some studied specimens: Azerbaijan, Mianeh to Tabriz, 1000 m, Sabeti 5606 (TARI); Tehran, 16 km Gazvin to Alamot, 2000-2300 m, Assadi & Maassoumi 59743 (TARI); Hamedan; Kabodar Ahang, 2200-2800 m, Mozaffarian 64565 (TARI); Isfahan; Booien dareh to Khalat, 2600 m, Feyzi, Saedifar & Eftekhar 6304. Map 1.

Typical characters: Base of stem woolly. Involucral bracts 14-18 in number.


Type: Caucasus.

Studied specimen: Azerbaijan, 5 km Ardebil to Astara, 1300 m, Assadi & Akhani 61640 (TARI). Map 2.

Typical character: Synflorescence paniculate.


Type: Khorasan.
Some studied specimens: Azerbaijan, Tabriz to Moshk anbar, 1770 m, Mozaffarian 87147 (TARI); Tehran, Gazvin, Abezarm, 1974 m, Mozaffarian 87302(TARI); Senman, between Senman and Firuz kuh, 2450 m, Wendelbo & Assadi 29768 (TARI); Khorasan, E. Esfarayen, Sarigol National Park, Kalate Narimani, 1746 m, Joharchi & Zangoii 39828 (FUMH). Map 3.

Typical characters: Plant sparsely arachnoid, arachnoid-floccose to subglabrous. Phyllaries 15-22, 11-15 × 1.5-3 mm. Limb of ray flowers 12-25 mm long. Tube of ray flowers 6-10 mm long. Disk flowers 35-60 in number and 10-15 mm long.


Studied specimen: Northern Khorasan, Esfarayen, Saluk National Park, Mt. Ahangaran, 1861 m, Ezazi & Rahchamani 4692 (FAR). Rare. Map 3.

Typical characters: Plant densely arachnoid floccose. Phyllaries 32-35, 9-10 × 0.8-1 mm. Limb of ray flowers 6-7 mm long. Tube of ray flowers 2 mm long. Disk flowers ca. 80 in number and 3-5 mm long. Sect. Quadridentati Boiss., Fl. Or. 3: 385 (1875). Plants perennial. Leaves obovate or lyrate, pinnatifaritate or pinnatisect. Capitula radiate; tubular flowers 4 dentate. Pappus persistent or temporary.


Type: Caucasus.

Studied specimens: Azerbaijan, Sabalan, Shah bil, 3000-3570 m, Mozaffarian 87588 (TARI); Sabalan mountain, 3340 m, Rejamand 6745 (TARI). Map 4.

Typical characters: Stem 30 cm high. Leaves with 1-3 pairs of lobes; terminal lobe equaling the other lobes.


Type: Caucasus.

Studied specimens: Azerbaijan, Arasbaran, 1200 m, Hamzee & Asri 81365 (TARI); Kurdestan, Divan dereh, Chehel cheshtme mountain, 2000-2750 m, Mozaffarian79853 (TARI); Lorestan, Borojerd, 1480 m, Karimi 2431 (TARI); Isfahan, Fereidan, Varzaneh, 2200 m, Feyzi 12358; Tehran, Karaj, Dashteh, 1910 m, Foroughi 935 (TARI). Map 6.

Typical characters: Leaf margin smooth. Achenes with glossy pubescence. Subsp. erucifolius (Fig. 1).


Some studied specimens: Azerbaijan, Arasbaran, 1200 m, Hamzee & Asri 81365 (TARI); Kurdestan, Divan dereh, Chehel cheshtme mountain, 2000-2750 m, Mozaffarian79853 (TARI); Lorestan, Borojerd, 1480 m, Karimi 2431 (TARI); Isfahan, Fereidan, Varzaneh, 2200 m, Feyzi 12358; Tehran, Karaj, Dashteh, 1910 m, Foroughi 935 (TARI). Map 6.

Typical characters: Leaf margin smooth. Achenes with glossy pubescence. Subsp. erucifolius (Fig. 1).


Some studied specimens: Azerbaijan, W. Salmas, Pereshkhoran, border of Turkey, 2100 m, Mozaffarian 96947 (TARI); 50 km W. Khoy, near to Turkey, 2800 m, Assadi & Olfat 68793 (TARI). Map 6.


This subspecies is recorded from Iran for the first time. In Flora Orientalis (Boissier 1875) S. erucifolius includes two taxa: \( \beta \) latilobus , \( \gamma \) grandidentatus. In Flora URSS (Schischkin 1961) S. erucifolius latilobus was regarded as a synonym of S. schischkinianus. The present species with bipinnatisect leaves and endemic distribution in Caucasus (described from Daghestan) is
Fig. 1. Senecio erucifolius subsp. erucifolius (×0.5); capitula (×1.5) ray and disk flowers (×2).
separable from our specimens. In Flora de l'Iran (Parsa 1943) S. erucifolius var latilobus was reported from Tehran. This area is close to the distribution of S. erucifolius subsp. grandidentatus, therefore Parsa (l. c.) record may be a misidentification of S. erucifolius subsp. grandidentatus.

In Flora URSS (Schischkin 1961), Flora of Turkey (Matthews 1975) and Flora Europaea (Chater & Walters 1976) Senecio erucifolius and Senecio grandidentatus are known as two distinct, but in Flora Iranica S. grandidentatus was reduced to a subspecific rank named S. erucifolius subsp. grandidentatus for the first time.

The closest locality to the Iranian gathering of S. erucifolius subsp. erucifolius seems to be in E. Anatolia (Matthews 1975).

S. erucifolius subsp. erucifolius (Fig. 1) is compared with closely related subspecies, S. erucifolius subsp. grandidentatus (Lede.) B. Nord. in Table 2.

Type: Caucasus.

Studied specimens: Mazandaran, Firuzkuh to Ghaem Shahr, Duab, 700 m, Mozaffarian 74246 (TARI); Baluchestan, 45 km S. of Gorgan, Zarin Gol, 850 m, Riazi 6711 (TARI). Map 6.

Typical characters: Stem leaves only present, elliptic or oblong-obovate, pinnatifid, dorsal surface densely hairy, grey. Capitula radiate or disciforme; tubular flowers 5 dentate. Pappus temporary or seldom persistent.

Type: Cultivated in Europe.

Some studied specimens: Khuzestan, Andimeshk, Zal bridge, 260 m, Foroughi 3026 (TARI); Fars, 18 km Kazeroon road to Dalaki, 800 m, Runemark & Mozaffarian 26758 (TARI); Tehran Botanical garden, 1320 m, Riazi 2876 (TARI); Khorasan, Mashhad, Ghar moghan mountain, 1900 m, Faghehnia & Zangooi 20380 (FUMH). Map 7.

Typical character: Capitula discoid.

Type: Iran: Kerman: Jiroft. Endemic.
Studied specimens: Kerman, Jiroft, Baft, Hanza, Takhte Sartashk, 3200-3600 m, Fatehi 15586 (IRAN). Map 10.

Typical character: Radiate florets with corolla reduced to a narrowly cylindrical tube, apically truncate and 2-3 fids.

Type: Iran: Tehran: Damavand mountain. Endemic.

Studied specimens: Mazandaran, South slope of Damavand mountain, 4200 m, Cobham 85752 (TARI); Tehran, South slope of Damavand mountain, 3700-4350 m, Assadi & Hamdi 85752 (TARI); Gazvin, Abdul Abad, Bonvan 9761 (TARI). Map 10.

Typical character: Achenes glabrous.


Type: Jordon.

Some studied specimens: Bandar Abbas, between Kahgum and Traum, 800 m, Mozaffarian 52287 (TARI); Kerman, 50 km Sirjan to Haji abad, 1700-1900 m, Mozaffarian 74246 (TARI); Baluchestan, 45 km S. of Chabahar road, 1100 m, Runemark, Assadi & Sardabi 23323 (TARI); Khozestan, 17 km E. Dezful, Pabot 195 (TARI). Map 9.

Typical character: Stem leaves only present, ovate or obovate, pinnatifid, dorsal surface densely hairy, grey. Capitula radiate or discoid or disciforme; tubular flowers 5 dentate. Pappus temporary or seldom persistent.

Senecio flavus was included by Nordenstam (1984) in Flora Iranica and reported from Iran. Kadereit (1984) described S. flavus subsp. breviflorus indicating that this subspecies has ligulate flower, while S. flavus subsp. flavus has no ligulate flowers. Later, Coleman et al. (2001) made the new combination S. mohavensis subsp. breviflorus, a species with the new and old world distribution. Finally, Greuter (l. c.), made the new combination S. breviflorus with no explanation, apparently based on the distribution of S. mohavensis from the new world and and S. breviflorus from the old world. Studies on Iranian materials showed that the

<table>
<thead>
<tr>
<th>Subspecies</th>
<th>Characters</th>
<th>Leaf division</th>
<th>Leaf indument</th>
<th>Capitula number</th>
</tr>
</thead>
<tbody>
<tr>
<td>subsp. erucifolius</td>
<td></td>
<td>Lanceolate-pinnatisect</td>
<td>Glabrous</td>
<td>7-13</td>
</tr>
<tr>
<td>subsp. grandidentatus</td>
<td></td>
<td>Pinnatifid</td>
<td>hairy grey</td>
<td>16-90</td>
</tr>
</tbody>
</table>

Table 2. Diagnostic characters of the subspecies of Senecio erucifolius.
Iranian materials bear ligulate flowers, therefore they can not be named *S. flavus*. It seems further studies based the examination of the old and new world are needed to understand the relationship of *S. mohavensis* and *S. breviflorus*.  

Studied specimen: Bakhtiari, Gandoman, (Sabzkuh) Lah- Deraz, Vastegan, 2400-2900 m, Moussavi & Tehrani 15585 (IRAN). Rare. Map 9  
Typical characters: plant 4-12 cm high, densely pubescent. Radiate flowers 5-6, in apex with 3 profound lobes or teeth.  

18. *S. subnivalis* Y. Ajani, J. Noroozi & B. Nord. Comp. Newslet. 48: 47 (2010), (Fig. 2).  
Type: Iran: Kerman. Endemic.  
Studied specimen: Kerman, Lalehzar Mountain, 4100 m, Mirtajoddini 86980 (TARI). Rare. Map 11.  
Typical characters: Plant 3- 5 cm high, glabrous or sparsely pubescent. Radiate flowers 1-5, at the apex with 3 short teeth. This species was known as a new species by present authors, but as it was known by the other authors simultaneously we stopped to publish it.  

Type: Egypt.  
Some studied specimens: Azerbaijan, 30 km S. Khalkhal, 1500 m, Forghandust 36211 (TARI); Mazandaran, Sangdeh, Polsefid, 1400 m, Domechek 31416 (TARI); Tehran, Shemshak, 1800 m, Dini & Arazm 5259 (TARI); Baluchestan, 5 km Khash to Iranshahr, 1500 m, Runemark, Assadi & Sardabi 22194 (TARI); Isfahan, Ghameshlo Protection Area, 2200-2300 m, Yousofi 1518 (TARI); Khuzestan, Hendijan, 20 m, Mozaffarian 62372 (TARI); Bandar Abbas, Genu mountain, 1200-2200 m, Mozaffarian 59154 (TARI); Khorasan, Ferdows to Boshroveieh road, 1400 m, Rafiei & Zangoii 24816 (FUMH). Map 8.  
Typical characters: Leaves pinnatifid, pinnatisect and or linear and entire; lobes acute. Calyculus bracts green or brown.  

Type: Hungary.  
Some studied specimens: Azerbaijan, Shahbil, Sabalan mountain, 1700 m, Foroughi & Assadi 13886 (TARI); Kurdestan, Sanandaj, 21 km E Sanandaj, 2010 m, Babakhanlo & Pabot 19987 (TARI); Gilan, Asalam to Khalkhal, 800-1000 m, Wendelbo & Assadi 27718 (TARI); Mazandaran, 25 km S. Ramsar, 3000 m, Assadi & Maassouni 51348 (TARI); Lorestan, Khoram abad, Dorood, Oshtoran kuh, 1750 m, Riazi 9654 (TARI); Semnan, Sangsars, 1800 m, Babakhanlo & Amin 16797 (TARI); Tehran, Lashkarak, 1850 m, Dinii 8991 (TARI); Hamedan, Abbas abad, 2300 m, Assadi & Amini 13609 (TARI); Khorasan, Andimeshk, 750 m, Foroughi 9556 (TARI); Zanjan, Taroum, 930 m, Makouii 9879 (TARI); Fars, 15 km Firuzabad to Ghir, 1500-2100 m, Assadi & Sardabi 41472 (TARI); Khorasan, N. W. Bojnord, between Eshghabad & Cale imani, 950 m, Joharchi & Zangoii 33220 (FUMH). Map 7.  
Typical characters: Plant annual, 3- 55 cm high.  

Studied specimen: Mazandaran, Kelar dasht, Takhte Soleiman mountain, 3620 m, Fotovat 10087 (TARI). Rare. Map 8.  
Typical character: Plant biennial or perennial, rhizomatose, 3- 8 cm high.  
Note. This species was mentioned as annual or perennial in Flora Orientlis (Boissier 1875). Nordenstam (1989) reported it as biennial or perennial in Flora Iranica. The studied specimen is showing that it could be biennial or perennial.  

Names to be excluded from flora of Iran  
This variety was reported from Elbrus Mountains (Caucasus) in Flora Orientalis (Boissier 1875) but in Flora de l,Iran (Parsa 1943) erroneously was reported from Elburz Mountains in N. Iran that is apparently confusion of Elbrus and Elburz names.  
*Senecio cineraria* DC. *Prodr.* 6: 355 (1837).  
This species was reported and illustrated for the first time from Azerbaijan elevations (between Marand and Yam) in Color Flora of Iran (Ghahreman 1987) as a new record to Iran. Unfortunately, the herbarium specimen is not traceable. But clear photograph of the plant with 12-14 ligulate flowers distinguishes this plant from *S. cineraria* with 8 ligulate flowers. Moreover, *S. cineraria* is a Mediterranean element (Chater & Walters 1976). With respect to the habit and locality, the plant identified as *S. cineraria* should be *S. lipskyi* Lomak.  
This species was reported by Parsa (1943) from Baluchestan. Also, this species was reported from East
Fig. 2. *Senecio subnivalis* (×1); capitula (×8); ray and disk flowers, fruit and anther (×20).

Afghanestan and Hindukush in Flora Iranica (Nordenstam 1989). Comparing Parsa (l. c.) record with the local name (Sonowall) and the book of Flowering Plants of Baluchistan (Burkill 1906) it is quite clear that Parsa’s record has been based on Burkill’s (l. c.) record. As, the area of the book Flowering Plants of Baluchistan is Baluchistan of Pakistan, therefore the record of this species from Iran is erroneous.

**Key to the accepted species of Senecio**

1. Plants perennial
   - Plants annual, very seldom biennial
2. Disc flowers 4-lobed
- Disc flowers 5-lobed 6
3. Achenes glabrous 4
- Achenes pubescent 9. S. lipskyi
4. Stem floccose hairy. Leaves sparsely floccose above, densely so below 10. S. lorentii
- Stem glabrous or sparsely hairy. Leaves glabrous or with few hairs 5
5. Stem 30 cm high. Leaves with 1-3 pairs of lobes; terminal lobe longer 7. S. taraxacifolius
- Stem 70 cm high. Leaves with 4-8 pairs of lobes; terminal lobe equaling the other lobes 8. S. davisii
6. Leaves obovate or oblanceolate, pinnatifid or pinnatisect. Achenes 2-2.5 cm long 7
- Leaves oblanceolate or lanceolate, entire or along the margin shortly divided. Achenes 3-7 mm long 8
7. Leaves smooth at the margin. Achenes glossy pubescent 11. S. mollis
- Leaves returned to the back at the margin. Achenes pubescent between ribs 12. S. crucifolius
8. Synflorescence raceme-like or paniculate 9
- Synflorescence single or sparsely corymbose 10
9. Synflorescence raceme-like 3. S. racemosus
- Synflorescence paniculate 4. S. thyrsophorus
- Plants 30-97 cm high 11
11. Achenes hairy. Involucre 1-2 cm in diameter 12
- Achenes glabrous. Involucre 0.5-1.5 cm in diameter 13
- Phyllaries 32-35 in number. Calycular bracts 13-16 in number. Limb of ray flowers 6-7 mm long 6. S. joharchii
- Basal of stem not woolly. Involucral bracts 12-13 in number 2. S. doriiformis subsp. orientalis
- Capitula radiate 15
15. Radiate flowers with corollas reduced to a narrowly cylindrical tube, apically truncate with 2-3 fids 14. S. eligulatus
- Radiate flowers entire 16
16. Achenes glabrous 15. S. iranicus
- Achenes pubescent 17
17. Lamina of radiate flowers 2-3.5 mm long 18
- Lamina of radiate flowers 3.5-15 mm long 20
18. Leaves only on stems, ovate or rotundate, entire 16. S. flavus
- Leaves basal and on stems, lanceolate or oblanceolate, pinnatifid or dentate 19
19. Plant 4-12 cm high, densely pubescent. Radiate flowers 5-6, at the apex with 3 profound lobes or teeth 17. S. kotschyanus
- Plant 3-5 cm high, glabrous or sparsely pubescent. Radiate flowers 1-5, at the apex with 3 short teeth 18. S. subnivalis
20. Leaves up to the middle of lamina pinnatifid or crenulate; lobes obtuse or rounded. Calycular bracts with black tips 21
- Leaves pinnatifid to pinnatisect and/or linear and entire; lobes acute. Calycular bracts with green or brown tips 19. S. glaucus
21. Plant annual, 3-55 cm high 20. S. vernalis
- Plant biennial or perennial, rhizomatose, 3-8 cm high 21. S. vulcanicus
Map 1: ■ Senecio pseudo-orientalis, ○ S. doriformis subsp. orientalis

Map 2: ■ Senecio racemosus, ○ S. thyrsophorus

Map 3: ■ Senecio paulsenii subsp. khorasanicus, ○ S. joharchii

Map 4: ■ Senecio davisii, ○ S. taraxacifolius

Map 5: ■ Senecio lipskyi, ○ S. lorentii

Map 6: ○ Senecio erucifolius subsp. grandidentatus, □ S. erucifolius subsp. erucifolius ■ S. mollis
Map 7: ≪Senecio vulgaris, ■ S. vernalis

Map 8: ≪Senecio vulcanicus, ■ S. glaucus

Map 9: ■ Senecio kotschyanus, ≫ S. breviflorus

Map 10: ■ Senecio iranicus, ≫ S. eligulatus

Map 11: ≫Senecio subnivalis
DISCUSSION

Diversity centers of *Senecio* in Iran

The geographical distribution of *Senecio* is on the elevations of Azerbaijan provinces, Zagros Mountains, Central Alborz Mountains and elevations of the Southern desert of the Iranian plateau such as Lalehzar Mountains in Kerman province. A few numbers of the species, such as *S. paulsenii* subsp. *khorasanicus* and *S. joharchii* can be found in N.E. Iran. *S. vulcanicus*, and *S. iranicus* grow on the Demavand Mountains in the Central Alborz. The diversity of this genus is rapidly increased toward the W. and N.W. Iran. Diversity center is on the elevations of Azerbaijan in western Iran. Therefore, Azerbaijan with 7 species has the highest species diversity among the other provinces in Iran. Toward S Iran, there is speciation of this genus with endemic species such as *S. subnivalis* and *S. eligulatus*. The farthest limit of southern distribution of *Senecio*, with *S. glaucus*, *S. vernalis* and *S. flavus*, occurs in Hormozgan and Bushehr provinces.

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