NOTES ON THE GENUS OROBANCHE (OROBANCHACEAE) IN IRAN

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The genus Orobanche has 39 species in Iran of which nine taxa are endemic to Flora Iranica area. During preparation of Orobanchaceae for the Farsi version of Flora of Iran, Orobanche owerini is described and illustrated as a new record to Iran. O. schultzii is reported for the second time from Iran. O. cistanchoides, O. stocksii, O. caucasica and O. bungeana which have been reported as distinct species by previous authors are revised and accepted. Also, Orobanche caryophyllacea is represented as a valid species and it has the priority over O. vulgaris. Details on the habitat, ecology and taxonomic remarks of the studied taxa are given.

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Key words. Orobanche, Taxonomy, new record, synonymy, Iran.

INTRODUCTION

The genus Orobanche L. has 39 species in Iran, of which nine taxa are endemic to Flora Iranica area (Schiman-Czeika 1964). Many species of the genus grow exclusively in the semi-arid and temperate part of northern hemisphere regions (Uhlich & al. 1955). This genus was divided into two sections Trionychon Wallr. and Orobanche (Beck-Mannagetta 1930). Orobanche comprises holoparasitic herbs, with alternative scale-like leaves and flowers arranged in spike. Calyx campanulate, 4(-5)-toothed, or split into two lateral segments, each entire or 2-toothed, shorter than the corolla. The corolla is subzigomorph bilabiate; upper lip more or less 2-lobed, often erect; lower lip 3-lobed. There is no detailed taxonomic study on Orobanche in Iran except for that presented in Flora Iranica (Schiman-Czeika, 1964), which lacks taxonomic description of the species, but encompasses a diagnostic key and notes on the distribution of the species.

Gilli (1976) considered 33 species of this genus in Iran and also presented notes on geographical distribution of the species.

Forthy one species of Orobanche were described in Farsi by Iranshahr (2008), but distribution of these species has not been reported from any locality. Two species of O. androssovii Novopokr. and O. rosea Tzvel. which were reported by Iranshahr (2008), are not present in any Iranian herbaria or nor have Schiman-Czeika (1964) and Gilli (1976) made any mention of these species in Iran.
This paper presents a study of the taxonomy, distribution, and habitat of some species of *Orobanche* in Iran. Appropriate information on the most frequent host plants of *Orobanche* is also included.

**MATERIAL AND METHODS**

This study has been based on numerous specimens in Iranian major herbaria (i.e., IRAN, TARI, TUH) and field observations. In addition, the studied species were compared with type specimens and authentic materials in the herbaria: B, G, K, P and W. Selected localities representing the distribution of seven species of *Orobanche* distributed in Iran are given under the related taxa.

**RESULTS AND DISCUSSION**

According to Schiman-Czeika (1964), the genus *Orobanche* comprises 36 species in Iran and 47 species in Flora Iranica area, of which nine taxon are endemic to “Flora Iranica area”. The studies showed that this genus includes 39 species in Iran.

**Orobanche overini** Beck, Feddes Repert. 18: 39 (1922).

*Type.* Georgia Republic, LE!

*Specimen seen.* Azerbaijan: East of Bazargan, 1830 m, Forsch & Sireng 31730, (IRAN)!.- Fig. 1.!

*Description.* Stem simple, 20-40 cm long, 10-11 mm thick in the middle part, reddish-brown in dry state, with rather numerous lanceolate scales 15-22 mm long, glandulose. Inflorescence short-cylindrical or oval, 8-10 cm long. Bract scales lanceolate up to 20 mm long, short whitish hairy. Calyx 14-16 mm long, two-toothed, usually shorter than corolla-tube. Corolla 15-30 mm long, bell-shaped, violet-purple from yellowish base to limb. Capsule ovate.

This species belongs to sect. *Orobanche*. Until now, *O. overini* was only known from near Tbilisi, the capital of Georgia (Novopokrovskii 1958) but now is reported as a new record to Iran. This plant is parasite on *L. L*. and *Lathyrus L.*. Nevertheless its occurrence in Iran isn’t unlikely.

**Orobanche nana** Mutel, Fl. Franç. 2: 352. (1835) – Fig. 2.

Specimens seen: Mazandaran: Lar valley, 2450 m, Wendelbo & Assadi 13393; Fars: Protected Region of Bambo, 1650-1900 m, Wendelbo & Foroughi 17593; Kermanshah: Rijab to Sarab, Ghandar, 1800 m, Iranshahr & Dezfolian 31742 (IRAN); Tehran; 41 km S. Qom, 1700 m, Amin & Bazargan 18911; Khorasan: 90 km from Mashhad to Kelat-Naderi, 800 m, Iranshahr & Zarkani 31374 (IRAN).

*Type.* Algeria, P.

*Taxonomic remarks.* Calyx teeth lanceolate or linear, longer than the calyx tube. Corolla bluish or violet, glandular pubescent outside. Anthers villous.

*Orobanche schultzii* was described in 1835 from Algerian coast where it was fairly abundant. In the ensuing one hundred seventy years it was gradually reported from Spain (Sánchez-Gullón, & al. 2005). Recently, it was reported from Turkey by Kandemir & Türkmen (2008). Occurrence of this species has been previously reported in the Flora Iranica area from northeastern Afghanistan (Schiman-Czeika 1964). The first record of *O. schultzii* was based on some collections from North, South and Central Iran (Gilli 1976). From chorological point of view, this species belongs to Mediterranean elements. It is now reported from other localities in western and eastern Iran.


*Type.* Afghanistan, W!

*Taxonomic remarks.* Calyx 4-toothed, as long as the corolla tube. Bracts longer than the calyx; bracelets usually free, shorter than the calyx. Corolla violet, shortly glandular hairy. Anthers glabrous at base.

*O. sargueloni* was first reported in the Flora Iranica area only from one locality in eastern Afghanistan by Gilli in 1960 (Schiman-Czeika 1964). The type specimen of this taxon was deposited at Vienna herbarium: (W, Fig.3). Subsequently, Gilli (1976) recorded this species in southern Iran from Dasht-e-Lut, and Jaz Murian based on one specimen Leonard 5656. Likewise, no herbarium specimen of this species was found in the major Iran herbaria during this study. Although our attempts were unsuccessful in 2008 and 2009 to re-collect this species there, nevertheless its occurrence in Iran isn’t unlikely. Also, *O. angustelaciniata* is known as an endemic species in Flora Iranica area (Schiman-Czeika 1964).


*Type.* Afghanistan, W!

*Taxonomic remarks.* Calyx 4-toothed, as long as the corolla tube. Bracts longer than the calyx; bracelets usually free, shorter than the calyx. Corolla violet, shortly glandular hairy. Anthers glabrous at base.

*O. angustelaciniata* was first reported in the Flora Iranica area only from one locality in eastern Afghanistan by Gilli in 1960 (Schiman-Czeika 1964). The type specimen of this taxon was deposited at Vienna herbarium: (W, Fig.3). Subsequently, Gilli (1976) recorded this species in southern Iran from Dasht-e-Lut, and Jaz Murian based on one specimen Leonard 5656. Likewise, no herbarium specimen of this species was found in the major Iran herbaria during this study. Although our attempts were unsuccessful in 2008 and 2009 to re-collect this species there, nevertheless its occurrence in Iran isn’t unlikely. Also, *O. angustelaciniata* is known as an endemic species in Flora Iranica area (Schiman-Czeika 1964). Taxonomically it is closely related to *O. nana* but differs from it by having unequal lips of corolla (lower lip longer than the upper lip in *O. angustelaciniata* vs. equal lips in *O. nana*) and attenuate linear of corolla lobes in *O. angustelaciniata* (vs. elliptic lobes in *O. nana*).
Fig. 1. *Orobanche owerini* (× 0.6); details (× 2.2).
Fig. 2. General view of Orobanche schultzii
Fig. 3. Holotype of O. angustelaciniata.

Orobanche stocksii Boiss. Fl. Or. 4: 505 (1879). Specimens seen. Khorassan: 60 km N. of Torbat-Heydarieh, Robat-Sefid, 1750-1900 m, Assadi & Mozaffarian 35856; 20 km from Sabzevar to Nishabour, 1300 m, Assadi & Mozaffarian 35405; Tehran: near Mardabad, S. of Karaj, 1250 m, Wendelbo & Assadi 18147.

Taxonomic remarks. Plants with scales ovate-oblong to oblong. Spikes dense, subcapitate. Calyx length 14-23 mm; segments longer than the calyx tube. Corolla whitish, suberect. Filaments hairy at the base.


Taxonomic remarks. Plants with scales lancolate. Spikes dense. Calyx length up to 10 mm; segments shorter than the calyx tube. Corolla violet or pinkish, whitish-yellow to base. Filaments villous.

Based on Flora Iranica (Schiman-Czeika 1964), O. cistanchoides was regarded as a synonymy of O. stocksii, whereas these species were recorded as distinct species by Gilli (1982) and Iranshahr (2008). Based on examined herbarium specimens and observation of the type specimen in Kew (K), we follow the previous taxonomic treatment proposed by Gilli (1982) about separation of these two species. O. cistanchoides resembles to O. stocksii in having the stamens inserted 5-7 mm above corolla base, elliptic capsule and ovate seeds, but differs from it in length of calyx (up to 10 mm in O. cistanchoides vs. 14-23 mm), calyx segments size (shorter than tube in O. cistanchoides vs. longer than tube), lateral segments of calyx shape (oblong, in O. cistanchoides vs. elliptic in O. stocksii).
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lanceolate), filaments indumentum (hairy at the base in \textit{O. cistanchoides} vs. villous). The differences between two species are shown in Table 1.


*Specimens seen.* Mazandaran: Erika, Mac-Liz, Dehla mountain, 3500-4000 m, Terme 31522 (IRAN); Guilan: Asalem to Khalhal, 1000 m, Delghandi & al. 31521 (IRAN); Tehran: 91 Km from Karaj to Chalus, The protected station of Pole-Zangouleh, 2400 m, Babakhanlo and Amin 14629.

*Type.* Iran (Gorgan), LE.

*Taxonomic remarks.* Corolla bluish-violet, 25 to 35 mm long; lower lobes acute. Calyx teeth as long as or shorter than the calyx tube.


*Specimens seen.* Mazandaran: Chalus, Visar, Tepeh-Sabz mountain, 1950 m, Terme & al. 31541 (IRAN); Golestan: between Gonbad and Minoo-Dasht, Mirzayans 31542 (IRAN).

*Type.* Georgia Republic, WU.

*Taxonomic remarks.* Corolla violet, 20 to 30 mm long; lower lobes obtuse. Calyx teeth longer than the calyx tube.

\textit{O. caucasica} is treated as a synonym of \textit{O. bungeana} (In Flora USSR (Novopokrovskii 1958) and Flora Iranica (Schiman-Czeika 1964), whereas these species were recorded as distinct species by Gilli (1982) and Iranshahr (2008). Recently, \textit{O. bungeana} and \textit{O. caucasica} were reported from northeastern and northwestern Turkey by Eminagaoglu & Ansiin (2004). The type specimen of \textit{O. bungeana} collected from Ziarat, located in northern Iran by Bunge in 1859 (Schiman-Czeika 1964) and it was deposited at LE herbarium!. The syntype of \textit{O. caucasica} collected from Isperechan near to Tabriz, by Knapp in 1884 and it was deposited at WU (Gilli 1982). The differences between these two species is indeed very significant as follows: the flowers of \textit{O. bungeana} are mostly longer, with calyx teeth equal or shorter than the tube and also lower lobes of corolla is obtuse (not acute); the calyx teeth of \textit{O. caucasica} is distinctly longer than the tube.

**Orobanche caryophyllacea** Sm. Trans. Linn. Soc. London 4: 169 (1797).

*Type.* Europe, P.

*Specimens seen.* Azerbaijan: Oromieh, from Khoshkhu to Germi, 2500 m, Mozaffarian 69909; Arasbaran, forests above Kalaleh village, 1200 m, Assadi 73875; Mazandaran: Lar valley, 2450 m, Wendelbo & Assadi 13381; Guilan: Siahkal, Dayleman, 1500 m, Saeidi 16554 (TUH); Hamedan: near to Ganj-Nameh, 2100 m, Mozaffarian & Assadi 36731.

*Taxonomic remarks.* Plants glandular-pubescent. Scales yellow to purplish or brown. Calyx exceeding as or long as the bract, 2-segmented, each lateral segment ovate-oblong, shortly 2-fid to above the middle. Corolla yellowish or tinged with reddish-brown.

Schiman-Czeika (1964) and Novopokrovskii (1958) treated \textit{Orobanche caryophyllacea} as a synonym under \textit{O. vulgaris}, but several other authors (e.g. Jafri, 1976; Gilli, 1982; Wu & Raven, 1998, and IK: www.ipni.org) reduced \textit{O. vulgaris} under synonymy of \textit{O. caryophyllacea}. Since the publication date of \textit{O. caryophyllacea} is 24 May 1797 and that of \textit{O. vulgaris} is 1 November 1797 (Rumsey & Jury 1991), the former has clear priority over the latter, the valid name for this taxon should be \textit{O. caryophyllacea}. Lectotype of \textit{O. caryophyllacea} which is labelled "Hill behind the inn at Valcimara April 29 1787", was deposited in Smith's herbarium [LINN] (Foley, 2001).

This species is found mainly on \textit{Galium verum}, but we have seen no specimens and suspect confusion with another species. This plant is only found on \textit{Galium mollugo} L. in Britain (Rumsey & Jury 1991).

**Orobanche hirtiflora** (Reut.) Tzvelev, Fl. Azerbaidzhana, 7: 569 (1957).

*Type.* Iran, W!

*Specimens seen.* Lorestan: Doroud, 22 km from Azna to Mahmoud-Abad, 1740 m, Mahmoudi 32290 (IRAN); Tehran: Ab-Ali, 1350 m, Dini & Arazm 14674 (IRAN).


This species resembles to \textit{O. coelestis} (Reut.) G. Beck. for its bracteoles free form calyx, but it differs markedly from these species in having acute calyx segments (not filiform); it is also similar to \textit{O. orientalis} G. Beck. for its calyx teeth longer than tube or united segment base, but differs from it principally by its longer flowers, bracteoles free, and corolla lobes acute.

\textit{O. hirtiflora} is distributed in Caucasus, Iran and Pakistan (Jafri 1976). The type specimen of this species collected from southern Iran by Kotschy (No. 408, 920) and was deposited at Geneva and Vienna herbaria (G, W) (Schiman-Czeika, 1964). Also Gilli (1976) reported this species from Lorestan, 60 km western Khorramabad, 1230 m, Archibald 1620. Two specimens of this species were observed in IRAN herbarium These specimens were collected from West and Central Iran.
Notes on the ecology and distribution about other species of Orobanche
Most species of Orobanche are found in west and northwestern Iran. Some of them e.g. O. aegyptiaca Pers. and O. cernua Loefl. have wide range of distribution in Iran, while others such as O. angustelaciniata, O. cypria Reut., O. kurdica Boiss. & Hausskn., O. hansii Kerner, O. penduliflora and O. Schwingenschussii Gilli have very limited distribution. Orobanche aegyptiaca and O. cernua are widely distributed species occurring in Afghanistan, Africa, Europe, Middle Asia, Saudi Arabia and Turkey. According to Momčilo Kojić & al. (2001), these two species have been reported as predominantly Mediterranean species from Europe.

Orobanche cernua is especially widespread, primarily in sunflower fields. It also grows as a parasite species on tomato, tobacco and some weeds (Sonchus oleraceus, Xanthium strumarium and Artemisia sp.). Orobanche aegyptiaca and O. cernua from tobacco and tomato did equally well on either host (Musselman and Parker 1982).

The most host plants belong to Asteraceae, Fabaceae, Solanaceae and Lamiaceae family, most prominently the species of the following genera: Artemisia, Astražalus, Nicotiana and Thymus. Within Orobanche species, O. aegyptiaca has specialized to parasitize a wide range of crops. A list of host plants of different species of Orobanche in Iran is given in Table 2.

Based on studied specimens, O. cypria and O. kurdica are distinguished as rare species. A collection of O. cypria from Kohgiluyeh and Boyer Ahmad Province (Dena mountain, 3200 m, Riazi 7663) and O. kurdica from Lorestan Province (Oshtrankuh, Ghaleh of Rostam to Gohar, 2400-2700 m, Iranshahr 31651) is present in TARI and IRAN herbaria, respectively.

ACKNOWLEDGMENTS
We are indebted to Dr. Ludwig (Herbarium of Berlin, Germany) for digitalized pictures of the type specimens. We are very grateful to Dr. M. Assadi for allowing us to use facilities at Research Institute of Forests and Rangelands.

REFERENCES


Table 1. Comparison of *Orobanche stocksii* and *O. cistanchoides*.

<table>
<thead>
<tr>
<th>Characters</th>
<th><em>O. stocksii</em></th>
<th><em>O. cistanchoides</em></th>
</tr>
</thead>
<tbody>
<tr>
<td>Calyx length</td>
<td>Up to 10 mm</td>
<td>14-23 mm</td>
</tr>
<tr>
<td>Calyx teeth</td>
<td>Shorter than tube</td>
<td>Longer than tube</td>
</tr>
<tr>
<td>Lateral segments of calyx</td>
<td>Oblong</td>
<td>Lanceolate</td>
</tr>
<tr>
<td>Filaments</td>
<td>Hairy</td>
<td>Villous</td>
</tr>
</tbody>
</table>

Table 2. The host plants of different species of *Orobanche*. (Data compiled from: Musselman (1980), Riches and Parker (1995) and Schiman-Czeika (1964)).

<table>
<thead>
<tr>
<th>Taxon</th>
<th>Host plants</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. <em>O. ramosa</em></td>
<td><em>Nicotiana tabacum</em>, <em>Amygdalus</em>, <em>Cannabis</em>.</td>
</tr>
<tr>
<td>2. <em>O. nana</em></td>
<td><em>Artemisia</em>, <em>Astragalus</em>, <em>Amygdalus scoparia</em>.</td>
</tr>
<tr>
<td>3. <em>O. mutelii</em></td>
<td><em>Nicotiana tabacum</em>, <em>Amygdalus communis</em>, <em>Parroxia persica</em>, <em>Carpinus</em>, <em>Cousinia multiflora</em>, <em>Armeniaca vulgaris</em>, <em>Salvia</em>, <em>Stachys</em>.</td>
</tr>
<tr>
<td>5. <em>O. hirtiflora</em></td>
<td><em>Astragalus</em>.</td>
</tr>
<tr>
<td>6. <em>O. penduliflora</em></td>
<td><em>Holoxylon</em>, <em>Calligonum</em>.</td>
</tr>
<tr>
<td>7. <em>O. lavandulacea</em></td>
<td><em>Fagus</em>, <em>Lycoceus europaeus</em>, <em>Anthemis</em>.</td>
</tr>
<tr>
<td>8. <em>O. oxyloba</em></td>
<td><em>Iris</em>, <em>Stachys uniflora</em>, <em>Ferula</em>, <em>Quercus brantii</em>, <em>Rubus</em>, <em>Acer monspessulanum</em>, <em>Amygdalus</em>.</td>
</tr>
<tr>
<td>9. <em>O. orientalis</em></td>
<td><em>Amygdalus</em>.</td>
</tr>
<tr>
<td>10. <em>O. schultzii</em></td>
<td><em>Amygdalus scoparia</em>, <em>Cannabis sativus</em>, <em>Alopecurus</em>.</td>
</tr>
<tr>
<td>11. <em>O. angustelaciata</em></td>
<td><em>Amygdalus</em>.</td>
</tr>
<tr>
<td>12. <em>O. coelestis</em></td>
<td><em>Artemisia</em>, <em>Astragalus</em>, <em>Acantholimon</em>, <em>Echinium album</em>, <em>Cucurbita</em>, <em>Amygdalus</em>.</td>
</tr>
<tr>
<td>13. <em>O. schlingenschussii</em></td>
<td>?</td>
</tr>
<tr>
<td>14. <em>O. eriophora</em></td>
<td>?</td>
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<tr>
<td>15. <em>O. bungeana</em></td>
<td><em>Tanacetum chilophyllum</em>.</td>
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<tr>
<td>16. <em>O. caucasica</em></td>
<td><em>Artemisia</em>.</td>
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<td>17. <em>O. ciliaca</em></td>
<td><em>Salvia</em>, <em>Phlomis</em>.</td>
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<tr>
<td>18. <em>O. caesia</em></td>
<td><em>Carpinus</em>.</td>
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<tr>
<td>19. <em>O. pulchra</em></td>
<td><em>Thymus holostae</em>.</td>
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<td>20. <em>O. purpurea</em></td>
<td><em>Artemisia</em>.</td>
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<tr>
<td>21. <em>O. arenaria</em></td>
<td><em>Onobrychis cornuta</em>.</td>
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<td>22. <em>O. pogonanthera</em></td>
<td><em>Artemisia</em>, <em>Achillea santolina</em>, <em>Lycium europaeum</em>.</td>
</tr>
<tr>
<td>23. <em>O. cernua</em></td>
<td><em>Artemisia</em>, <em>Grata</em>, <em>Calligonum</em>, <em>Lactuca</em>, <em>Nicotiana tabacum</em>, <em>Helianthus amnus</em>, <em>Lygeum eculentum</em>, <em>Sonchus oleraceus</em> and <em>Xanthium strumarium</em>.</td>
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<td>24. <em>O. camptolepis</em></td>
<td><em>Polygonum</em>.</td>
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<tr>
<td>25. <em>O. kotchyi</em></td>
<td><em>Juniperus sabina</em>, <em>Juniperus communis</em>, <em>Artemisia</em>, <em>Astragalus ascendens</em>, <em>Ferula</em>, <em>Gypsophila</em>.</td>
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<tr>
<td>26. <em>O. kanhai</em></td>
<td><em>Artemisia</em>.</td>
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<tr>
<td>27. <em>O. amoena</em></td>
<td><em>Artemisia</em>.</td>
</tr>
<tr>
<td>28. <em>O. stocksii</em></td>
<td><em>Lactuca</em>, <em>Salvia</em>, <em>Cousinia</em>, <em>Eryngium</em>.</td>
</tr>
<tr>
<td>29. <em>O. cistanchoides</em></td>
<td><em>Carpinus</em>, <em>Astragalus</em>, <em>Thymus</em>, <em>Prangos</em>.</td>
</tr>
<tr>
<td>30. <em>O. carophyllacea</em></td>
<td><em>Galiun verum</em>.</td>
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<tr>
<td>31. <em>O. latifolia</em></td>
<td><em>Circium</em>, <em>Eryngium</em>, <em>Thymus</em>.</td>
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<tr>
<td>32. <em>O. maior</em></td>
<td><em>Fagus</em>, <em>Quercus macranthera</em>.</td>
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<tr>
<td>33. <em>O. cypria</em></td>
<td><em>Pterocephalus</em>.</td>
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<td>34. <em>O. kurdica</em></td>
<td><em>Phlomis</em>, <em>Tanacetum</em>, <em>Cirsium</em>.</td>
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<tr>
<td>35. <em>O. longibracteata</em></td>
<td>?</td>
</tr>
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<td>36. <em>O. anatolica</em></td>
<td><em>Salvia</em>.</td>
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<td>37. <em>O. alba</em></td>
<td><em>Thymus</em>, <em>Stachys</em>, <em>Medicago</em>, <em>Galium</em>, <em>Rubia</em>.</td>
</tr>
<tr>
<td>38. <em>O. crenata</em></td>
<td><em>Allium</em>, <em>Centaurea</em>, <em>Verbascum</em>.</td>
</tr>
<tr>
<td>39. <em>O. owerini</em></td>
<td><em>Trifolium</em>, <em>Lathyrus</em>, <em>Vicia</em>.</td>
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</tbody>
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