Taxonomic diversity of *Astragalus* L. in Alpine and Sub-alpine zones in Talesh Mountains, Northwest Iran

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Abstract

The largest genus in Iran has investigated in Talesh Mountains. These mountains are located along the transition area between Irano-Turanian and Hyrcanian phytocoria in the northwest Iran. *Astragalus* with 61 species belong to 20 sections represents in Talesh Mountains alpine and subalpine zones, 21 are endemic, and 27 taxa either in the country’s or the state’s Red Lists of categories. The results provides checklist of *Astragalus* species, a taxonomic comments for some species, also recorded some species from NW Iran and report new localities for recently introduced *Astragalus* species.

Keywords: Flora, Fabaceae, Conservation, Checklist, High altitude, Distribution

Introduction

*Astragalus* L., a genus belong to the Tribe Astragaleae of Leguminosae is one of the largest genera of vascular plants in the world. It is represented by approximately 2900 taxa in more than 250 sections (Zarre & Azani 2013; Mabberley 2008). The arid and semi-arid mountainous parts of the Northern Hemisphere and South America seem to be the center diversity of this genus (Polhill 1981). The majority of its species are widespread in the south-western Asia mainly Iran and turkey, south-central Asia, the Central Asian, the western North America and along the Andes in South America (Polhill 1981; Lock & Simpson 1991; Maassoumi 1998).

*Astragalus* is the largest genus in Iran, where it is represented about 830 taxa, over 400 of them endemic in political territory, and is classified in 63 sections (Maassoumi 1998; Ghahremaninejad 2015). The sections with the most species in the flora of Iran are *Caprini* De Candolle, followed by *Malacothrix* Bunge and *Incani* De Candolle (Zarre et al. 2008; Maassoumi 2005).

In the recent years, a large number of publications have been brought out on the genus, both on regional and global basis (*Astragalus of Iran* 2018). While the study area has been poorly investigated botanically. However, the study area has been visited by several collectors in the past (e.g. Collectors of Flora Iranica and flora of Iran), in addition this study following previous investigations in the neighboring area (Maassoumi et al. 2015; Bagheri et al. 2011), which focused on the genus *Astragalus* to aimed complete distribution largest genus in Iran. The present work provides a synopsis of the *Astragalus* diversity in Talesh Mountains. It provides comments only on those species that's distributed in the Alpine and
sub-alpine habitat and have been collected from 2007 to 2017 by authors.

**Materials and Method**

**Study area**

Talish Mountains forms the northwest section of the Elburz Mts, extending southeast ward from the Azerbaijan border to the lower part of the Sefid-Rud in NW Iran (Fig. 1). These Mountains have an interesting phytogeographical position in the transitional zone between the Hyrcanian (Hyr) and Irano-Turanian (Ir-Tur). So that, in three consecutive peaks inserted from Hyrcanian into Irano-Turanian region respectively Bakrodagh (3200 m a.s.l.), Palangah (2950 m a.s.l.) and Aq-dagh (3330 m a.s.l.).

In eastern steeps of this area have relatively humid but the western steeps have dry and high lands climate. This climatic difference has resulted in completely different vegetation types in the Eastern to Western parts. Totally, climate of those areas usually is cold and snowy in winter and moderate climate in summer. In general, study areas mainly belong to Irano-Turanian floristic region (Zohary 1973). There are two protected areas in the Talesh Mountains, Lisar and Aq-dagh Protected Areas. This work focused on both protected area. The altitude of the area ranges between 2100 to 3330 m. The mean annual rainfall is 359.32 mm and annual temperature is 4.42°C. The coldest month is February with a minimum temperature of -11.88°C and the hottest month is August with a maximum temperature of 21.15°C.

**Sample collection**

During vegetation and floristic studies on the alpine and subalpine zones of the Talesh Mountains, we focused on *Astragalus*, with the largest diversity in study area. Besides floristic sampling of some specific species, the flora was recorded in 240 relevés followed the Braun-Blanquet approach, the numbers of relevés and their size were related to site area and followed the minimal area. Sampling has done across the six faces in three line or mountain peak from Hyrcanian to Irano-Turanian phytochoria.

In this research 850 specimens were collected. The exact location and altitude have been determined using GPS with the addition of notes on the vegetation and habitat. The specimens transferred to the herbarium and identified according to the *Astragalus* in the Old World, Check List (Maassoumi 1998), Flora of Iran (Maassoumi 2003), Genus *Astragalus* in Iran (Maassoumi 1986-2005); Flora Iranica (Podlech 1999, 2010; Podlech et al. 2001; Zarre et al. 2008), Flora of Turkey and taxonomic revision of the genus *Astragalus* (Podlech & Zarre 2013). The specimens were deposited in the FAR, T, and TARI Herbaria. Here, GPS points have provided for species that were collected only from one location, for more distribution species, based on Fig. 1, six distribution sites or growing area have been determined (Fig. 1). The following sites have been detected based on six main faces from Hyrcanian to Irano-Turanian phytochoria:

**Results**

During the course of present study, 61 species belong to 20 section of *Astragalus* were recognized in the Talesh Mountains high altitude. Out of these, 10 species (18%) belong to sect. *Malacothrix* Bunge, 7 (11.5%) species to sect. *Carpini* DC., 6 (10%) species to sect. *Onobrychoidei* DC., 6 (10%) species to sect. *Incani* DC., 5 (8%) species to sect. *Rhacophorus* Bunge, 5 (8%) species to sect. *Hymenostegis* Bunge, 5 (8%) species to sect. *Adiaspastus* Bunge and 17 (27.5%) species belonging to the other sections (Fig. 2 and 3).

Some of the widespread species in the study area occur in many plots and dominant in this area. Species that represent in more than 13 plots (like, *Astragalus aureus* 68 p; *A. ochrochlorus* 49 p; *A. aegobromus* 32 p; *A. lilacinus* 30 p; *A. pinetorum* 28 p; *A. curvirostris* 22 p; *A. lisaricus* 21p), and

![Figure 1. Study areas with six site or face from Hyrcanian to Irano-Turanian phytochoria: A-Gilan province. Lissar Protected Area. The slope leading to the hyrcanian forest (Eastern slope); B-Ardabil province. Lissar Protected Area. The slope leading to the Neor Lake (Western slope); C-Ardabil province. Aq-Dagh. Protected Area. Palangah. The slope leading to the Shahrood River, (Eastern slope); D-Ardabil province. Aq-Dagh. Protected Area. The slope leading to the Lerd River (Western slope); E-Ardabil province. Aq-Dagh. Protected Area. The slope leading to the Lerd village, (Eastern slope); F-E. Ardabil province. Aq-Dagh. Protected Area. Aq-Dagh Mountain The slope leading to the Hashjin districts (Western slope).](image-url)
Taxonomic diversity of Astragalus L. in Talesh mountains

also some represent in 6 to 9 plots and others occur in 1 to 4 plots or gathered in floristic sampling.

In this mountain snow-bed and scree are two main Alpine habitats. Alpine vegetation occur continuous and discontinuous in the scree and snow-bed habitats mostly above 2900 m a.s.l., that surrounded by sub-alpine thurn- cushion vegetation. Six species grow in the Alpine zone (2900 to 3320 m a.s.l.) and the rest of species can be found in subalpine and montane zones (2100 to 2900 m a.s.l.). species namely A. andabilensis, A. nezva-montis are representing in scree and the species like A. fragrans, A. angustiflorus, A. lisaricus and A. pinetorum are growing in the snow-beds.

Most of the species dominant in sub-alpine habitat as well some species can see in montane zone. In lower altitudes or sub-alpine region, cushion formation of Astragalus spp. provide a variety of habitats favorable for the growth of a large number of other species as nurse plants. Most of the species belong to section Adiaspastus bunge (A. aureus, A. karabaghensis and A. ochrochlorus), Hymenostegis bunge (A. nervistipulus, A. recognitus, A. tabrizianus), Sect. Campylanthus Bunge (A. tricholobus) and predominantly in lower elevation Sect. Rhacophorus Bunge (A. microcephalus).


In recent years, several new species of Astragalus are introduced in study area and their adjacent region. Some introduced species were again collected and according to the morphological characters confirmed their existence and recorded new location for their distribution area. A. andabilensis Ranjbar & Mahmoudian (Ranjbar et al. 2013) recorded again from Aq-Dagh Alpine zone, A. zarjabadensis Ranjbar (Maassoumi & Ranjbar 1996) recorded again from Lerd village. A. taleshensis Bidarlord, F.Ghahrem. & Maassoumi has described as a new species during this invetigation (Bidarlord et al. 2016) here, we added new locality for this species.

During this study some species recorded from northwest Iran, A. nezva-montis Podlech & Zarre was previously reported from northeastern and A. ochrochlorus Boiss. & Hooihn and A. recurvatus Podlech was reported respectively from north, center and center of Iran. Record species marked with an asterisk in following list.

In Flora Iranica the name A. lisaricus Maassoumi treated as synonym for its relative species A. beckii Bornm. (Podlech et al. 2010). Besides morphological traits such as plant size, leaf shape (angusti-ellipticis vs. oblongi-ovatis), stipule and calyx size, ecological differences in the distribution of these species is also visible. A. lisaricus mainly grows in snow-beds, acid soil, and lower organic matter. While A. beckii grows in subalpine region with more diverse soils.

Nearly 34.5 percent of the cited Astragalus species are endemic to the Iranian political borders and sub-endemic that distributed in Iran and nearest country borders, for example Astragalus tricholobus subsp. hohenackeri and Astragalus beckii some restricted to Iran and republic of Azerbaijan. Besides the endemism and distribution, some of the species characterized as IUCN threatened categories like, critically endangered (CR), endangered (EN), vulnerable (VU), near threatened (NT) (IUCN, 2014). These categories inserted with the abbreviation for each
species in the following. There are 11 vulnerable, 8 Near Threatened, 3 Endangered and 3 Critically Endangered species within investigated species (Tab. 1).

Following checklist represent our finding species in the study area under their sections and provide respectively their distribution in the world and Iran, habitat distribution in study area, collector name with herbarium number, status of species in IUCN threatened categories.

**Sect. Adiaspastus Bunge**

1- Astragalus aureus Willd.; Transcaucasia, Anatolia, Talish, N, NW, W, C Iran, Alpine and subalpine, 68 plots in A, B, C, D, E, F sites, Bidarlord 15807 to 15809 (T)

2- Astragalus karabaghensis Bunge; Armenia, Republic of Azerbaijan, NW Iran, Alpine and subalpine, 20 plots in B, C, D, E, F sites, Bidarlord 15810 to 15812 (T)

3- Astragalus ochrochlorus Boiss. & Hooihn; Endemic to N, C Iran, NW Iran, subalpine, 49 plots in A, B, C, D, E, F sites, Bidarlord 15813 to 15816 (T)

4- Astragalus polyanthus Bunge subsp. polyanthus

Endemic to NW Iran, subalpine, 37°20´09˝N, 48°37´26˝E, Bidarlord 15813 (T), NT

5- Astragalus caspicus Bieb.; Transcaucasia (Azerbaijan), Anatolia orientalis, Iraq, Talish, N, NW, W, C Iran; subalpine/ Montane, 37°28´58˝N, 48°33´06˝E, Bidarlord 15816 (T)

**Sect. Alopecuroidei DC**

6- Astragalus zarjabadensis Ranjbar; Endemic to NW Iran, subalpine/Montane, 37°21´03˝N, 48°39´26˝E, Bidarlord 15824 (T), EN

7- Astragalus macrocephalus Willd. Anatolia, Transcaucasia, Libanon, Iraq, NW, W, C Iran; subalpine/ Montane, 37°58´17˝N, 48°33´06˝E, Bidarlord 15890 (T)

**Sect. Astragalus**

8- Astragalus caragana Fischer & C.A. Mey.; Anatolia, Transcaucasia, Persia, Talish, N, NW, W, C Iran, subalpine/Montane, 37°20´09˝N, 48°37´26˝E, Bidarlord 15815 (T)

9- Astragalus tricholobus DC subsp. tricholobus; Endemic to W, C, NW Iran, subalpine/Montane, 9 plots in A, B, C, D, E, F sites, Bidarlord 15817 (T), NT

10- Astragalus hohenackeri (Boiss.) Tietz

Syn. Astragalus hohenackeri Boiss.; restricted to Republic of Azerbaijan and N, NW, W, C Iran, subalpine/ Montane, 5 plots in C, D, E sites, Bidarlord 15818 (T), NT

**Sect. Carpini DC**

11- Astragalus aegobromus Boiss. & Hohen.; Anatolia, Iraq, Caucasus, Transcaucasia, N, NW, W, C Iran, subalpine, 32 plots in B, C, D, E, F sites, Bidarlord 15819, 15820 (T)

12- Astragalus angustiflorus K.Koch subsp. angustiflorus; Anatolia, Iraq, Persia, Transcaucasia, C, NW Iran, Alpine 5 plots in B, D, E, F sites, Bidarlord 15821, 15822 (T)

13- Astragalus basilicus Maassoumi & Podlech, Endemic to NW Iran, subalpine and lower altitude, 37°22´20˝N, 48°32´10˝E, Bidarlord 15823 (T), NT

14- Astragalus ovinus Boiss.; Anatolia, Iraq; W, C, NW Iran, subalpine and lower altitude 37°22´30˝N, 48°44´10˝E, Bidarlord 15824 (T)

15- Astragalus pinetorum Boiss. subsp. pinetorum; Anatolia, Libanon, Syria, Iraq, Caucasus, Transcaucasia, N, NW, C Iran, Alpine, 28 plots in A, B, E, F sites, Bidarlord 15825 (T)

16- Astragalus rubrocalycinus Maassoumi & Podlech, Endemic to NW Iran, subalpine and lower altitude 37°26´31˝N, 48°29´10˝E, Bidarlord 15825 (T), NT

17- Astragalus urmiensis Bunge; Transcaucasia, N, NW, C Iran, subalpine, 37°22´27˝N, 48°34´10˝E, Bidarlord 15826 (T)

**Sect. Erioceras Bunge**

18- Astragalus barnassari Grossh.; Iraq, Talish, N, NW, C Iran, Alpine/ subalpine, 8 plots in E, F sites, Bidarlord 15827, 15828 (T)

**Sect. Grammocalyx Bunge**

19- Astragalus lineatus Lam. Transcaucasia, Anatolia, Iraq, N, NW, C Iran, subalpine, 37°23´37˝N, 48°33´34˝E, Bidarlord 15829 (T)

**Sect. Hololeuce Bunge**

20- Astragalus aegobromus Boiss.; Endemic to N, NW Iran, subalpine, 7 plots in B site, Bidarlord 15832, 15833 (T), NT

21- Astragalus tabrizianus Fisch; Endemic to N, NW Iran, subalpine, 5 plots in B site, Bidarlord 15834, 15835 (T), NT

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**Table 1. IUCN risk categories of endemic species growing study area.**

<table>
<thead>
<tr>
<th>Endemic species</th>
<th>CR</th>
<th>VU</th>
<th>A. elegans</th>
<th>A. recognitus</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. andabilensis</td>
<td>A. e.</td>
<td>A. seidabadensis</td>
<td>A. polyanthus</td>
<td></td>
</tr>
<tr>
<td>A. taleshensis</td>
<td>A. e.</td>
<td>A. xerophilus</td>
<td>A. ochrochlorus</td>
<td></td>
</tr>
<tr>
<td>A. nezva-montis</td>
<td>A. l.</td>
<td>NT</td>
<td>A. karabaghensis</td>
<td></td>
</tr>
<tr>
<td>A. recurvatus</td>
<td>A. p.</td>
<td>A. beckii</td>
<td>A. recognitus</td>
<td></td>
</tr>
<tr>
<td>A. lilacinus</td>
<td>A. s.</td>
<td>A. tricholobuss</td>
<td>A. polyanthus</td>
<td></td>
</tr>
<tr>
<td>A. zarjabadensis</td>
<td>A. t.</td>
<td>A. hohenackeri</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A. rubrocalycinus</td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

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23- Astragalus seidabadensis Bunge; Endemic to NW Iran, subalpine, 38°00′10″N, 48°36′33″E, Bidarlord 15869 (T), VU

24- Astragalus chrysostachys Boiss.; Anatolia, NW, E, C Iran, subalpine, 38°00′30″N, 48°31′34″E, Bidarlord 15837 (T)

25- Astragalus nervistipulus Boiss.; Iraq, NW, W, C Iran, subalpine, 4 plots in C, E sites, Bidarlord 15838 (T)

Sect. Hypoglostidei DC

26- Astragalus nezва-montis Podlech & Zarre; Endemic to N, NW Iran, Alpine, 37°22′30″N, 48°33′10″E, Bidarlord 15861 (T)

Sect. Incani DC.

27- Astragalus curvostris Boiss.; Iraq, NW, W, C, S Iran, Alpine/subalpine, 22 plots in A, B, C, D, E, F sites, Bidarlord 15840, 15843 (T)

28- Astragalus khadem-kandicus Maassoumi & Podlech; Endemic to N, NW Iran, subalpine, 37°22′30″N, 48°33′10″E, Bidarlord 15847 (T)

29- Astragalus refractus C.A.Mey; Endemic to NW Iran, Armenia, subalpine, 12 plots in C, D, E sites. Bidarlord 15849, 15850 (T), VU

30- Astragalus rostratus C.A. Mey; Azerbaijan, Talish, N, NW Iran, subalpine, 37°22′20″N, 48°39′30″E, Bidarlord 15851 (T)

31- Astragalus supervisus (Kuntze) Sheld.; Endemic to subalpine, NW, W, C, E, S Iran, 37°20′30″N, 48°30′50″E. Bidarlord 15853, 15855 (T), VU

32- Astragalus robustus Bunge; Anatolia, Caucasus, S, NW, C Iran, subalpine, 37°33′25″N, 48°34′29″E, Bidarlord 15856 (T).

Sect. Macrophyllum Boiss.

33- Astragalus oleaefolius DC.; Transcaucasia, Anatolia, Lebanon, Syria, Palaeastina, Jordania, Iraq, W. NW Iran, subalpine, 37°21′40″N, 48°39′50″E, Bidarlord 15857 (T)

34- Astragalus peymani Maassoumi; Endemic to N Iran, subalpine, 37°21′30″N, 48°42′10″E. Bidarlord 15858 (T), VU

Sect. Malacothrix Bunge

35- Astragalus beckii Bornm.; Restricted to Republic of Azerbaijan (Talesh) and N, C, NW Iran, subalpine, 20 plots in A, B, C, D, E, F sites, Bidarlord 15859, 15860 (T), NT

36- Astragalus elegans Bunge; Endemic to NW Iran, Armenia, subalpine, 37°26′10″N, 48°31′25″E, Bidarlord 15861 (T)

37- Astragalus eriopodus Boiss.; Syria, Turkey, Armenia, to W, NW, C Iran, subalpine/ Montane. 37°18′15″N, 48°31′12″E. Bidarlord 15861 (T), VU

38- Astragalus iranicus Bunge.; Turkey (Van), N, NW, W, C Iran, subalpine 37°57′10″N, 48°31′40″E Bidarlord 15864 (T), VU

39- Astragalus lisaricus Maassoumi; Endemic to N, NW Iran, Alpine, 21 plots in A, B, E, F sites. Bidarlord 15865, 15869 (T), VU

40- Astragalus macrourus Fisch. & C.A.Mey.; Transcaucasia, N, NW Iran, Anatolia, subalpine/ Montane, 38°01′37″N, 48°32′10″E, Bidarlord 15870 (T)

41- Astragalus pauperiflorus Bornm.; Endemic to NW Iran, Alpine and subalpine, 37°22′15″N, 48°35′23″E, Bidarlord 15871 (T), VU

42- Astragalus podocarpus C.A.Mey.; Republic of Azerbaijan and NW, C Iran, subalpine/ Montane, 9 plots of F, E, D, Bidarlord 15872, 15874 (T)

43- Astragalus taleshensis Bidarlord, F.Ghahrem. & Maassoumi, Endemic to NW Iran, subalpine 38°01′10″N, 48°30′50″E., 37°23′ N, 48°38′ E, CR. Bidarlord 15883, 15884 (T, TARI)

44- Astragalus sp., subalpine. 38°01′10″N, 48°30′50″E, Bidarlord 15815875 (T)

Sect. Onobrychoidei DC

45- Astragalus aduncus Willd.; Libanon, Syria, Anatolia, Iraq, NW, C Iran, subalpine/ Montane, 37°57′55″N, 48°29′57″E, Bidarlord 15876 (T)

46- Astragalus brevipes Bunge, Armenia, Azerbaijan (Nakhichevan), Anatolia, NW, W Iran, subalpine/ Montane, 37°58′45″N, 48°34′55″E, Bidarlord 15877 (T)

47- Astragalus effusus Bunge; Armenia, NW, C Iran, subalpine/ Montane, 37°57′23″N, 48°33′33″E, Bidarlord 15878 (T)

48- Astragalus lilacinus Boiss.; Endemic to N, C, NW Iran, subalpine, 30 plots in B, C, D, E, F sites, Bidarlord 15879, 15880 (T), NT

49- Astragalus shagalensis Grossh.; Anatolia, Armenia, NW Iran, subalpine, 37°57′43″N, 48°33′20″E, Bidarlord 15881 (T)

50- Astragalus xerophilus Ledeb.; Anatolia, NW Iran, subalpine/ Montane, 38°01′04″N, 48°35′23″E. Bidarlord 15885 (T), VU

Sect. Ornithopodium Bunge

51- Astragalus jodostachys Boiss. & Buhse; Turkey, NW, C Iran , subalpine, 37°53′37″N, 48°37′40″E, Bidarlord 15887 (T)

52- Astragalus recurvate Boiss.; Endemic to NW, C Iran , subalpine, 37°18′27″N, 48°35′15″E, Bidarlord 15888 (T), EN

Sect. Platonychium Bunge

53- Astragalus denudatus Steven; Daghestan, Gruzia, N, NW, W, C Iran, subalpine/ Montane37°20′37″N, 48°37′40″E, Bidarlord 15889 (T)

Sect. Rhacophorus Bunge

54- Astragalus compactus Lam.; Gruzia, Armenia, Azerbaijan, Anatolia orientalis, Iraq, N, NW, W, C, S Iran, subalpine, 37°20′31″N, 48°37′25″E, Bidarlord 15890 (T)
55- Astragalus meyeri Boiss.; Transcaucasia (Azerbaijan), NW Iran, subalpine/ Montane, 37°56´30˝ N, 48°31´36˝ E, Bidarlord 15891 (T)
56- Astragalus rhodosemius Boiss. & Hausskn Endemic to N, NW, W, C, S Iran, subalpine, 37°21´02˝ N, 48°41´11˝ E, Subalpine, Bidarlord 15892 (T)
57- Astragalus microcephalus Willd. subsp. microcephalii; Bulgaria, Gruzia, Armenia, Azerbaijan, Anatolia, Iraq, N, NW, W, C Iran, subalpine/ Montane, 15 plots in B, C, D, E, F sites, Bidarlord 15892, 15898 (T)
58- Astragalus paralipomenus Bunge; Anatolia, N, NW, W Iran, subalpine, 8 plots in B, C, D, E sites, Bidarlord 15894, 15895 (T)

**Sect. Stereothrix Bunge**
59- Astragalus andabilensis Ranjbar & Mahmoudian, Endemic to NW Iran, Alpine, 12 plots in C, E, F sites, Bidarlord 15896, 15899 (T), CR

**Sect. Synochreati DC.**
60- Astragalus fragrans Willd.; Transcaucasia, Anatolia, NW Iran, Alpine, 8 plots in A site, Bidarlord 15805, 15806 (T)

**Sect. Uliginosi A. Gray**
61- Astragalus odoratus Lam.; Macedonia to Kazakhstan, N, NW, W, C Iran, Alpine, 37°27´03˝ N, 48°33´26˝ E, Bidarlord 15897 (T)

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**Discussion**

Maassoumi et al. (2015) have mentioned 75 species belong to 29 sections from Bozghoush Mountain, situated in west of this study area and Bagheri et al. (2011) have listed 116 species belong to 28 sections from Zanjan province, the east of study area. By comparing our finding with the results of mentioned neighboring areas respectively 30 and 25 species are common in the three studied area. It should be noted that this study exclusively focused to the high altitude of Talesh Mountains. Noroozi et al. (2008, 2018) recorded 78 species for Alpine zone of Iran. Their results do not include any of our finding species. Some of the species that they reported from Alpine areas are seen in the sub-Alpine zones of our study area.

In Iran A. aureus is distributed generally on the central Alborz to Azerbaijan often at 2000 to 3600 m a.s.l. with Onobrychis cornuta (L.) Desv. and A. karabaghensis, A. ochrochlorus, they are formed the Thorn-cushion formation in the Alpine and sub-alpine areas (Maassoumi 1995). This plant and companion plants growing mostly in the sub-alpine zone and thorn-chusion. They have dominant Thorny-cushion formation. They act as nurse plant. In stressful environments nurse plants Provide microclimates of within their canopies and thus this conditions increase species richness, abundance, diversity, and species survival (Liczner and Lortie 2014). Representing species with cushion formation

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**Figure. 4.** Distribution endemic species in Iran, Astragalus ochrochlorus (1), A. polyanthus Bunge subsp. Polyanthus (2), A. zarjabadensis (3), A. tricholobus DC subsp. Tricholobus (4), A. basilicus (5), A. rubrocalycinus (6), A. recognitus (7), A. tabrizianus (8), A. seidabadensis (9), A. nezvamontis (10), A. khadem-kandicus (11), A. supervises (12), A. peymanoi (13), Astragalus elegans (14), Astragalus lisaricus (15), A. pauperiflorus (16), A. taleshensis (17), A. lilacinus (18), A. recurvatus (19), A. rhodosemius (20), A. andabilensis (21). Two hotspot-within-hotspot (Azerbaijan and Alborz) in Iran have been marked.
also provide suitable conditions for soil conservation, especially on slopes.

Endemic levels are not the same throughout the study area. In Alpine and the nearest areas, the concentration of endemic species is higher. Study area is located of Irano-Austrian hotspots. In Alpine and the nearest areas, the concentration of endemic species distribution (Fig. 4), It can be concluded that the study area is part of Azerbaijan hotspots - within-hotspots and has many common species with Alborz hotspots - within-hotspots. It is worthy of mention that for comprehensive protection management detection hotspots - within-hotspots is needed (Cañas et al. 2014).

Our results provide information regarding the potential distribution of rare endemic species. This information is critical for the conservation of the Talesh mountain vegetation. Based on rare species classification by Fiedler and Ahouse (1992), most of the rare species in study area are narrow distribution and small population sizes. Currently, the protection of endemic and rare plant species in study area is not guaranteed by protected program. While study area is the only recorded locality for A. taleshensis, A. andabilensis and A. zarjabadensis. This area can be considered as hot spot for some endemic and rare plant.

References