

Investigation of Backgrounds of Product, Supply and Use of Astragalus Genus

Case Study: Fars Province, Iran

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Abstract - Astragalus genus from Fabaceae (Papilionaceae) family includes one of the highest numbers of species in Iran, and on the other hand, most parts of Iran have arid and semi-arid climate and Astragalus type is dominantly seen in many of these regions. Therefore, the use of derived products can be economically remarkable for people, especially indigenous people. Fars province is one of the most prominent provinces of Iran, which has a dominantly arid and semi-arid climate and is habitat of Astragalus genus, while the province also has the highest production of medicinal plants in the country. Considering these cases, the fields of production, supply and use of products of Astragalus genus was studied in Fars province. Finally, the results were discussed and a number of suggestions presented for further action.

Keywords - products of Astragalus genus, Fars province.

I. INTRODUCTION

Iran is one of the most important Astragalus genus habitats in the world. According to its area and comparison with large countries such as Russia (which has 850 Astragalus genus) and the United States (which has 350 Astragalus genus), Iran has more than 900 Astragalus genus [1].

So far, a lot of researches on this genus has been carried out in the country, but the most comprehensive research on this subject has been done by Maassoumi, which has been published as "The genus Astragalus in Iran" in four volumes by the Forests and Rangelands Research Institute [1].

Due to the fact that it has many species, Astragalus genus has different characteristics in terms of botany, in general terms it can be stated that the plants are annual or

perennial, herbaceous or bush or shrub, single leaf or multi-leaves with either even or odd pair, flowers are either spikes, cylindrical or stacked casings with round or cylindrical grains, and also highly variable fruits [1,2 and 3].

Due to this morphological variation observed in the Astragalus genus, however, the species of Iran are divided into 8 sub-genus, which are also divided into 83 parts [1].

With an area of 133,000 square kilometers, 1.8 percent of Iran's territory is covered by Fars province which is one of the largest provinces in Iran and is located in the southern part of the country [4]. The presence of different climates in this province has caused diversity of vegetation. The weather has three climatic zones: mountains with snow and rain in the north and northwest of the province with rainfall of more than 400 mm per year. The central regions are moderate with a warm and dry summer with annual rainfall

of 200 to 400 mm, as well as southern and southeast, with moderate winter and very hot summers with annual rainfall of 100 to 200 mm [4, 5, 6 and 7]. The total area of the forests and rangelands is about 9803273 hectares; of which

8600000 hectares consists of steppe, semi steppe, semi-desert, high mountains, dry forests and saline rangelands. There are about 10 million livestock in this province [6, 7]. Figure 1 shows the location of Fars province in Iran.



Figure 1. The location of Fars province in Iran

II. METHODOLOGY

The following steps were taken to carry out this paper:

- Data Collection: All the necessary information and data were collected from various resources. These resources include Iranian and foreign books, research conducted by the Forests and Rangelands Research Institute, research from valid medicinal plants shops as well as Internet resources.
- Extracting the key data: With regard to collected data, vital data were extracted.
- Discussion and conclusion and suggestions: Finally, the results are discussed and, given the purpose of this study, suggestions for improve

ment and advancement were presented.

III. RESULTS

In Fars province, 87 Astragalus genus have been identified so far that only 9 of them are annual, whose flowering time is from late March to early April, and the rest are perennial. However, many of these species belong to a particular region in the province and only a few of them have a large distribution in the province. On the other hand, these are observed at various altitudes from the sea level [1]. Table 1 shows annual Astragalus species and table 2 shows perennial Astragalus species in Fars Province, along with the distribution area and the average height of the site from sea level also habitat form [1,8 and 9].

Table 1- Annual Astragalus species in Fars province

No.	genus	Distribution area and average height of the site from sea level (m)	Habitat form
1	<i>As. hamosus</i>	Firooz Abad 1500 - Barm Shour 750 - Bajgah 170	Herbal
2	<i>As. eremophyllus</i>	Shiraz 1300	Herbal
3	<i>As. bakaliensis</i>	Near Fasa 1380 - Khezr 1300	Herbal
4	<i>As. rutilobus</i>	Maharlou 1600	Herbal
5	<i>As. cruciatus</i>	Maharloo 1600	Herbal
6	<i>As. corrugatus</i>	Shiraz road to Fasa 1450	Herbal
7	<i>As. kerkukiensis</i>	Bamoo mountain 1800 to 2650	Herbal
8	<i>As. maharluensis</i>	Maharloo 1700	Herbal
9	<i>As. campylorrhynchus</i>	Khonj 700 to 1200	Herbal

Table 2- Perennial Astragalus species in Fars province

No.	genus	Distribution area and average height of the site from sea level (m)	Habitat form
1	<i>As. pulchellus</i>	Eghlid 2470 - Dehbid 2070	Herbal
2	<i>As. plagiophacos</i>	Dena Highlands	Herbal
3	<i>As. doshman-ziariensis</i>	Doshman Ziari 1900 to 2500 - Firooz Abad, Kalleh Ghandi mountain 1800	Herbal
4	<i>As. ledinghamii</i>	Shiraz road to Firooz Abad 1000 to 2000 - Bamoo mountain 1650 to 1900 - Sa'adat Shahr 1965 - Roniz 1550 to 1850	Herbal
5	<i>As. anserinifolius</i>	Abadeh 1900 - Lar, Hoormood mountain 800 to 1100	Herbal
6	<i>As. babakhanloui</i>	Doshman Ziari 2000	Herbal
7	<i>As. griseus</i>	Eghlid 2470	Herbal
8	<i>As. plebeius</i>	North of Shiraz 1750	Herbal
9	<i>As. spachianus</i>	Fasa, Kharman Koub 2900	Herbal
10	<i>As. tenuiscapus</i>	Khabar mountain 3500	Herbal
11	<i>As. eusarathron</i>	Kooshke Bidak 2070 - Imamzadeh Sabz-Poushan 1650	Herbal
12	<i>As. gagnieuae</i>	Eghlid	Herbal
13	<i>As. gaubae</i>	Lar, Hormood mountain 700	Herbal
14	<i>As. ibicinus</i>	Tange Fali	Herbal
15	<i>As. indistinctus</i>	Roniz 1850	Herbal
16	<i>As. johannis</i>	Kotal Dokhtar 2150 - Bamoo mountain 1980 to 2650 - Eghlid, Bull mountain 2750 - Kotal Pirzan 2100 to 2250	Herbal
17	<i>As. managetha</i>	Doshman Ziari 1800 - Kotal Pirzan 2120	Herbal
18	<i>As. neo-podlechii</i>	Fasa, Kharman Koub 2900	Herbal
19	<i>As. nurabadensis</i>	Doshman Ziari 1850	Herbal
20	<i>As. ovinus</i>	Kotal Pirzan 2250 - Doshman Ziari 1900 to 2500	Herbal
21	<i>As. pseudopellitus</i>	Shiraz	Herbal
22	<i>As. sojakii</i>	Neyriz, Sar Sefid mountain 2700 to 3000	Herbal
23	<i>As. daenensis</i>	Dena mountain, Bijan defile 3000 to 3600	Herbal
24	<i>As. zerdanus</i>	Dena mountain, Bijan defile 2500	Herbal
25	<i>As. siliquosus</i>	Dasht Arzhan 1850 - Fasa, Kharman Koub 2900	Herbal
26	<i>As. ischredensis</i>	Estahban	Herbal
27	<i>As. dactylocarpus</i>	Deh Bid 2160 - Bamoo mountain 1700	Herbal

28	<i>As. anacardius</i>	Lar 700	Herbal
29	<i>As. callistachys</i>	Abadeh, Eywoon defile 2300	Bushy
30	<i>As. baba-alliar</i>	Tange Abolhayat 1500 - Doshman Ziari 1850 –Chenar Shahijan 1300	Bushy tree
31	<i>As. chalaranthus</i>	Doshman Ziari 1900 to 2500 - Dasht Arzhan 50 - Kotal Pirzan 2100 to 2250	Bushy
32	<i>As. campylanthus</i>	Bamoo mountain 1900	Bushy
33	<i>As. cephalanthus</i>	Doshman Ziari 1850 - Kotal Pirzan 2300 to 2450- Fahlian 1800- Bamoo mountain 1650 to 1900	Bushy
34	<i>As. chartostegius</i>	Dena mountain, Bijan defile 3000 to 3600	Bushy
35	<i>As. murinus</i>	Khafr 3000 – Sisakht 2820 to 3280- Dena mountain, Bijan defile 3000 to 3600	Bushy
36	<i>As. fasciculifolius</i>	Dena mountain 1800	Bushy tree
37	<i>As. ghashghaicus</i>	Abadeh, Darreh Gol 2550 to 3000	Bushy
38	<i>As. fragiferus</i>	Eghlid 2900 to 3200 - Dena mountain, Bijan defile 3000 to 3600	Bushy
39	<i>As. arbusculinus</i>	Ghir 800 – Maharloo 1500 – Neyriz 1550- Shiraz 1720 – South of Dehbid 1790	Bushy tree
40	<i>As. coluteopsis</i>	Mousa Khan mountain	Bushy
41	<i>As. microphysa</i>	Sepidan 2800	Bushy
42	<i>As.pseudofragiferus</i>	Jahrom 1320	Bushy
43	<i>As. ptychophyllus</i>	Doshman Ziari 1950- Sisakht 2400- Bamoo mountain 1900- Fasa, Kharman Koub 2900	Bushy
44	<i>As. remotiflorus</i>	Fasa, Kharman Koub 2900 – Meymand, Sefid mountain 1750 to 2300	Bushy
45	<i>As. susianus</i>	Estahban 1750 - Shiraz road to Sepidan 2130	Bushy
46	<i>As. ajubensis</i>	Eghlid 2700 to 3600	Herbal
47	<i>As. meridionalis</i>	Lar, Hoormood mountain 800 to 1100 - Estahban 1800 to 2000 - Fasa, Kharman Koub 1800 - Bamoo mountain 1800 - Meymand 1750 to 2850 - Roniz 1550 to 1850	Herbal
48	<i>As. albispinus</i>	Abadeh 2150 – Aspas 2250- Dasht Arzhan 1850	Bushy tree
49	<i>As. andalanicus</i>	Eghlid, Timargoon defile 2750	Bushy
50	<i>As. rhodosemius</i>	Bamoo mountain 1750 to 2000 - Sepidan 2500 - Sarvestan road to Fasa 1700 – Doshman Ziari 2400 – Khanezenyan 2050	Bushy
51	<i>As. echidnaeformis</i>	Sepidan 2500 - Dasht Arzhan 2250 to 3000	Bushy
52	<i>As. eriostylus</i>	Shiraz road to Sepidan 2130 - Dasht Arzhan 2100 - Abadeh 2430 to 2550	Bushy tree
53	<i>As. globiflorus</i>	Dasht Arzhan 1850 - Sepidan 2500 - Sisakht 1800 - Kotal Pirzan 2250 - Eghlid, Namdan plain 2300 to 2600	Bushy
54	<i>As. myriacanthus</i>	Dena mountain, Bijan defile 3500 to 3900	Bushy
55	<i>As. passargadensis</i>	Pasargad, Musa Khan mountain 2250 to 2700	Bushy
56	<i>As. piptocephalus</i>	Shiraz road to Sepidan 2130	Bushy
57	<i>As. pseudolateritius</i>	Sepidan 2600 to 3300	Bushy tree
58	<i>As. biabanensis</i>	Fasa 1200	Bushy
59	<i>As. Tarumensis</i>	Jahrom 1100 – Bakhtegan lake 1750	Bushy
60	<i>As. Eburneus</i>	Lar 1000	Herbal
61	<i>As. Baraftabensis</i>	Baraftab 2400 – Eghlid 2500	Herbal
62	<i>As. Pravitzii</i>	Baraftab 2400 – Mahakestan 2030	Herbal

63	<i>As. Ruscifolius</i>	Dasht Arzhan 2000	Herbal
64	<i>As. Saadatabadensis</i>	Saadat Shahr 2000	Herbal
65	<i>As. Abadehensis</i>	Abadeh	Herbal
66	<i>As. bavanaticus</i>	Bavanat	Herbal
67	<i>As. Catacampus</i>	Abadeh 2150	Herbal
68	<i>As.garmashubensis</i>	Abadeh, Garmashoub 2500	Herbal
69	<i>As. Subpentanthus</i>	Khorrambid	Herbal
70	<i>As. Curvirostris</i>	Bamoo mountain 1800 – Dasht Arzhan 1850 – Kazeroun 2000	Herbal
71	<i>As. Elezgensis</i>	Shadkam 2400	Herbal
72	<i>As. mercklinii</i>	Khorrambid, Didegan 2100	Herbal
73	<i>As. Quenquefoliolatus</i>	Abadeh, Dasht Oyooun 2270	Herbal
74	<i>As. Supervisus</i>	Abadeh 2050	Herbal
75	<i>As. Curviflorus</i>	Bande Amir 1450 – Jahrom, sim mountain 1100 to 2700 – Fasa, Raz mountain 1600 to 2200	Herbal
76	<i>As. ovoideus</i>	Shiraz 1750 – Abadeh 1950 – Bakhtegan Lake 1590 – Jahrom 1130	Herbal
77	<i>As. craccinopsis</i>	Dasht Arzhan 2050	Herbal
78	<i>As. effusus</i>	Dasht arzhan 1850 – Bamoo mountain 1900	Herbal

Products obtained from Astragalus genus in Fars province can also be classified as follows:

1-Tragacanth

The gum is also known as Katiran, Gum Tragacanth, Gum Mitracanth, and Metracanth. Evidence has been known since a few centuries BC and has been traded in Europe since the 13th century. Its main producers are Iran, followed by Turkey and Syria. The more varied it is, the more transparent and colorful it represents, which result in a better quality and a higher price [10]. Its chemical structure is molecular, very heavy, containing mineral elements and sugars, which consist of two parts: the water-soluble part is highly hydrophilic, called Tragacanthin, which contains 30% of Tragacanth; the insoluble part is called Basurin [10 and 11].

In terms of classification, it is divided into two groups: wire-like tragacanth which is roughly flat, with a length of up to 5 cm and a thickness of up to one cm, with two colors: white or yellow. This type of tragacanth is graded according to its length, for example, it is considered as grade one if it

benefits approximately 5 cm heights. The other is the harvest-like tragacanth with creamy to yellowish color and its shape is somewhat wide, fanner, shapeless, piece and round, which, depending on the type of tool used to blade, can be obtained in many ways. These shapes are classified as ribbon, flake, harvest-like and cuneiform. Of course, the above classification is not widely used today, and a new classification has to be made according to the type of Astragalus, the chemical structure of the tragacanth and its properties [10].

Applicably, Tragacanth is used in pharmacy for cover of capsules, glaze of tablets, vaccination and is also used in medicine for stomach and chest pain and is also laxative. In the food industry, it is used for canning, sausage and chocolate making and chewing gum. In sanitary and cosmetic industries, it is also used to make soaps, shampoos and perfumes. In the industry is also used for paper making, adhesives and textiles [1,10,11 and 12].

Tragacanth is produced in stem cells of Astragalus. Eventually, after the breakdown of the Pectic materials of the middle blade of the cells, channels gradually arise that

are the place where the copper is accumulated, and these canals are also associated with small channels. Therefore, the most commonly used method to extract it is cutting, which for this purpose dig a hole on the soil, around the base of the plant stem in the direction of gradient alongside a slope, to find the collar of the plant, which, unlike the air organs, does not have spin. Then, with a blade, a split dig into the collar as a vertical shape with a one third of collar's diameter size. It should be noted that, however, due to the durability of the Tragacanth at the time of discharge, just one split in one direction is enough. Creating diagonal, horizontal or deep grooves can destroy the plant, because the raw juice flows with the rest of the plant tissues and will result in plant deterioration, especially in the cold season and severe winds. Afterward, the pond filled the hole with the foliage and prevented the livestock from entering the area. On the other hand, the digs should be done on sunny days, so that Tragacanth will not be ruined by rainfall. Usually, after scrubbing, the secretion of the Tragacanth is carried out for up to 20 days, but every 4 days. For the first time after the first four days, the first-line replica is said to be very good. The Tragacanth may be harvested up to 6 folds, but the most unpopular product is obtained in the last chains that are dark in color [1 and 10].

Generally, each plant is to be scrubbed at least once a year at least once a year, so that the plant does not deteriorate, although taking into account plant health, the period of exploitation of Astragalus is 3 to 5 years. The expected yield per square meter of canopy is about 35 to 50 grams. The best time for harvesting is the end of flowering, usually in July and August [10].

Notice should be given to scrubbing time; the more heat and drought is, the less the amount of extraction will be obtained. Because the rate of discharge depends on the humidity and the soil and the temperature, so the more moisture, the easier it flows out from groove. By reducing moisture and increasing temperature, the plant uses various mechanisms to reduce its transpiration and also increases the concentration of the Tragacanth, which results in its more difficult extraction. Meanwhile, in this case, the plant tries to prevent the expulsion by rapid drying the wound and the corrosion of the blade [1 and 10].

All species of Astragalus are not productive of Tragacanth, and, on the other hand, the amount of Tragacanth production varies in its different species. Most Tragacantha sub-genus are able to produce Tragacanth. Having large ducts in the stem, Calycophysa sub-genus are also able to produce Tragacanth. 77 species of Astragalus in

Iran are capable to producing Tragacanth which only 10 species are available in Fars province, as described in Table 3 [1 and 10]:

Table 3- Astragalus species of Tragacanth-producer in Fars province

1	<i>As. albispinus</i>
2	<i>As. andalanicus</i>
3	<i>As. rhodosemius</i>
4	<i>As. echidnaeformis</i>
5	<i>As. eriostylus</i>
6	<i>As. globiflorus</i>
7	<i>As. myriacanthus</i>
8	<i>As. passargadensis</i>
9	<i>As. piptocephalus</i>
10	<i>As. pseudolateritius</i>

2- Sarcocolla

Also called Konjideh and Konjehdeh, and is a type of Manna which is grow due to the activity of some kind of insects on species of the *As. Faciculifolius*, specially sub species *As. arbusculinus*, and also species of *As. glaucacanthus* which the first species is exist in Fars province. Sarcocolla also has colloidal properties and are used to blood coagulation, relieve pain and skin care. Eating more than 20 grams can be fatal for the reason that closes the pores of the body [1,10 and 11].

Its harvest is during summer and carried out by spreading the fabric under the shrubs and shaking its branches by hand or by wood, which is done in the absence of wind and dust [10].

The candied substance is a small yellowish piece with mixed sweet and bitter flavor [10].

3- Honey of Stragalus

It is considered as one of the best and high quality honey in Iran, which is popular among people due to its special taste. It is also used as medicine to stomach, kidney diseases and joint pains.

4- Gazangabin

Sometimes called it Gazoo and is a kind of Manna. It is a semi-transparent and candied substance which is result of activity of an insect called *Dicora cyamophylla* on *As. adscendens* which is used as a laxative and also as a medicine to strengthening heart. However, it commonly used in famous cookie, Gaz. The fluctuations of the

population of these insects in different years cause a dramatic change in the annual production of this product [10].

The harvest time is at the end of summer and early autumn and carried out by spreading the fabric under the shrubs and shaking its branches by hand or by wood, which is done in the absence of wind and dust. The frequency of shaking the branches of the productive plant is not more than 3 times per year in order to prevent the defect in the population of this insect [10].

There is no report on the harvesting of this product in Fars province due to the absence of a species or its very limited distribution.

5- Nakhonak

With Scientific Name of *As. hamosus*, also known as Aklil-ol-Molk, plant of Qaisar, Nesha Afsar and Saabe-ol-Molk, is an annual Stragalus. The fruit and the seeds of this plant are used in the late spring and early summer. The unripe fruits of this plant are opened and the seeds that are not yet hardened are used raw.

Nakhonak is Blood diluent, Mucus producing, Sedative, Diuretic and Laxative, and is also used to treat Bloody diarrhea, Asthma, Paroxysm and Heartbeat. Also, a small amount of gum similar to Tragacanth is obtained from this plant. Due to the presence of Miserotoxin in the leaf of the plant, it is dangerous for the livestock, especially the cow, and can cause poisoning [13].

This plant exists in Fars province, but it is usually used locally.

6- Firewood

Unfortunately, firewood for fuel is one of the main uses of the most Astragalus species in Fars province. This, more than any other factor, causes the decline of these plant species.

The average price of Astragalus genus products in the valid medicinal plants shops in Fars province, at the time of writing this article in the August of 2018, with considering of equality of one Dollar with 110/000 Rials is:

- Low quality Tragacanth 3/63 \$ per Kilogram
- High quality Tragacanth 36/36 \$ per Kilogram
- Sarcocolla 10/9 \$ per Kilogram
- Honey of Stragalus 5/27 \$ per Kilogram

- Gazangabin 2/36 \$ per Kilogram
- Nakhonak 6/36 \$ per Kilogram

IV. DISCUSSION AND CONCLUSION

As mentioned, due to the fact that the Astragalus is distributed in the all parts of Fars province, its products can be effective in the economy of people, especially the local people of the region. On the other hand, given that the Fars province is a major site for nomadic tribes, this case can has two major effects on these plants: firstly, the tribes are quite dependent on many of these species for the supplying their firewood and causes the plants to be degenerated. On the other hand, they sometimes try to harvest products, which in both cases cause tensions between them and local residents.

Of the other threats that exclusively threaten the varieties of Astragalus genus is creating unscrupulous and deep cuts on the collar to create grooves which causes the raw juice to not reach the rest of the plant, since only the remaining healthy tissues are able to so which, however, is not enough for entire plant. On the other hand, due to its weakness, with the onset of the cold season, the plant goes down. At the same time, in severe winds, the trunk cannot withstand the pressure from its crown and wind force and will cause the fracture of the plant. There is another significant yet less touchable threat to these species: if the number of scrubbing increases more than once a year, due to the pressure on the plant, it will result in its deterioration. Some species of Tragacanth-producer Astragalus genus begin to secretion immediately after scrubbing. In Fars province, they are including: *As.myriacanthus*, *As. andalanicus*, *As. globiflorus*, *As.campylanthus* and *As. echidnaeformis*. There are also some species in Fars province which begin to secretion several hours after scrubbing, such as *As. cephalanthus*, *As. susianus*, *As. albispinus* and *As. piptocephalus*.

From the existing ones in Fars province, *As. myriacanthus* produces somewhat yellowish Tragacanth which is valuable and *As. andalanicus* produces creamy Tragacanth. In addition, *As. globiflorus* produces whitish Tragacanth and *As. echidnaeformis* produces yellowish Tragacanth.

V. SUGGESTIONS

- Considering that one of the problems in this field is harvesting Astragalus genus for consumption as a fuel, therefore, supplying fuel for natives and tribes can be effective in this regard. This can be done by supplying oil as well as gas caps for domestic consumption.

- In order to raise awareness of nomads and indigenous peoples of the region about these vital species, some action should be taken towards their culture development.
- One important issue is the interference of the interests of the tribes and indigenous peoples in using these products. Therefore, establish of cooperative companies to regulate the use of these products as well as the culture creation for the benefit of the partners can be effective.
- Another problem that causes the decline of these species is using inappropriate methods for extracting the products of Astragalus. To overcome this problem, educating the beneficiaries by relevant organizations can be effective.
- So far, there has been no report on the industrial harvesting of products of Astragalus in Fars province and traditional methods are carried out for extracting those products. Therefore, entering into the industrial phase can be useful considering the principles of sustainable development and special attention to the survival of the plants, which, of course, requires comprehensive studies.

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