



Resource potential of *Glycyrrhiza glabra* L. species in the lowlands of the Azerbaijani flora

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Abstract

In the lowlands of Azerbaijan, *G. glabra* is distributed in moist, waterlogged gorges and is supplied in tons every year. The resource potential of the plant in individual regions was as follows: Annual supply reserve for Kurdamir district was 61921 ton, for Bilasuvar district - 34424 ton, for Ujar district - 34675 tons, for Zardab district - 15020 tons, for Goychay district - 30354 tons, in the villages of Agdash district - 25767 ton, for the Sabirabad district - 17167 ton and for Saatli district - 11918 ton. In general, the annual supply of species *G. glabra* in the lowlands of Azerbaijan is estimated at 231,246 tons in 8 regions. If we take into account that the studied areas do not fully cover 8 districts, and there are also unexplored villages, then it is possible to supply *G. glabra* more than 300,000 tons from lowland areas. Re-supply can be made on the supplied lands no later than 3 years.

Keywords: *Glycyrrhiza glabra*, biological reserve, resource potential, annual supply

Introduction

More than 20 species of the genus *Glycyrrhiza* L. are found in Europe, America, North Africa and Australia. Six species are found in Azerbaijan (*Glycyrrhiza glabra* L., *G. uralensis* Fisch. ex DC., *G. aspera* Pall., *G. glandulifera* Waldst. et Kit.=*G. echinata* L., *G. foetidissima* Tausch, *G. macedonica* Boiss. & Orphanides)^[1]. The most common and widely used of these is the species *Glycyrrhiza glabra*, partly *G. uralensis* used as a medicine. The research shows that species *G. glabra* is distributed within the borders of Azerbaijan, in the Greater Caucasus, Guba, Samur-Davachi lowland, Kur-Araz lowland, Caspian coastal lowland, Absheron, Gobustan, all regions of the Lesser Caucasus, Bozgir plateau, Nakhchivan plain-Lankaran plain, etc.

Research has been conducted on the chemical composition, phytocenology and other aspects of the plant^[2, 3, 4]. However, the resource potential has not been studied. Taking this into account, we set a goal to study the possible supply reserves of the species *G. glabra* in the flora of Azerbaijan, especially in the lowlands.

Material and Methods

The species *G. glabra* was taken as the object of research. The research is based not only on reserves of medicinal plant raw materials, but also on the possibility of supply, cost-effective location of mass distribution areas (population density, proximity to the transport network for transportation, cleanliness of the area of distribution). For this purpose, first of all, the ecological condition of humid areas where ecomorph is spread was studied. The study of the state of wild medicinal plants and their effective use involves several stages. At the preparatory stage, the tasks of the research are defined. These tasks often include assessing the plant's raw material reserves and determining the amount that can be supplied annually^[5, 6].

Information was obtained on the actual supply of raw materials in the last 5 years in the farms engaged in the supply of raw materials in the area.

Experimental part

Glycyrrhiza glabra L.- Common licorice is one of the most widespread species in the lowlands. Investigation was conducted around Udulu village of Bilasuvar region on April 15-18, 2021 and September 12-15, 2021 in 2 seasons. In general, plant reserves were calculated in 22 villages of Bilasuvar region. The relief of the marked area of study is arid-denudation depression, the soil cover is saline and belongs to the gray-meadow type. Humidity is slightly dry. The vegetation of the area corresponds to the semi-desert type. *G. glabra* plays an important role in the first tier in the formation. Indicators of meadow-fragile saltwort-licorice formation on the tiers and the species composition of vegetation (Tables 1 and 2) are shown in Tables.

Productivity was determined in accordance with generally accepted methodology and reserves of *Glycyrrhiza glabra* were calculated in the area of 4 m² with the 1st repetition in spring pasture and the 2nd repetition in early autumn by mowing and modeling and given in figure-diagram 1 by villages. Most of the supplies were from Zahmatabad village (1980 tons). It is possible to supply 34,424 tons of plants a year from 22 villages in Bilasuvar region. Efficient use and improvement of the area is one of the important issues, as licorice is so

widespread in Bilasuvar region that it is invasive and hinders the development of other forage crops. With this in mind, plant roots should be collected regularly (every 3 years). Since it is used as a medicine, it generates export income. Local communities in the area collect plant roots every year and sell them. However, if this is repeated every year, it can lead to a narrowing of the plant's areal.

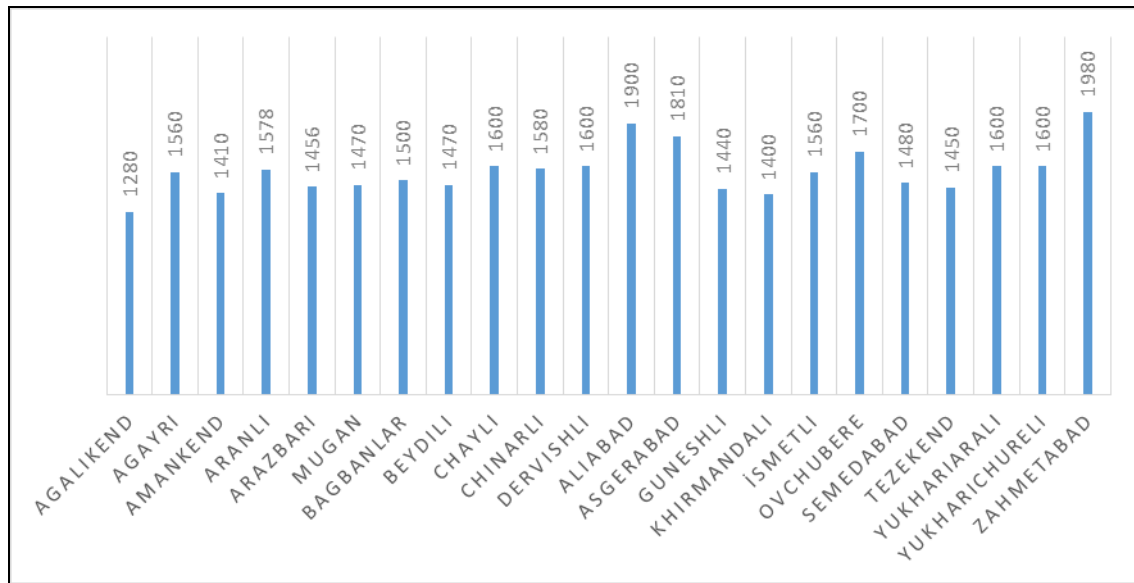


Fig 1: One year supply of *Glycyrrhiza glabra* in Bilasuvar region (Total 34424 tons, 2021)

Among lowland areas, Kurdamir region ranks first in Azerbaijan. In order to study the resource potential of the plant, 47 villages in Kurdamir region were visited in May and October 2021 for one month and the natural resources and distribution of the species *Glycyrrhiza glabra* were studied. Biological reserves have been established in almost all villages where the plant is spread. For example, species composition and tier indicators of the tamarisk- tree-like saltwort -sea lavender-licorice association in *Glycyrrhizeta* formation around Garabujag village where the relief is arid plain, soils are saline, moist is dry, water supply is poor are shown in Tables 1 and 2.

To determine productivity, all villages in the Kurdamir region were inspected and the results on reserves in different villages with regards to *Glycyrrhiza glabra* are shown in Figure 2. The annual reserve of plants in Kurdamir region is 61871 tons, it is possible to collect plant roots more than 1500 tons per month from the area. Crop-engineering condition of the studied area is saline soils.

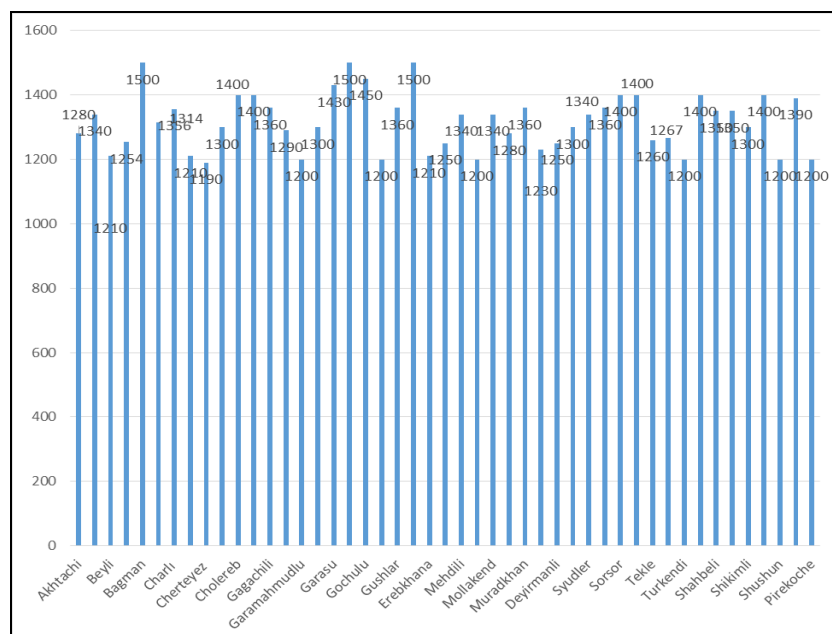


Fig 2: Annual supply of *Glycyrrhiza glabra* in 47 villages of Kurdamir region (Total 61921 tons, 2021)

In 2021, similar studies were conducted in pastures around the village in Ujar. Date: 1-14.06.2021 and 1-12.09.2021. Sample site was selected in the vicinity of Malikballi village where the relief is alluvial, the soil

cover is saline, the humidity is dry, semi-deserts, in the shrub formations (licorice jungles). Indicators on vegetation and tier are shown in Tables 1 and 2.

Productivity was determined in the associations dominated by *Glycyrrhiza glabra*, monocotyledonous cereals and dicotyledonous forbs in the spring pasture in an area of 4 m² with the 1st repetition and the results are given in Figure 3. Calculations show that it is possible to collect 34,675 tons of plant roots from the area.

Improvement measures (superficial and fundamental) should be implemented for the efficient use of areas. In these areas *Glycyrrhiza glabra* has an expanis character.

Research conducted in the same year in Zardab region showed that the annual reserve of *Glycyrrhiza glabra* species was studied in 19 villages. Site area was selected near Alijanly village and indicators of cereal-forb-licorice association on tiers were determined in the semi-deserts where the relief is plain, the soil cover is gray-meadow, humidity is less moist (Table 1-2). Similar vegetation is observed in other villages. The results of research conducted in June 2021 show that the area is suitable for the supply of licorice, and the plant can be supplied every 3 years.

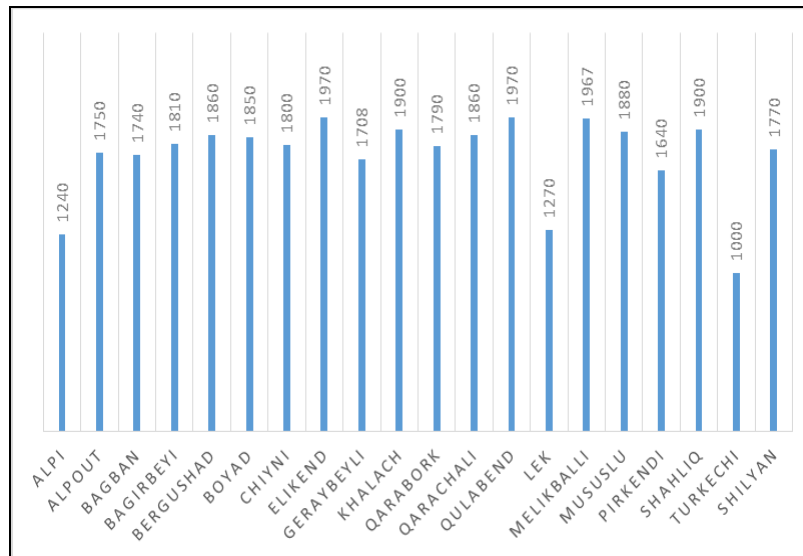


Fig 3: Annual supply of *Glycyrrhiza glabra* in the villages of Ujar region (34675 tons, 2021)

The productivity was determined in the area of 4 m² with the 1st repetition in spring pasture and 2nd repetition in autumn pastures. In the villages, mainly monocotyledonous cereals, dicotyledonous forbs and legumes are widespread. The resource potential of *Glycyrrhiza glabra* (Fig. 4) was studied and the annual supply capacity is estimated at 12,460 tons.

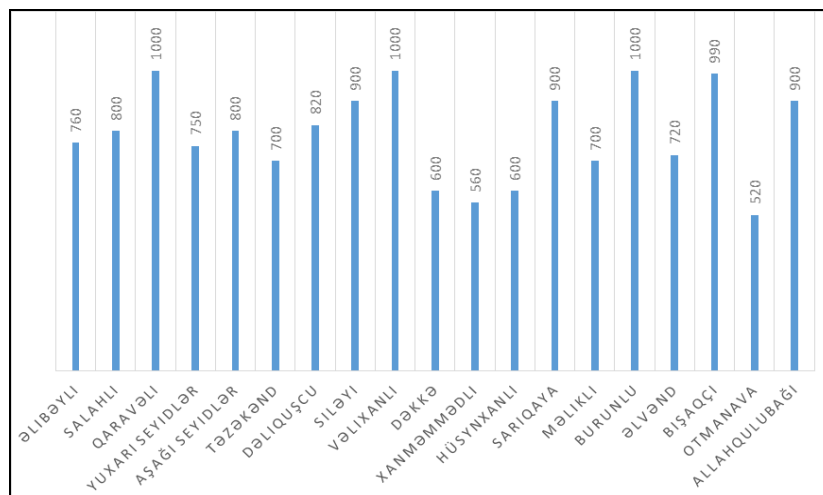


Fig 4: -Diag 4. Annual supply of *Glycyrrhiza glabra* in Zardab district (Total 15020 tons, 2021).

Crop-engineering condition of the areas is saline and suitable for economically useful, salt-tolerant plants. Superficial and fundamental improvement is required for efficient use and improvement of the area. *Glycyrrhiza glabra* damages other forage plants, the ecosystem loses its function. It is recommended to supply licorice roots every 3 years.

Glycyrrhiza glabra is also found in the Agdash region in the lowlands of Azerbaijan, where both plant suppliers and several plants have been established. *Glycyrrhiza glabra* is also cultivated in the area by local communities.

In the wild flora, the plant seems to form jungles in the formations of camelthorn-sea lavender-licorice. Field excursions were conducted several times in April and early June of the research year, including October. Eirkhan village was chosen as a experimental station. Relief is uneven, soil cover-saline, humidity-dry, water supply-poor. Vegetation is semi-desert and desert type. In early spring, dense jungle forms from the last year's dried bushes of camelthorn and bushes of *Glycyrrhiza glabra* which is in the vegetation in the area. Indicators on tier and species composition of vegetation are given in the following tables (Table 1-2).

The resource potential of the *Glycyrrhiza glabra* species in the villages of the Aghdash area is shown in Figure-diagram 11. The annual supply is more than 25,717 tons in the surveyed villages. Crop-engineering condition of the area consists of moderately eroded vacant areas. In terms of economy, its use is very low, not used for grazing and planting, it is useless.

Goychay region, around Garayazi village is one of the registered areas. The relief is alluvial, the soil cover is gray-brown, consists of dry semi-deserts. The species composition of sagebrush-ephemeral-licorice associations is almost homogeneous. Indicators on tiers and species composition of vegetation prove this (Table 1-2). The resource potential of *Glycyrrhiza glabra* species in Goychay region is given in Figure-diagram 6 on the villages, calculations were made in 4 m² area by mowing and modeling method.

As a recommended main measure for the efficient use and improvement of the area, it should be taken into account that *Glycyrrhiza glabra* jungles are in majority and should be collected from the root every 3 years for the development of other forage crops.

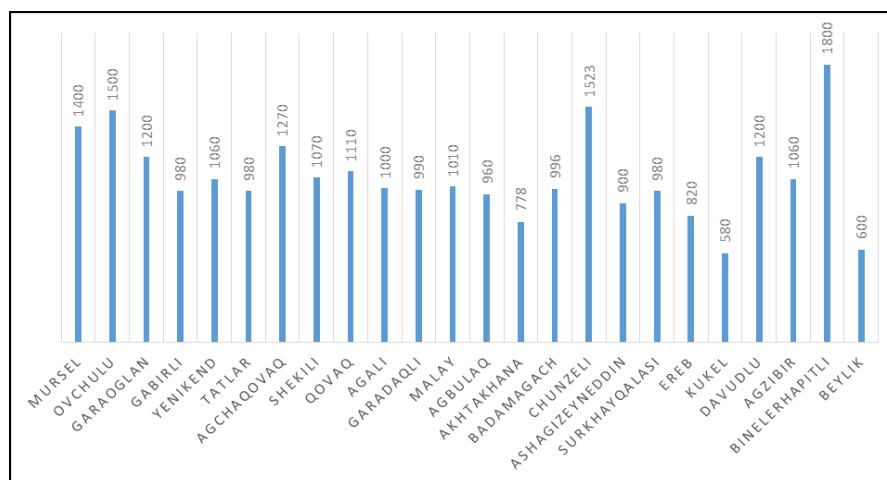


Fig 5: Annual supply of *Glycyrrhiza glabra* in the villages of Agdash region (25767 tons, 2021)

Sabirabad region is suitable for licorice. There are 4 supply centers in the region. The relief around Agajan village and Shirvan bridge is arid-denudation depression, and the soil cover belongs to salt-affected, gray-meadow-saline type. It belongs to the semi-desert vegetation with low humidity. The most widespread of the association is saltwort-camelthorn-licorice. Indicators of the area on tier and species composition of vegetation are given in the tables 1 and 2.

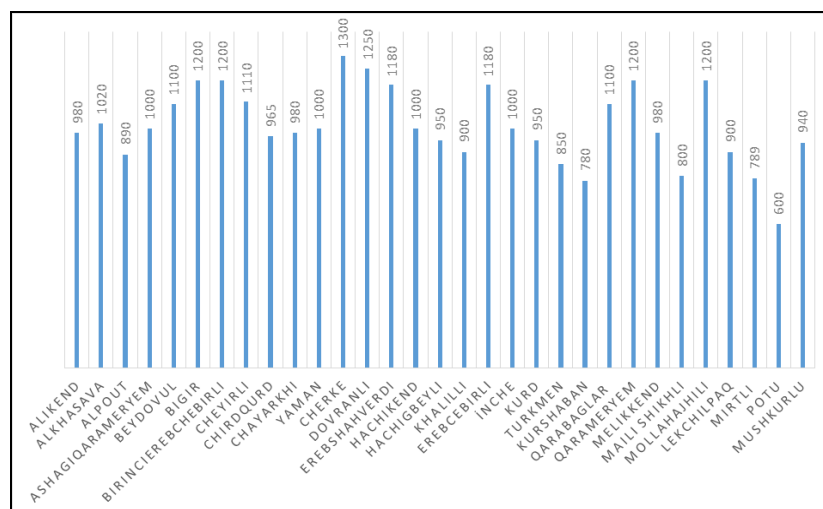


Fig 6: Annual supply of *Glycyrrhiza glabra* in the villages of Goychay region (30354 tons, 2021)

In order to determine the productivity, the productivity of the licorice was calculated in the area of 10m² at the beginning of autumn with the first repetition and given in the table by villages (diagram 7). A total of 17,187 tons can be supplied annually.

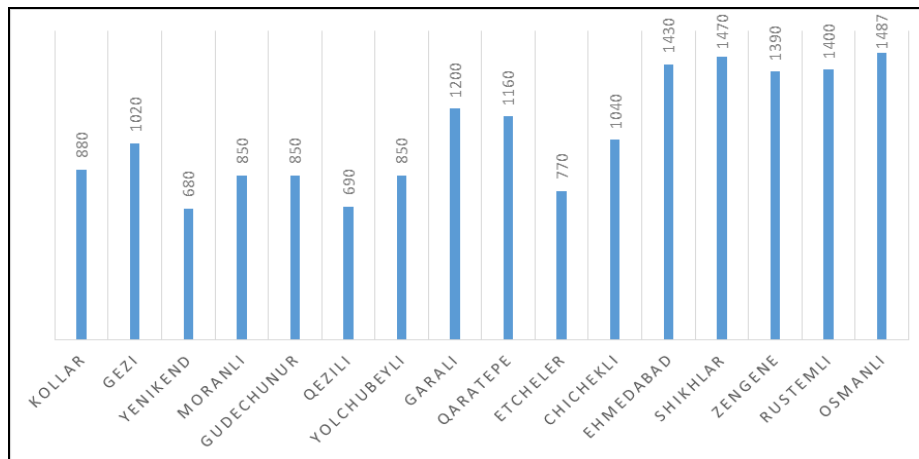


Fig 7: Annual supply of *Glycyrrhiza glabra* in Sabirabad district (Total 17167 tons, 2021)

Recommended measures for efficient use and improvement of areas: Licorice is an aboriginal species that affects the ecosystem, is expanis, requires radical improvement for other forage crops. Pastures around the village, Saatli district were inspected in the spring and autumn seasons in 2021 and licorice jungles were registered around the village of Garalar, in the edge of the railway. Licorice jungles were formed in shrub vegetation type in the registration area with alluvial relief, saline soil cover, drought humidity, low water supply. Indicators of the area by tier, species composition and structure of vegetation were studied (Table 1-2).

Indicators on tiers by regions

Table 1

Tiers	The name of the main plants that make up the tier	Project cover, %	Medium height (cm)
Around Udulu village of Bilasuvar district			
I	<i>Glycyrrhiza glabra</i> L.	40-60	10-30
II	<i>Suaeda dendroides</i> (C. A. Mey.) Moq.	10-20	40-70
III	<i>Salsola futilis</i> Iljin (= <i>S. aucheri</i> (Moq.) Iljin)	20-40	20-60
Around Garabujag village of Kurdamir district			
I	<i>Tamarix</i> sp.	50-60	100-150
II	<i>Glycyrrhiza glabra</i> L.	60-70	20-35
III	<i>Tussilago farfara</i> L.	40-45	25-35
Around Malikballi village of Ujar district			
I	<i>Glycyrrhiza glabra</i> L.	60-70	30-45
II	<i>Aegilops</i> sp.	40-80	20-50
III	<i>Eremopyrum</i> sp.	50-80	20-35
Around Alijanli village of Zardab district			
I	<i>Alhagi maurorum</i> Medik.	40-80	30-70
II	<i>Suaeda dendroides</i> (C. A. Mey.) Moq.	30-60	30-60
III	Herbosum	20-50	15-30
Around the village of Eirkhan, Agdash district			
I	<i>Alhagi</i> sp.	10-20	40-60
II	<i>Glycyrrhiza glabra</i> L.	50-60	35-40
III	<i>Limonium</i> sp.	20-40	20-40
IV	<i>Petrosimonia</i> sp.	40-60	10-20
Around Garayazi village, Goychay district			
I	<i>Paliurus</i> sp.	15-20	150-200
II	<i>Bothriochloa ischaemum</i> (L.) Keng	40-60	15-70
III	<i>Glycyrrhiza glabra</i> L.	60-70	45-60
IV	<i>Artemisia fragrans</i> Willd.	20-40	10-15
Agajan village of Sabirabad district and around Shirvan bridge			
I	<i>Glycyrrhiza glabra</i> L.	40-60	10-30
II	<i>Alhagi</i> sp.	10-20	40-70
III	<i>Salsola futilis</i> Iljin (= <i>S. aucheri</i> (Moq.) Iljin)	20-40	20-60

Saatli district, around Garalar village, edge the railway			
I	<i>Glycyrrhiza glabra</i> L.	60-70	30-45
II	<i>Aegilops</i> sp.	40-80	20-50
III	<i>Eremopyrum</i> sp.	50-80	20-35

As can be seen from Table 1, the botanical groups in which the *Glycyrrhiza glabra* species is distributed are similar and homogeneous.

For the determination of productivity in the area, reserve of licorice together monocotyledonous cereals and dicotyledonous forbs was calculated in the autumn pasture in an area of 4 m² with the 1st repetition by the method of mowing and modeling and shown in the diagram 8.

Crop-engineering condition of the area: saline and eroded; Recommended measures for efficient use and improvement of the area: improvement measures (superficial and fundamental) should be applied, licorice jungles should be partially reduced.

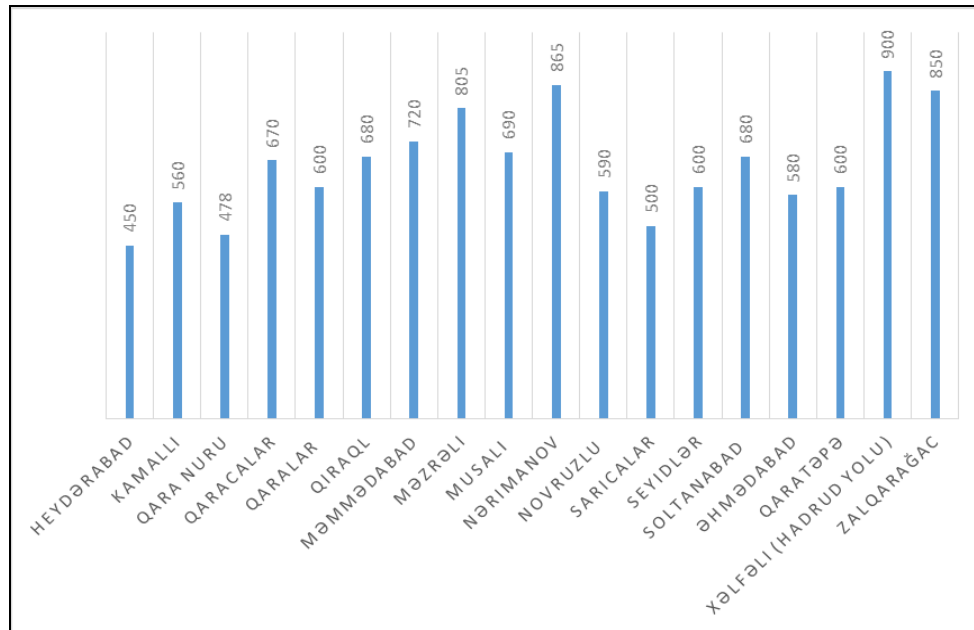


Fig 8: Annual supply of *Glycyrrhiza glabra* in Saatli region (Total 11918 ton, 2021).

Table 2: Species composition and structure of vegetation cover on the regions

Species of plants	Abundance (with points)	Height (cm)	Phenological phase
<i>Glycyrrhiza glabra</i> L.	3-4	20-40	Flowering
<i>Suaeda dendroides</i> (C. A. Mey.) Moq.	2	40-70	Vegetation
<i>Salsola arbuscula</i> Pall.	1-2	30-60	Vegetation
<i>Salsola rigida</i> Pall. (= <i>S. orientalis</i> S. G. Gmel.)	1-2	20-40	Vegetation
<i>Nitraria schoberi</i> L.	1	40-80	Flowering
<i>Zerna rubens</i> (L.) Grossh. (= <i>Anisantha rubens</i> (L.) Nevski)	3-4	15-30	Flowering
<i>Hordeum leporinum</i> Link (= <i>H. murinum</i> subsp. <i>leporinum</i> (Link) Arcang.)	2-3	10-20	Flowering
<i>Phalaris minor</i> Retz.	1-2	20-40	Flowering
<i>Agropyron repens</i> (L.) P. Beauv. (= <i>Elytrigia repens</i> (L.) Nevski)	1	5-10	Vegetation
<i>Artemisia fragrans</i> Willd.	1	15-20	Vegetation
<i>Petrosimonia brachiata</i> (Pall.) Bunge	2	5-15	Vegetation
<i>Tamarix ramosissima</i> Ledeb.	1	100-150	Flowering
<i>Aeluropus repens</i> (Desf.) Parl. (= <i>A. lagopoides</i> subsp. <i>repens</i> (Desf.) Tzvelev)	1-2	10-15	Flowering
<i>Agropyron repens</i> (L.) P. Beauv. (= <i>Elytrigia repens</i> (L.) Nevski)	1	5-10	Flowering
<i>Alhagi maurorum</i> Medik.	1-2	40-60	Vegetation
<i>Eremopyrum orientale</i> (L.) Jaub. & Spach	3-4	5-10	Flowering
<i>Aeluropus littoralis</i> (Gouan) Parl.	1-2	15-60	Flowering
<i>Halostachys caspica</i> (M. Bieb.) C.A. Mey.	2	70-100	Vegetasiya

<i>Kalidium caspicum</i> (L.) Ung.-Sternb.	1	40-60	Flowering
<i>Aegilops</i> sp.	1-2	10-25	Flowering
<i>Lolium perenne</i> L.	1-2	10-15	Flowering
<i>Poa bulbosa</i> L.	1-2	5-10	Flowering
<i>Medicago minima</i> (L.) L.	1-2	5-10	Flowering
<i>Tamarix</i> sp.	1	50-150	Vegetation
<i>Palirus</i> sp.	3-4	150-200	Vegetasiya
<i>Bothriochloa ischaemum</i> (L.) Keng	1-2	30-40	Flowering
<i>Teucrium orientale</i> L.	1-2	5-15	Flowering
<i>Centaurea iberica</i> Spreng.	1-2	15-20	Flowering
<i>Peganum harmala</i> L.	1	20-40	Vegetasiya
<i>Salsola futilis</i> Iljin (= <i>S. aucheri</i> (Moq.) Iljin)	1-2	20-40	Flowering
<i>Nitraria schoberi</i> L.	2	40-80	Vegetation
<i>Alhagi</i> sp.	3-4	15-30	Flowering
<i>Phalaris brachystachys</i> Link	1-2	20-60	Vegetation
<i>Agropyron repens</i> (L.) P. Beauv. (= <i>Elytrigia repens</i> (L.) Nevski)	1	5-10	Vegetation
<i>Petrosimonia brachiata</i> (Pall.) Bunge	2	5-15	Vegetation
<i>Glycyrrhiza uralensis</i> Fisch.	3-4	15-25	Vegetation

Conclusion

Annual biological, operational and supply reserves of *Glycyrrhiza glabra* species in the villages shown in the diagrams on the lowlands of Azerbaijan are calculated for 8 regions. It has been determined that 231246 tons of *Glycyrrhiza glabra* species can be supplied annually. If we take into account that these villages do not fully cover 8 districts, and there are unexplored villages, then it is possible to supply about 300,000 tons of *Glycyrrhiza glabra* from these districts. No re-supply should be made earlier than 3 years from the supplied lands.

The following diagram shows the percentage of *Glycyrrhiza glabra* species on the studied regions (Fig. 9).

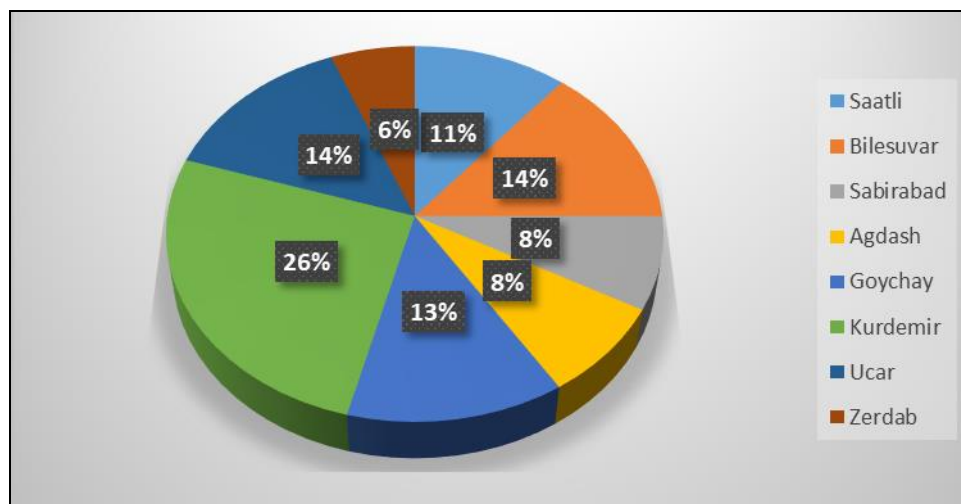


Fig 9: Annual supply reserve of *Glycyrrhiza glabra* species on some districts in the lowlands of Azerbaijan

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