

The role of legumes in the desert and semi-desert of the steppe plateau (Republic of Azerbaijan)

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Abstract

Geobotanical classification of desert and semi-desert phytocenoses created by legumes spreading within the Steppe Plateau of Azerbaijan have been given in the paper. More than 170 species of legumes have been revealed in the Steppe plateau, of which 77 are more common, and some play important role in botanical groupings under creating of populations: *Glycyrrhiza glabra* L., *Alhagi pseudoalhagi* (Bieb.) Fisch., *Medicago minima* (L.) Bartalini, *M.orbicularis* (L.) Bartal., *Astragalus igniarius* Popov, *A. caucasicus* Pall. and etc. These plants can be considered satellites of associations formed by the predominance of legumes. Groupings created by legumes are classified into 3 formation classes, 6 formations, 6 associations for semi-desert plants, 2 formation classes, 4 formations, 4 associations for desert plants. Legumes are either ecosystem engineers (edificator) or a component in these cenoses.

Keywords: legumes, vegetation type, deserts and semi-deserts, formation, association

1. Introduction

The Steppe plateau of Azerbaijan ends by Alazan-Haftaran valley in the North, by the Kur River in the South, the sword-like ridge of Jeyranchol in the West, and Bozdog mountain in the East. Jeyranchol, Ajinohur-Sarija winter pastures and several administrative districts (Shamkir, Tovuz, Samukh, Agstafa, Sheki, Gakh, etc.) includes here. The study, protection and restoration of flora and vegetation of the region have particular importance due to the fact that the main part of the Steppe plateau under strongly affected by anthropogenic factors. Intensive use of ecosystems leads to the deterioration of the natural ecological situation, the development of desertification and radical negative impacted on the structure of vegetation. Particular attention should be paid to eliminating the negative effects of desert and semi-desert ecosystems used as winter pastures in the Steppe plateau. Pasture fodder in these areas is characterized by high nutritional value and rationally, which is very important for the country. The study of the vegetation of the area began from the XVIII century. The study of vegetation of the research area since more specific began from the XIX century. Information on floristic and geobotanical studies of semi-desert and desert plants of natural phytocenoses in the following period: A.A.Grossheim ^[1], Y.M.Isayev ^[2], L.I.Prilipko ^[3], V.J.Hajiyev ^[4], V.V.Hatamov ^[5], I.M.Agaguliyev ^[6], E.M.Gurbanov ^[7], S.Z.Ahmadova ^[8], E.Sh.Shukurov ^[9], F.Q.Movsumova ^[10], S.C.Ibadullayeva ^[11], including number of other monographs and scientific works ^[12, 13, 14]. Semi-deserts of the country located around the desert and dry steppe vegetation in the carbonate, clayey and gray, gray-brown soils of the foothills at an altitude of 800-1100 m above sea level (in the territory of Nakhchivan AR), as well as an altitude of 500-700m and 300-500m (up to the Kur-Araz lowland) ^[15].

Azerbaijani scientists listed above have discovered elements of some legumes in the semi-deserts (*Glycyrrhiza glabra* L., *Alhagi pseudoalhagi* (Bieb.) Fisch., *Lolium rigidum*

Gaudin., *Medicago sp.*, *Trifolium sp.*, *Astragalus sp.* and etc.) and also gengiz semi-deserts spread over a wide area. The physical and geographical conditions of the semi-desert vegetation are very favorable for the development of nomadic livestock, including the grazing capacity, taking into account the duration of use during the grazing season and pasture capacity.

From this point of view, conduct of ecological-geobotanical researches of phytocenoses registered in winter pastures with predominance of legumes in plant groups, which are mainly a source of natural fodder (formed by edificator of wormwood and saline) is important. Geobotanical studing of Steppe plateau have been shown: lack of information about the plant community dynamics and succession, not enough information about ecology and biology of natural ecosystems, lack of development of differentiated methods for rational use and improvement of natural fodder areas and shortcomings in other areas. So, the main goal of our research - to study the deserts and semi-deserts of the Steppe plateau area.

2. Materials and Methods

The research was conducted in 2016-2019 under field research at the Steppe plateau on the basis of the plant diversity studing. Phenological observations of plants found in the region were carried out at different times and herbarium materials were collected. The collected materials were compared with the herbarium of the Institute of Botany of the Azerbaijan National Academy of Sciences. Materials developed at Azerbaijan State Agrarian University (Ganja, Azerbaijan), species names by flora ^[16, 17] and specified according to the latest nomenclature ^[18]. Types, classification classes, formation and association groups from ecological- phytocenological taxonomic units were used in the classification.

The analyzes were performed according to the generally accepted methodology ^[19, 20, 21].

3. Results and discussion

The relief features of the Steppe plateau are closely related to the tectonic structure. Their upper layer descends by steps under moves from north to south. The area is characterized by the alternation of wide valleys with plains, the bottom of the 4th period with Pliocene gravel, clay, and in some places created by smooth valleys and slopes.

The total height of the Steppe plateau is 200-890 m above sea level. The climate is middle-hot, semi-arid, continental. The annual amount of sunny hours is 2200-2500, solar radiation is 125-130 kcal/cm and the balance of radiation on the soil surface is 45-50 kcal/cm. The average annual temperature in July is +24.2, + 26.7°C, the maximum temperature is +40°, more than 200 frost-free days. The annual precipitation is 383 mm in the Western part of the massif (Karayazi), 265 mm in the East (Samukh), 493 mm in the North (Shirak) and 360 mm in the South (Shamkir). Rainfall is in floods forms. Snow are short-lived and not permanent. The maximum snow cover is 10 cm and lasts for 10-20 days. 2-3 times a year hail falls. There is no river with a constant flow in the study area. Their filling occurs at the expense of spring-autumn rainfall. At other times rivers dry out. The density of the river is zero "0" with the exception of the Kur river and Gabirri rivers. Ravines and gullies form dense network excluding western and central zones. Temporary lakes are formed during heavy rains. There is only one permanent lake in Ajinohur area - Ajinohur lake.

The soils of the massif are arid and extraarid types. Neogene rocks were mainly involved in the formation of their geological structure. The soils of the study area are chestnut soils based on the bioclimatic distribution of soils. Gray soils and salinities are also found. The main reason of the strong erosion process in the soils is the lack of dense vegetation and the abundance of easily washed rocks.

Ephemers and ephemerooids are outnumbered in semi-deserts due to the relatively high humidity, which is part of the climate. In this sense, the number of xerophyt-bushes, semi-bushes and bushes is smaller than in the desert.

There are 175 species of legumes in the local flora, of which 77 species are more common, and some play a key role in botanical groupings under creating of populations. Semi-desert vegetation is formed phytocenoses by legumes on the Steppe plateau depends from diversity of relief and soil-ecological conditions. Therefore, phytocenological features and the dominance principle in groups formed with the participation of legumes in the desert and semi-desert vegetation of Azerbaijan are classified into 5 formation classes, 10 formations, 10 associations. Here legumes participate as either an edificator or a component.

Motley grass-bushes-legumes, motley grass-saline and motley grass-legumes-ephemers semi-desert formation classes were found on the Steppe plateau. Geobotanical classification of the main elements of the associations formed by participation of legumes have been shown in table 1.

Table 1: Geobotanical classification of *Glycyrrhiza glabra-Salsola dendroides-Artemisia szowitziana* association

№	Name of biomorph species	Ecological groups	Abundance (ball)	Average height (in cm)	Phenological phases
<i>Bushes</i>					
1.	<i>Tamarix hohenackeri</i> Bunge	mesoxerophyte	1-2	I (240)	flow.
2.	<i>Caragana grandiflora</i> (Bieb.) DC.	xerophyte	1-2	I (120)	flow.
3.	<i>Halostachys belangeriana</i> (Moq.) Botsch.	halophytes	1-2	I (100)	veg.
<i>Semi-bushes</i>					
4.	<i>Salsola dendroides</i> Pall.	mesoxerophyte	2-3	II (60)	veg.
<i>Perennial</i>					
5.	<i>Glycyrrhiza glabra</i> L.	mesophyte	3-4	II (80)	veg./ bean ripening
6.	<i>Artemisia szowitziana</i> (Bess.) Grossh.	mesophyte	2	III (30)	flow.
7.	<i>Limonium meyeri</i> (Boiss.) O.Kuntze	halophytes	1-2	II (45)	flow.
8.	<i>Melilotus dentatus</i> (Waldst. et Kit.) Pers.	xerophyte	1-2	III (25)	bean ripening
9.	<i>Hirschfeldia incana</i> (L.) Lagr.-Foss.	xerophyte	1-2	II (80)	flow.
10.	<i>Alhagi pseudoalhagi</i> (Bieb.) Fisch.	mesophyte	1	II (60)	veg.
11.	<i>Peganum harmala</i> L.	mesoxerophyte	1	II (50)	flow.
12.	<i>Aeluropus litoralis</i> (Gouan) Parl.	halophytes	1	III (10)	flow.
<i>Biennial</i>					
13.	<i>Colutea orientalis</i> Mill.	xerophyte	1-2	III (20)	flow.
14.	<i>Lolium rigidum</i> Gaudin.	xerophyte	1-2	III (15)	flow.
15.	<i>Eremopyrum triticeum</i> (Gaertn.) Nevski	halophytes	1-2	III (20)	flow.
16.	<i>Poa bulbosa</i> L.	xerophyte	1-2	III (15)	seed shedding
17.	<i>Chenopodium rubrum</i> L.	xerophyte	1	II (40)	flow.
18.	<i>Xanthium strumarium</i> L.	xerophyte	1	II (35)	flow.
19.	<i>Petrosimonia brachiata</i> (Pall.) Bunge	halophytes	1	III (10)	veg.
20.	<i>Climacoptera crassa</i> (Bieb.) Botsch.	halophytes	1	III (10)	veg.
21.	<i>Gamanthus pilosus</i> (Pall.) Bunge	halophytes	1	III (5)	veg.
The total projective cover is 60-80%.					

Motley grass-bushes-legumes semi-desert formation class. *Artemisia lerchiana* + *Caragana arboroscens* association includes in *Artemisieta-Caraganasae* formation. Vegetation of the group (with the dominance of *Caragana arborescens* Lam.) was revealed on gray soils (bushes pastures) in the Gakh district at an altitude of 454 m above sea level in May 2018. 22 species of plants in *Artemisia lerchiana* +

Caragana arboroscens phytocenosis has revealed under geobotanical description. Of these, 3 species (13.6%) are bushes, 1 species (4.5%) is semi-bushes, 8 species (36.4%) are perennials, 1 species (4.5%) is biennial and 9 species (40.9%) are annual grasses. 17 species (77.3%) - xerophytes, 3 species (13.6%) - mesoxerophytes and 2

species (9.1%) – mesophytes according to the analysis of ecological groups.

Arborescens of dominance *Caragana arborescens* species of the phytocenosis is 3-4 ball and the subdominant *Artemisia lerchiana* Web. - 2 ball. The vegetation has three layers according to the structure of the studied phytocenosis. Thus, in the first tier - *Paliurus spina-christi* Mill., *Punica granatum* L. and *Caragana arborescens* (by height till 250-100 cm); in the second tier - *Stipa prilipkoana* Grossh., *Salsola dendroides* Pall., *Alhagi pseudoalhagi* and others (height till 70-40 cm) and in the third tier - *Artemisia lerchiana*, *Anisantha tectorum* (L.) Nevski, *Lolium rigidum* Gaudin. and etc. (up to 30-10 cm). The total project coverage varies between 50-70%.

The *Artemisieta-Salsola-Glycyrrhizosae* formation is represented by the *Glycyrrhiza glabra-Salsola dendroides-Artemisia szowitziana* association in the Motley grass-saline semi-desert formation class. Vegetation cover of *Glycyrrhiza glabra-Salsola dendroides-Artemisia szowitziana* association with domination of *Glycyrrhiza glabra* L. was registered in low-slope plains on saline gray-meadow soil in “Ajinohur” winter pasture in Shamkir districts in May 2019. 21 species are in the vegetation cover. Of these, 3 species (14.3%) - bushes, 1 species (4.8%) - semi-bushes, 8 species (38.1%) - perennial grasses, and 9 species (42.9%) - annual grasses. 8 species (38.1%) are

xerophytes, 7 species (33.3%) are halophytes, 3 species (14.3%) are mesocreserophytes and 3 species (14.3%) are mesophytes according to ecological groups. Abundance of the dominant *Glycyrrhiza glabra* species of the phytocenosis - 3-4 ball, the abundance of the subdominants *Salsola dendroides* species - 2-3 ball and *Artemisia szowitziana* (Bess.) Grossh. - 2 ball. The total projective cover varies between 60-80%.

Motley grass-wormwood-ephemer semi-deserts formation class. *Artemisieta-Medicagosae* formation include *Medicagosetum minima-Artemisiosum lerchianae* associations formed these class.

The species composition and structure of the association (with the dominance of *Medicago minima* (L.) Bartalini) was recorded in the winter pastures on carbonate gray soils of the Tovuz and Agstafa districts in May 2019 (Table 2). 24 species were found in the *Medicagosetum minima-Artemisiosum lerchianae* association as reflected in the geobotanical description, of which 2 species (8.3%) are bushes, 1 species (4.2%) is semi-bushes, and 1 species (4.2%) is semi-shrubs, 6 species (25.0%) are perennials and 14 species (58.3%) are biennial plants. 14 species (58.3%) belong to xerophytes, 3 species (12.5%) to halophytes, 1 species (4.2%) to mesophytes and 6 species (25.0%) to mesoxerophytes according to ecological groups.

Table 2: Species components and structure of *Medicagosetum minima-Artemisiosum lerchianae* association

№	Name of biomorph species	Ecological groups	Abundance (ball)	Average height (in cm)	Phenological phazes
<i>Bushes</i>					
1.	<i>Tamarix ramosissima</i> Ledeb.	mesoxerophyte	1	I (120)	veg.
2.	<i>Halimodendron halodendron</i> (Pall.) Voss.	mesoxerophyte	1	I (100)	flow.
<i>Semi-bushes</i>					
3.	<i>Salsola dendroides</i> Pall.	mesoxerophyte	1	II (70)	veg.
<i>Semi-shrubs</i>					
4.	<i>Salsola ericoides</i> Bieb.	halophyte	1-2	II (30)	veg.
<i>Perennial</i>					
5.	<i>Artemisia lerchiana</i> Web.	xerophyte	2	III (20)	veg.
6.	<i>Alhagi pseudoalhagi</i> (Bieb.) Fisch.	mesophyte	1-2	II (40)	veg.
7.	<i>Aeluropus littoralis</i> (Gouan) Parl.	halophyte	1-2	III (10)	flow.
8.	<i>Marrubium propinquum</i> Fisch. et C.A.Mey.	xerophyte	1-2	III (35)	flow.
9.	<i>Anthyllis lachnophora</i> Juz.	mesoxerophyte	1	III (30)	flow.
10.	<i>Convolvulus arvensis</i> L.	mesoxerophyte	1	III (20)	flow.
<i>Biennial</i>					
11.	<i>Silybum marianum</i> (L.) Gaertn.	xerophyte	1	I (50)	flow.
12.	<i>Carduus seminudus</i> Bieb.	mesoxerophyte	1	II (45)	flow.
13.	<i>Medicago minima</i> (L.) Bartalini	xerophyte	3-4	III (15)	flow.
14.	<i>Medicago orbicularis</i> (L.) Bartalini	xerophyte	1-2	III (30)	bean ripening
15.	<i>Lolium rigidum</i> Gaudin.	xerophyte	1-2	III (20)	flow.
16.	<i>Bromus japonicus</i> Thunb.	xerophyte	1-2	III (15)	flow.
17.	<i>Poa bulbosa</i> L.	xerophyte	1-2	III (10)	seed shedding
18.	<i>Hordeum leporinum</i> Link	xerophyte	1-2	II (40)	flow.
19.	<i>Avena fatua</i> L.	xerophyte	1	II (35)	flow.
20.	<i>Psylliostachus spicata</i> (Willd.) Nevski.	halophyte	1	III (30)	flow.
21.	<i>Adonis parviflora</i> Fisch. ex DC.	xerophyte	1	III (20)	flow.
22.	<i>Petrosimonia brachiata</i> (Pall.) Bunge	xerophyte	1	III (15)	veg.
23.	<i>Erodium turcmenum</i> (Litv.) Grossh.	xerophyte	1	III (10)	flow.
24.	<i>Filago pyramidata</i> L.	xerophyte	1	III (5)	flow.
The total projective cover is 30-70%.					

Abundance of the dominant species of the group *Medicago minima* is 3-4 ball, abundance of subdominant species *Artemisia lerchiana* – 2 ball. There are three levels according to the phytocenotic structure of the studied association: first - *Tamarix ramosissima* Lebed.,

Halimodendron halodendron (Pall.) Voss. - height till 120-100cm; second - *Salsola dendroides* - height 70 cm and *Alhagi pseudoalhagi* - height 40 cm, etc.; third - *Salsola ericoides* Bieb., *Artemisia lerchiana*, *Medicago minima* - up

to 15 cm in height and also ephemeroïd *Poa bulbosa* L. and etc. The total projective cover varies between 30-70%.

This grouping (sometimes found in saline deserts and psammophytes) is widespread in gray and gray-brown soils of semi-deserts for bioecological features. Favorable conditions for the strong development of various ephemeroïd species (or annual grasses that finish their vegetation in 1-2 months) from early spring to mid-May in the semi-desert vegetation. Cattle are well fed with fodder plants during this period. However, the reserve fodder stock is increased by wormwood, salsola (gengiz), etc. form salt marshes in the end of autumn and winter. The following legume formations are also found in the spots form in the semi-deserts.

Astragalus igniarius - *Artemisia arenaria*+*A.scoparia*+*herbosum* association of *Artemisieta-Astrgalosae* formation is distributed in the dry, low-moisture coastal sands of the loamy lakes. An average of 9 species are registered in the group. Of these, 2 species (22.3%) are xerophytes, 3 species (33.3%) are psammophytes, 3 species (33.3%) are mesoxerophytes and 1 species (11.1%) is hydrophytes. In the same number of species, 3 species (33.3%) of plants are bushes, 2 species (22.3%) are semi-bushes, 3 species (33.3%) are perennial grasses and 1 species (11.1%) is annual grasses.

Astragalus igniarius is the dominant species of the association and *Artemisia arenaria* DC, *A.scoparia*. are the subdominant species. The abundance of the *Astragalus igniarius* species is 3-4 ball, the abundance of *Artemisia arenaria* is 2-3 balls and the abundance of *A. scoparia* is 2 balls. *Tamarix ramosissima* bushes in I (upper) tier, *Astragalus igniarius*, *Artemisia arenaria*, *A.scoparia*, *Salsola dendroides* semi-bushes in II (middle) tier, *Ammochloa palaestina* Boiss., *Ferula persica* Willd. and *Xanthium spinosum* L. in III (lower) tier according to phytocenology structure of vegetation occurs in Shamkir-Samukh districts. The average height of the grass cover is 10-40 cm. Projective cover reaches 50-60%. Lichens from primitive plants can find here at the base of the stem of the *Astragalus igniarius*.

Artemisieta-Alhagiosae formation. *Artemisia scoparia*-*Alhagi pseudoalhagi*+*herbosum* association spots spread on wet, dry and sandy soils in the territory of Yenikend village of Samukh districts. The species composition of the group is poor and consists 11 species. Of these, 3 species (27.3%) are xerophytes, 3 species (27.3%) are mesoxerophytes, 4 species (36.4%) are psammophytes and 1 species (9.0%) is mesophytes. Of the same number, 3 species (27.3%) - semi-bushes, 4 species (36.3%) - perennial grasses, 2 species (18.2%) - biennial grasses and 2 species (18.2%) - annual grasses.

Artemisia scoparia is an edificatore and dominant species, and *Alhagi pseudoalhagia* is the subdominant. The abundance of *Artemisia scoparia* is 3-4 balls, and the abundance of *Alhagi pseudoalhagia* is 2-3 balls. The vegetation has two layers due to the phytocenological structure. Thus, on the first tier - *Artemisia fragrans* Willd., *A.scoparia*, *Alhagi pseudoalhagi*, on the second tier - *Medicago coerulea*, *Atriplex fominii*, *Melilotus polonicus* (L.) Pall. are revealed. The average height of the grass cover is 20-50 cm. Projective cover reaches 60-70%.

Juncuseta -*Astrgalosae* formation. This formation is found in moist places in the spots form on the semi-desert vegetation between Tovuz and Agstafa districts. 15 species of plants are registered in the species composition of the

formation. From these, 3 species (20%) are xerophytes, 4 species (26.7%) are halophytes, 1 species (6.6%) is mesophytes, 3 species (20%) are mesoxerophytes and 4 species (26.7%) are hydrophytes. Of the same number of plants, 2 species (13.3%) are bushes, 2 species (13.3%) are semi-bushes, 1 species (6.7%) is semi-shrubs, 6 species (40%) are perennial grasses, 1 species (6.7%) - biennial and 3 species (20%) are annual grasses. *Juncus acutus* L. is dominant and *Astragalus igniarius* is subdominant of *Juncus acutus* - *Astragalus igniarius* +*herbosum* association of this formation. *Tamarix ramosissima*, *Phragmites australis*, *Juncus acutus* on the first tier, *Suaeda denroides*, *Artemisia arenaria*, *Alhagi pseudoalhagi* on the second tier, *Astragalus igniarius* and etc. on the third tier have been noted according to the phytocenological structure. The average height of the grass cover is 15-50 cm. Projective cover reaches 30-60%.

In general, grazing is considered inconvenient here because very sparse and isolated distribution of fodder crops in the area as shown our research and observations in the phytocenoses of sandy vegetation in the Kur River and Alazan-Haftaran valleys. However, medicinal plants such as *Ephedra distachya* L., *Plantago arenaria* Waldst. & Kit. in the sandy desert and as well as industrial plants, including *Glycyrrhiza aspera* Pall., *Typha angustifolia* L. and others can be used as raw material.

Desert vegetation in Azerbaijan was mistakenly considered "steppe" and semi-desert in the last century. However, later wormwood spread to the plain area considered to desert, and wormwood on the foothills - to the semi-desert [4, 22]. I.N.Beydeman [20] at first wormwood formation on Kur-Araz lowland considered to semi-desert, but later the author included the wormwood vegetation to desert type. A.A. Grossheim [1] called this halophytic desert in Absheron "salinity". L.I. Prilipko [3] and V.J.Hajiyev [21] noted the xerophytes as edificators in ephemeral-subtropical, pure saline, etc. phytocenoses of desert vegetation. Desert vegetation in the region differs sharply from the ancient Mediterranean and Central Asian deserts in terms of geographical and ecological habitat have shown results of study.

Desert (halophyte-type) phytocenoses are spread on saline, salt marshes, gray-brown, polluted soils in the territory of the Steppe Plateau. The desert vegetation of the region is formed locally among the semi-desert vegetation. Legumes are not main elements, dominants and edificators here. Some annual species of legumes (*Medicago truncatula* Gaerthn., *M.rigidula* (L.) All., *Trigonella striata* L. fil., *T.cancellata* Desf., *T.orthoceras* Kar. et Kir. and *Trifolium medium* L.) are fragmented found in desert phytocenoses in spring and early summer. Information about the desert phytocenoses of the plateau have been given before.

Salinization and erosion processes continue to intensify in winter pastures in the Samukh-Aghstafa districts was determined during field research. The main reason for this is the rising groundwater level around the lakes in the lowland meso-relief and the unsystematic grazing of livestock, as well as non-implementation of pasture improvement measures. This, in turn, has a significant negative impact on the productivity, feed quality and bio-ecological characteristics of natural vegetation. 2 formation classes, 4 formations and 4 associations of desert vegetation type in the territory of the Steppe plateau have been revealed.

Species composition and structure of the desert vegetation type have been given below.

Saline-legume formation class. *Salsoleta-Halimodendrosae* formation. This formation consisted of only one association in the area. *Halimodendron halodendron* (Pall.) Voss., *Salsola dendroides* Pall. and *Helianthemum salicifolium* (L.) Mill. are edificators of species composition of the group in the spring flora. The project cover is spread in accordance with 25-40%. The number of species is very small (6 species). Vegetation is found in saline soils. This means that the soils are severely saline. The dominant of the *Salsola dendroides-Halimodendron halodendron-Halocnemum strobilaceum* association of these formation is *Salsola dendroides* (abundance - 3 balls) and *Halimodendron halodendron* (2-3 balls) and *Helianthemum salicifolium* (L.) Mill. (2 ball) are the subdominants.

Semi-bushes salinity formation class. *Suaedata - Argyrolobiosae* formation distributed on gray-brown (saline) soils. Bushes *Suaeda dendroides* and semi-bushes *Argyrobium trigonelloides* Jaub. et Spach are edificators of this formation. Vegetation presents by *Suaeda dendroides-Argyrobium trigonelloides-Salsola dendroides* association distributed in the area of winter pastures in the Shamkir districts on low-slope hill-side, plains, hollow and along the Jeyranchol canal. The phytocenosis covers small areas in this winter pasture. 10-12 plant species are registered in the phytocenosis. *Suaeda dendroides* is dominants of the association (abundance – 3 balls), *Argyrobium trigonelloides* (2-3 ball) and *Salsola dendroides* (1 ball) are subdominants. Projective cover reaches 25-45%.

Fabaeta-Petrosimoniae formation. Vegetation of this formation is spread in the saline soils of the area, especially in winter pastures, as well as in the direction of Samukh districts. *Petrosimonia brachiata* is edificators of this formation and also indicator of saline soils. The widespread of annual halophyte *Petrosimonia brachiata* indicators of salinization and degradation of the subsoil cover. *Alhagi pseudoalhagi* from legumes is a satellite of this desert association.

The area is considered to be the poorest phytocenosis for desert vegetation according to the species composition. There are 12 plants in the species composition of the association. Of these, 1 species (8.3%) is xerophytes, 6 species (50%) are halophytes, 4 species (33.4%) are mesoxerophytes and 1 species (8.3%) is mesophytes. In the same number of species, 2 species (16.7%) belong to bushes, 1 species (8.3%) to semi-bushes, 1 species (8.3%) to perennial grasses and 8 species (66.7%) to annual grasses. *Petrosimonia brachiata* is the dominant of the association and *Alhagi pseudoalhagi* is the subdominant. Sometimes *Petrosimonia brachiata* is formed in the form of a sinusoid with a monodominance in the spot form. The abundance of *Petrosimonia brachiata* is 2-3 balls and the abundance of *Alhagi pseudoalhagi* is 2 balls.

Tamarix ramosissima, *Suaeda dendroides* are on the first tier, *Salsola dendroides*, *Alhagi pseudoalhagi* on the second tier, *Salicornia europaea*, *Salsola pestifer* A.Nelson, *Gamanthus pilosus* (Pall.) Bunge, *Melilotoides brachycarpa* (Fisch.) Sojak and etc. on the third tier are registered according to phytocenological structure. The average height of the grass cover reaches 20-40 cm. Projective cover is 15-25%.

Ephemer-wormwood-salsola (gengiz) formation. The phytocenosis with wormwood forms desert plantation on saline gray-brown soils in winter pastures. The registration of ephemers of the species composition of this formation shows that the gray-brown soils here are moderately and severely saline. 15 species of higher flowering plants in the species composition of the formation are revealed. Of these, 6 species (40%) are xerophytes, 8 species (53.3%) are halophytes and 1 species (6.7%) is mesoxerophytes. Of the same number, 3 species (20%) are bushes, 1 species (6.7%) is semi-shrubs, 2 species (13.2%) are perennial grasses and 6 species (40%) are ephemers.

Salsola nodulosa is the dominant species of vegetation, *Artemisia lerchiana*, *Lolium rigidum*, *Anisantha rubens* are subdominants and legumes - *Trigonella spurumeriana* Boiss., *T.coerulescens* (Bieb) Halasy, *Medicago truncatula* Gaerthn. are found among the desert elements in the spring. The abundance of *Salsola nodulosa* is 2-3 balls, for *Artemisia lerchiana* - 2 balls and for ephemers are 2 and 1-2 balls. *Suaeda dendroides* on the first tier, *Nitraria schoberi* L., *Salsola dendroides* on the second tier, semi-shrub *Salsola nodulosa*, also *Trigonella spurumeriana* Boiss., *T.coerulescens* (Bieb) Halasy, *Medicago truncatula* Gaerthn. and etc. are ephemers. The average height of the grass cover reaches to 10-20 cm. Projective cover is 30-50%. This formation and its corresponding association by dominance of fragrant wormwood and salsola (gengiz) edificators with other ephemers and efemeroids occupy large areas in the winter pastures of Azerbaijan.

4. Conclusions

Legumes are characterized by high nutritional value in the pastures of the desert and semi-desert ecosystems of the Steppe Plateau of Azerbaijan. So, increase of the rational use of the area taking into account the grazing capacity is possible. Productivity is declining, fodder quality is deteriorating, and the load and capacity of pastures are being drastically reduced and failure to carry out improvement measures on a scientific basis. Therefore, erosion accelerates and the process of degradation of the pastures due to the abnormal grazing of livestock in the studied desert and semi-desert phytocenoses in result of their non-rational use.

The species composition of legumes distributed in the desert and semi-desert phytocenoses within the Steppe plateau has been clarified, and created by them botanical groupings have been classified according to geobotanical units (formation class, formation, association). Legumes are considered to be the main creative component of the arid area and participating as dominant and subdominant in these groups. Reintroduction of legumes by seeds can improve conditions of the area.

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