

# Leguminous phytocenosis distributed in hole-meadow vegetation of Azerbaijan and their agricultural importance

MAMMADOVA ZULFIYYA JALAL  
GURBANOV ELSHAD MAJNUN  
ASADOVA KAMALA ADIL

Baku State University  
Azerbaijan Republic

## Abstract:

*During geobotanical researches which conducted at vegetation of Azerbaijan the classification scheme of leguminous phytocenosis distributed at hole-meadow vegetation occurred as interzonal form was compiled and mapped [10].*

*It was determined that leguminous plants are found as dominants and subdominants at hole-meadow vegetation and this vegetation was formed from 1 type, 7 formation classes, 9 formation groups and 11 associations. Conservation and protection of researched phytocenosis has a great role in developing of agriculture and improving of fodder supply.*

**Key words:** dominant, subdominant, association, interzonal, hole-meadow

## INTRODUCTION

Azerbaijan Republic is the richest region among the Southern Caucasus Republics with its vegetation. Founded vegetation types in this area, as well as hole-meadow vegetation are considered important areas for agriculture and cattle-breeding.

One of the main problems of the modern period is studying of ecological evaluation with scientific-theoretical and practical bases for rational use of natural vegetation or phytocenoses. In this regard conducting of ecological-geobotanical researches at hole-meadow vegetation founded as interzonal form at Azerbaijan vegetation has an important significance.

Present ecological problems and anthropogenic factors observed in the world as well as in Azerbaijan influence to the vegetation of Azerbaijan which has a rich flora. Irregular use of vegetation causes to strong decreasing of valuable fodder plants, some of them are in threat to be loss. During researches conducted at interzonal vegetation of Azerbaijan were observed such as situations in the phytocenosis founded at hole-meadow vegetation type with dominance and subdominance of leguminous plants. The main goal of research was studying of phytocenosis founded with dominance of leguminous plants at such vegetation types.

## **THE OBJECT AND METHODOLOGY OF THE STUDY**

The object of the research was different regions of Azerbaijan, mainly Kura-Araks lowland during 2008-2016 years.

At studied areas the location of ground water near to soil surface, flooding of holes at the result of precipitation in winter cause to increasing of humidity that mesophytes make interozonality. In this aspect the classification of phytocenosis formed by leguminous plants at hole-meadow vegetation was studied on the base of ecological-phytocenological principles.

During studying of life forms, phenological phases, identification on systematic taxons [7,5], ecological groups, project cover [20] of the species of phytocenosis with the dominance of leguminous plants at hole-meadow vegetation, as well as their endemicity [3], rare and endangered species [11,22] different methods [6] were used.

In the works of L.İ. Prilipko [19], Y.M. İsayev [15], R.A. Aliyev [2], İ.A. Mailov, V.V. Hatamov [18], V.V. Hatamov [13], İ.M. Agaguliyev [1], E.M. Gurbanov [8,9], V.S. Baxshiyev [4], E.S. Shukurov [21] and others were given information about hole-meadow vegetation in Azerbaijan.

## **EXPERIMENTAL PART**

During researches at hole-meadow vegetation 7 formation classes were determined: shrubby-different grassy- leguminous-meadows; subshrubby-leguminous-cereal-wheat-grassy hole-meadows; shrubby-leguminous-wheat-grassy hole-meadows; mixed-leguminous-grassy; perennial wheaty-leguminous grassy hole-meadows; different-grassy-leguminous hole-meadows and leguminous-wheaty grassy hole-meadow. These formation classes and formation groups, associations which included to these formation classes were given at classification scheme.

As given in classification scheme in Azerbaijan flora the hole-meadow vegetation with dominance and subdominance of leguminous plants is formed by 1 type, 7 formation classes, 9 formation groups and 11 associations.

At hole-meadowlike and flood-land meadows *Glycyrrhiza glabra* L., *Alhagi pseudalhagi* (Bieb) Fisch. and some other leguminous plants create mesophyte groups with *Artemisia szowitziana* (Bess.) Grossh., *Cynodon dactylon* (L.) Pers. and different plants.

According to A.R. Shennikov [20], L. İ. Prilipko [19] noted that hole-meadow vegetation contain mainly perennial herbs with the dominance of mesomorphs [12].

Classification of phytocenosis created by leguminous plants at hole-meadow vegetation is explained on the base of ecological-phytocenological principles. Geobotanical description of studied formations was given, but in this article only one formation is described.

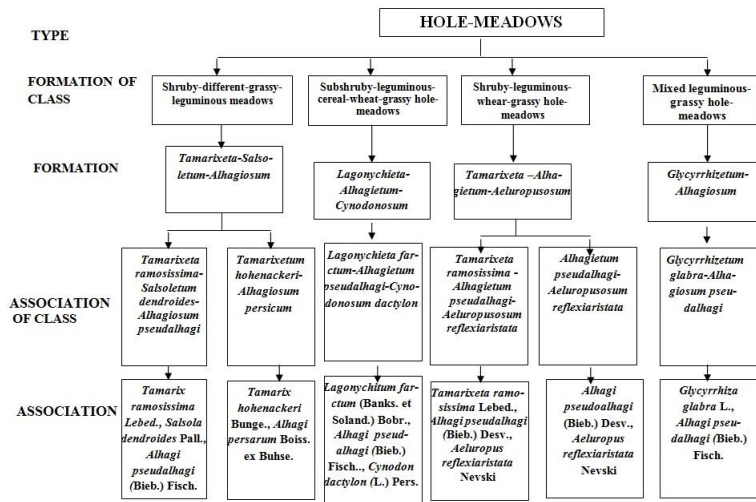
## 1. Shrubby-different-grassy leguminous hole-meadows formation class

At hole-meadow vegetation this formation class has a large areal and consists of *Tamarixeta-Salsoletum-Alhagiosum* formation group and two associations: *Tamarixeta ramosissima-Salsoletum dendroides-Alhagiosum pseudalhagi*) and (*Tamarixetum hohenackeri-Alhagiosum persicum*).

### *Tamarixeta-Salsoletum-Alhagiosum* formation.

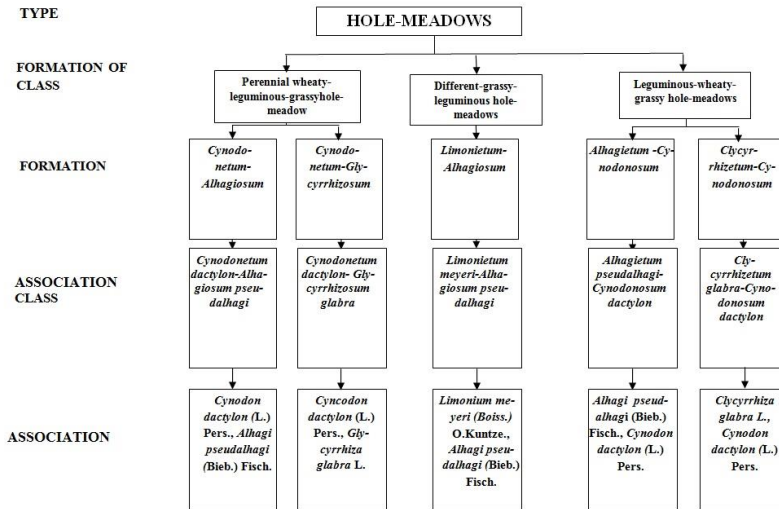
Vegetation of this formation was described at winter pastures at gray-meadow soils of Beylagan region which situated at southern part of Mil steppe of Kura-Araks lowland (300 m above sea level). At geobotanical description of the vegetation of formation the ecological groups, abundance, phenological phases, and medium height of the studied species were described.

Classification scheme



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Confining of classification scheme



**Geobotanical description**

Species content and structure of *Tamarixeta-Salsoletum* formation

No	Name of biomorphic plants	Ecological groups	Abundance (in points)	Average height (cm)	Phenological phases
1	2	3	4	5	6
<b>Bushes</b>					
1.	Tamarix ramosissima Lebed.	mesoxerophyte	2	I (150)	flowering
2.	Elaeagnus angustifolia L.	xerophyte	1-2	I (100)	Vegetation-flowering
<b>Subshrubs</b>					
3.	Salsola dendroides Pall.	mesoxerophyte	2-3	II (60)	vegetation
<b>Perennial herbs</b>					
4.	Alhagi pseudalhagi (Bieb.) Fisch.	mesoxerophyte	3-4	II (50)	vegetation
5.	Limonium meyeri (Boiss.) O.Kuntze.	halophyte	1-2	II (40)	flowering
6.	Cynodon dactylon (L.) Pers.	mesophyte	1-2	III (30)	flowering
7.	Aeluropus littoralis (Gouan.) Pall.	halophyte	1-2	III (10)	flowering
8.	Phragmites australis (Cav.) Trin. ex. Steud.	hydrophyte	1	I (90)	vegetation
9.	Artemisia szovitsiana (Bess.) Grossh.	mesophyte	1	II (70)	vegetation
10.	Centaurea iberica Tzev. ex Spreng.	xerophyte	1	II (45)	flowering
11.	Plantago lanceolata L.	mesophyte	1	II (40)	flowering
12.	Convolvulus arvensis L.	mesoxerophyte	1	II (35)	vegetation
<b>Biennial herbs</b>					
13.	Carduus seminudus Bieb.	mesophyte	1-2	II (60)	flowering
14.	Melilotus officinalis (L.) Pall.	mesophyte	1	I (80)	flowering
<b>Annual herbs</b>					
15.	Hordeum leporinum Link.	xerophyte	1-2	III (30)	flowering
16.	Lolium rigidum Gaudin.	xerophyte	1-2	III (25)	flowering
17.	Phalaris minor Retz.	xerophyte	1-2	III (20)	flowering
18.	Chenopodium album L.	halophyte	1-2	III (15)	vegetation
19.	Trifolium angustifolium L.	mesophyte	1	III (30)	mat. of beans
20.	Erodium cicutarium (L.) L'Her	mesoxerophyte	1	III (20)	flowering
21.	Sonchus oleraceus L.	mesoxerophyte	1	III (15)	flowering
22.	Capsella bursa pastoris (L.) Medik.	mesophyte	1	III (10)	flowering
23.	Medicago minima (L.) Bartalini.	xerophyte	1	III (5)	mat. of beans
General project cover contains 60-75%.					

From the geobotanical description it is clear that at the species content of phytocenosis 23 species of higher plants are found.

From them on the life forms 2 species (8,7 %) are shrubs, 1 species (4,4%) subshrub, 9 species (39,1%) perennials, 2 species (8,7%) biennials and 9 species (39,1%) are annual herbs. On ecological groups 6 species (26,1%) are xerophytes, 3 species (13,1%) halophytes, 6 species (26,1%) mesoxerophytes, 7 species (30,4%) mesophytes and 1 species (4,3%) hydrophytes.

From geobotanical description it is seen that abundance of the dominant species of this formation *Alhagi pseudalhagi* (Bieb.) Fisch. is in 3-4 point, abundance of the subdominant species *Salsola dendroides* (L.) Pall. is in 2-3 point and abundance of *Tamarix ramosissima* Lebed. is in 2 point.

According to structure at the I layer of phytocenosis *Tamarix ramosissima* Lebed. and *Elaeagnus angustifolia* L. – (height 150-200 sm); at II layer - *Phragmites australis* (Cav.) Trin. ex Steud., *Melilotus officinalis* (L.) Pall., *Artemisia szowitziana* (Bess.) Grossh., *Salsola dendroides* Pall., *Alhagi pseudalhagi* (Bieb.) Fisch. – (height 90-30 sm), at III layer *Cynodon dactylon* (L.) Pers. (height 30-10 sm) etc. are found. Whole project cover is 60-80%.

It is necessary to note that at the lowlands of steppe regions of Azerbaijan and hole-meadow, semidesert and seaside sandy and salty deserts of Absheron peninsula the *Alhagi pseudalhagi* (Bieb.) is eating by small cattles till starting of the eating of *Salsola nodulosa* (Mog.) Iljin or *Salsola dendroides* Pall. after snowing at countryside pasture areas and winter pastures [16,17].

Despite this, only at steppe areas of Nakhchivan AR *Alhagi persarum* Boiss. et Buhse is a drought tolerant plant that is eating from sheep and camel till flowering phase [8,14,18].

## **2. Subshrubby-leguminous-wheat-grassy hole-meadows formation class**

At the *Lagonychieta-Alhagietum-Cynodonosum* formation of this formation class the *Lagonychieta farctum* – *Alhagietum pseudalhagi-Cynodonosum dactylon* association is studied.

In the species content of phytocenosis 21 species of higher plants were found. Abundance of the dominate of this formation *Cynodon dactylon* (L.) Pers. was 4 points, abundance of the subordinate *Lagonychium farctum* (Banks. et Soland.) Bobr.) was 3 points, abundance of *Alhagi pseudalhagi* (Bieb.) Fisch. was 2-3 points.

Whole project cover was 70-90%. The reserve of cenosis consisting of *Clycyrrhiza glabra* L. and *Limonium meyeri* (Boiss.) O.Kuntze is reduced by year, so the natural thicket of this cenosis should be protected. As well as the *Glycyrrhiza glabra* L. is fodder and medicinal plants and we offered to protect it [16].

## **3. Shrubby-leguminous-wheat-grassy-hole-meadows formation class**

At researched hole-meadow vegetation the *Tamarixeta-Alhagietum-Aeluropusosum* formation which belongs to the more distributed shrubby-leguminous-wheat-grassy-hole-meadows formation class is presented with two associations: *Tamarixeta ramosissima-Alhagietum pseudalhagi-Aeluropusosum reflexiaristata* and *Alhagietum pseudalhagi-Aeluropusosum reflexiaristata*.

The plant cover of this formation was noted at the northern-western part of Kura-Araks lowland at hole which situated along Mingachevir water reservoir in 5 km distance (research object was salty gray-meadow soils in 120-80 m above sea level).

At the species content of phytocenosis 21 species were studied. From them 2 species are shrubs (9,5%), 1 species

subshrub (4,8%), 1 species undershrub (4,8%), 11 species perennial (52,3%) and 6 species are annual (28,6%) grasses. Analysis on ecological groups shows that 8 species belong to xerophytes (38,1%), 3 species halophytes (14,3%), 8 species mesoxerophytes (38,1%) and 2 species mesophytes (9,5%). Whole project cover of cenosis is changing between 45-75 %.

It is also important to note that the plant cover of ***Tamarixeta-Alhagietum-Aeluropusosum*** formation which belong to hole-meadow vegetation was developed by the influence of hole underground water at Caspian Seaside in Khisi region which situated at southern-western part of Great Caucasus mountains.

*Tamarixeta-Alhagietum-Aeluropusosum* formation group is found at the weakly salty gray-meadow soils where researched the phytocenosis of the *Alhagietum pseudalhagi-Aeluropusosum reflexiaristata* association. In this area the *Alhagi pseudalhagi* (Bieb.) Fisch. forms microcenosis with *Aeluropus reflexiaristata* in the form of little spots at “holes” and depressions as well as at sandy soils. In the species content of association there are 20-30 species. Whole project cover is 60-70%.

#### **4. Mixed leguminous-grassy-hole-meadows formation class**

At ***Glycyrrhizetum- Alhagiosum*** formation of this class the *Glycyrrhizetum glabra- Alhagiosum pseudalhagi* association was noted. In the species content of phytocenosis mainly leguminous mesophyte species (10-15 species) are found. In the Mugan steppe at the winter pastures of State Reserve Foundation around the “Golcuk” the plants are mixed and form cenosis.

Dominate of this phytocenosis is *Alhagi pseudalhagi* (Bieb.) Fisch., abundance is in 4 points and subordinate is *Glycyrrhiza glabra* L., abundance is in 2-3 points. On the



structure the dominate and subdominate species are found at the same layer (upper layer), their height is 70-100 sm. Project cover is between 60-80%.

These plant groups are formed at hole-meadowlake aspect at gray-meadow soils in larger areal. As well as at researched winter pasture area in the wet soil condition *G.glabra* L. is drought tolerant [1,21].

*G.glabra* L. and *A.pseudalhagi* are rich with protein on their biochemical content, as well as they are valuable fodder plants [13,15, 18,19].

## **5. Peennial wheaty-leguminous-grassy hole-meadows fomation class**

This formation class is presented with two formations: a) *Cynodonetum-Alhagiosum* and b) *Cynodonetum-Glycyrrhizosum*. The plant cover of formation class form an intrazonality at hole-meadow vegetation.

***Cynodonetum-Alhagiosum* formation** consists of *Cynodoneosum dactylon-Alhagiosum pseudalhagi* association. Plant cover of association was noted at winter pasture area of Beylagan region which situated at southern part of Mil steppe in Kura-Araks lowland. At this point the *Cynodonetum-Alhagiosum* formation is distributed at Mugan massive in Saatli region at Mil (Imishli region) and at State soils near Jalilabad region.

The edificators of the phytocenosis- *Cynodon dactylon* (L.) Pers. and *Alhagi pseudalhagi* (Bieb.) Fisch. form main cover. This vegetation is formed at the salty gray-meadow soils. At the species content of formation 19 species are noted.

Dominate of this formation is *Alhagi pseudalhagi* (Bieb.) Fisch., abundance is in 4 points and subdominate is *Cynodon dactylon* (L.) Pers., abundance is in 2-3 points. Whole project cover is between 60-80%.

Based on the literature references it is important to note that *Glycyrrhiza glabra* L. is perennial plant with high fodder quality; cattles eat this plant sufficiently [6,13, 15,18,19].

***Cynodonetum-Glycyrrhizosum* formation** consists of *Cynodonetum dactylon-Glycyrrhizosum glabra* association.

Plant cover of association is spread as spots at gray-meadow and alluvial-meadow soils in Agjabadi region which situated along Kur river at Mil steppe. At this formation especially at hole relief as well as at glades of tugay forests along Kur river the leguminous plants form thickets [17].

Dominate of this association is *G.glabra* L., abundance is in 3 points and subordinate is *Cynodon dactylon* (L.) Pers., abundance is in 2 points. In the species content there are 15-20 species. Whole project cover is between 60-90%.

## **6. Different-grassy-leguminous hole-meadows formation class**

This formation class include *Limonietum-Alhagiosum* formation and *Limonietum meyeri-Alhagietum pseudalhagi* associations.

This phytocenosis was noted at weakly salty gray-meadow soils microrelief in Kurdamir region at Shirvan steppe.

In the species content of formation 23 species of higher plants are found. Dominate of this phytocenosis is *Alhagi pseudalhagi* (Bieb.) Fisch., abundance is in 3-4 points and subordinate is *Limonium meyeri* (Boiss.) O.Küntze, abundance is in 2-3 points. Whole project cover is between 70-80%.

In the species content of phytocenosis main fodder plants such as *Lolium rigidum* Gaudin, *Bromus japonicus* Thunb., *Salsola dendroides* Pall. etc. Were found; beside that at this plant cover *Lagonychium farctum* (Banks. et Soland. Bobr., *Xanthium spinosum* L. etc. herbs are distributed.

## **7. Leguminous –wheaty-grassy-hole-meadows formation class**

This formation class which found at hole-meadow vegetation type is presented with two formations. These formations are *Alhagietum-Cynodonosum* and *Glycyrrhizetum-Cynodonosum*.

***Alhagietum-Cynodonosum* formation** is presented with *Alhagietum pseudalhagi-Cynodonosum dactylon* association.

Plant cover of association is found at gray-meadow soils in Shurabad-Mashadi Hasanli winter pasture areas of the Khisi region of Samur-Shabran lowland and at alluvial meadow of Sumgayitchay valley (Absheron peninsula).

It is important to note that at *Alhagietum-Cynodonosum* the dominate of phytocenosis is *C.dactylon*, abundance is in 3 points and subordinate is *A.pseudalhagi*, abundance is in 2 points. Whole project cover is between 40-70%.

***Glycyrrhizetum-Cynodonosum* formation** is presented with *Glycyrrhizetum glabra-Cynodonosum dactylon* association.

Plant cover of association is registered at slanting meadow and gray-meadow soils between Turyanchay and “Bichagchi” aryks in Zardab region which situated in Shirvan meadow.

In the species content of phytocenosis 27 species of higher plants are found. From them 4 species (14,8%) are shrubs, 2 species (7,4%) subshrubs, 15 species (55, 6%) perennial and 6 species (22, 2%) are annual herbs. On ecological groups 9 species (33,3%) are xerophytes, 12 species (44,4 %) mesophytes, 4 species (14, 8%) mesoxerophytes and 2 species (7,5%) hydrophytes.

Dominate of this formation is *Cynodon dactylon*, abundance is in 3 points and subordinate is *G.glabra*, abundance is in 2 points.

According to the structure of phytocenosis three layers were observed: at I layer *T. ramosissima* Ledeb., *Rubus anatolicus* (Focke) Focke ex Hausskn.) etc. shrubs (height in 200-110 sm), at the II layer *Glycyrrhiza glabra* L., *Salsola dendroides* Pall. etc. herbs were studied. Whole project cover is between 70-80% (thick cove mainly consists of *Cynodon dactylon* (L.) Pers.

## CONCLUSION

During geobotanical researches conducted at hole-meadow vegetation of Azerbaijan it was determined that phytocenosis which observed with dominance and subdominance of leguminous plants consist of 1 type, 7 formation classes, 9 formation groups and 11 associations. Leguminous plants which found at phytocenosis such as *Glycyrrhiza glabra* L., *Alhagi pseudalhagi* (Bieb.) Fisch., *Lagonychium farctum* (Banks. et Soland.) Bobr., *Vicia cinerea* Bieb. etc. are the main fodders of animals with the other fodder plants such as *Cynodon dactylon* (L.) Pers., *Limonium meyeri* (Boiss.) O.Küntze, *Lolium rigidum* Gaudin etc. At the result of the reduction of some researched phytocenosis reserves it is important the conservation and protection of them, because they have a great importance in development of agriculture and cattle-breeding, as well as in increasing of fodder reserves at winter pastures.

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