

Legumes Dominated Steppe Vegetation Type in the Flora of Azerbaijan

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Abstract: During the research legumes dominated steppe vegetation type found in the flora of Azerbaijan has been studied, the classification scheme was prepared and the area of distribution for this vegetation was determined and shown for the first time in "The ecological-geobotanical map of some phytocenoses formed by legumes in natural vegetation of Azerbaijan".

Keywords: steppe, legumes, ecological-geobotanical map, flora, desert, endemic

1 Introduction

A variety of physical, geographical and natural historical conditions of Azerbaijan Republic provides the richness of the flora and forms the colorful vegetation of the region. Steppe vegetation type found in this flora has particular importance. Thus, there are many plants with high forage value in the steppe phytocoenosis [15; 16]. Steppes have great importance for agriculture and economics. Steppes have formed mainly in soils under agricultural crops.

In addition to different important plants, the formations found in the steppe vegetation include valuable rare and endangered legumes. Legumes growing along with cereals in steppes are considered the additional source of nitrogen. It should also be noted that legumes dominated steppe vegetation type studied by us plays a significant role in the plant cover of Azerbaijan. Based on our studies, it was determined that the dry steppe vegetation formed by legumes was found at 1100 m to 1300 m, 700 m to 1000 m and 500 m to 700 m above sea level, as well as in relief of various forms below forest zones and in gray-brown soils [7; 11; 23].

The data on floristic and phytocenological studies of steppe vegetation may be found in monographies of many botanists as Grossheim [6]; Prilipko [19]; Isayev [13]; Hajiiev *et al.*, [8]; Hajiiev *et al.*, [9]; Nuriyev [18]; Gurbanov [3, 4]; Hatamov [10]; Ibrahimov [12]; Shukurov [21] and others.

According to Prilipko [19] and Shennikov [20] the concept of "steppe" is determined by xerophytic edificators of steppe vegetation associations, particularly by turf-forming grasses and individual shrubs. Hatamov [10] describes steppe vegetation as vegetation type with dominance of xerophytic, turf-forming cereals, heat and frost-resistant,

with surface and underground parts joined together, mainly spread in soils rich in calcium carbonate and having root collars located in soil. Shukurov [21] notes that according to Prilipko [19] dry steppes are spread in north-eastern regions of Azerbaijan and once spread over a wide area by forming zonation this vegetation currently has the area of distribution reduced to a small spot. The main reason for this is a strong influence of anthropogenic factors on this vegetation.

2 Materials and Methods

The legumes dominated steppe vegetation type in the flora of Azerbaijan was studied by us in 2007-2015. These studies determined that this vegetation type was formed in lower mountain belts of the Greater and Lesser Caucasus, Gobustan, Bozdagh-Jeyranchol, Nakhichevan Autonomous Republic of Azerbaijan, Talish (Lankaran).

The findings were reflected in "The ecological-geobotanical map of some phytocenoses formed by legumes in natural vegetation of Azerbaijan [5].

During the research we have determined that among the botanical-geographical regions of the country the phytocenoses of Talish and Nakhichevan AR are richer in species composition of steppe vegetation [3; 4; 12]. This study develops a classification scheme of dry steppe vegetation consisting of 1 type (steppe vegetation type), 2 formation classes (shrubby-leguminous-cereal-grassy dry steppes and different-grassy-leguminous dry steppes), 3 formation groups (Astracanthetum-Stiposum; Onobrychisetum-Festucosum; Artemisetum-Astracanthosum) and 4 associations (Astracanthetum caspica - Stiposum capillata; Onobrychisetum vaginalis - Festucosum rupicola; Artemisetum lerchiana-Astracanthosum microcephala). This classification scheme is provided in Figure 1. As seen from the classification scheme, in the

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legumes dominated steppe vegetation type species *Astracantha caspica* (Bieb.) Podlech., *Onobrychis vaginalis* C.A.Mey., *Onobrychis cyri* Grossh. and *Astracantha microcephala* (Willd.) Podlech. were evaluated as both dominant and subdominant species.

In the geobotanical description of species International Code of Botanical Nomenclature [14] was used for systematization of plant names and different methods were applied for studying life forms, phenological phases [1], rare and endangered species [22] as well as ecological groups and in field studies [20].

3 Results & Discussion

3.1 Shrubby-leguminous-cereal-grassy dry steppes formation class

This formation class includes two formation groups: *Astracanthetum – Stiposum* and *Onobrychisetum-Festucosum*.

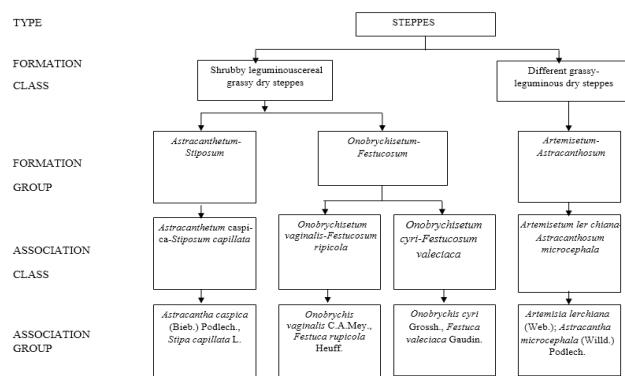


Figure 1. The classification scheme of legumes dominated steppe vegetation type in the flora of Azerbaijan

3.1.1 *Astracanthetum – Stiposum* formation group

This formation group was represented by *Astracanthetum caspica – Stiposum capillata* association. The association was recorded in Garayazi pasture 1 of Gobustan region located on the south-eastern slope of the Greater Caucasus, in light gray-brown soils (stony and shrubby slopes) at 676 m above sea level (**Table 1**).

Table 1. Species composition and structure of *Astracanthetum-Stiposum* formation.

Nº	Name of biomorphic plants	Ecological groups	Abundance (in points)	Average height (cm)	Phenological phases
1	2	3	4	5	6
<i>Shrubs</i>					
1.	<i>Astracantha microcephala</i> (Willd.) Podlech.	xerophyte	1-2	II (60)	flowering
2.	<i>Suaedadendroides</i> (C.A.Mey.) Moq.	Halophyte	1-2	II (40)	vegetative
3.	<i>Rhamnuspallasii</i> Fisch. et C.A.Mey.	xerophyte	1	I (120)	flowering
<i>Semi-shrubs</i>					
4.	<i>Salsoladendroides</i> Pall.	mesoxerophyte	1-2	II (80)	vegetative
5.	<i>Kochiaoprostrata</i> (L.) Schrad.	xerophyte	1	II (50)	vegetative
<i>Undershubs</i>					
6.	<i>Astracanthacaspica</i> (Bieb.) Poalech	xerophyte	2-3	III (30)	flowering-maturation of beans
<i>Semi-undershrubs</i>					
7.	<i>Thymuskarjaginii</i> Grossh.	xerophyte	1-2	II (70)	flowering
<i>Perennial herbs</i>					
8.	<i>Stipacapillata</i> L.	xerophyte	3-4	III (20)	flowering
9.	<i>Stipaszovitsiana</i> (Trin.) Griseb.	xerophyte	1-2	II (40)	flowering
10.	<i>Astragaluskabristanicus</i> Grossh.	xerophyte	1-2	III (30)	maturation of beans
11.	<i>Artemisiaierchiana</i> Web.	xerophyte	1-2	III (20)	vegetative
12.	<i>Bromussquarrosum</i> L.	xerophyte	1-2	III (10)	flowering
13.	<i>Elytrigiastrachophora</i> (Link) Nevski	xerophyte	1	II (30)	maturation of beans
14.	<i>Loliumrigidum</i> Gaudin.	xerophyte	1	II (50)	flowering
15.	<i>Medicagocaeulea</i> Less. ex Lebed.	xerophyte	1	II (45)	flowering
16.	<i>Bothriochloaishaemum</i> (L.) Keng	xerophyte	1	II (40)	flowering
17.	<i>Teucriumpolium</i> L.	xerophyte	1	III (30)	flowering
18.	<i>Poadensatroitzk.</i>	mesoxerophyte	1	III (25)	flowering
<i>Biennial herbs</i>					
19.	<i>Scorzoneralaciniata</i> L.	mesoxerophyte	1-2	II (20)	flowering
<i>Annual herbs</i>					
20.	<i>Medicagoarabica</i> (L.) Huds.	mesoxerophyte	1-2	III (25)	maturation of beans
21.	<i>Salviaviridis</i> L.	mesoxerophyte	1-2	III (15)	flowering
22.	<i>Astragalustribuloides</i> Delile	xerophyte	1	III (10)	abscission of beans

The total projective cover is equal to 60-80%

About 22 species were recorded in the species composition of this phytocenosis. From them 3 species (13.6 percent) are shrubs, 2 (9.1 percent) are semi-shrubs, 1 species (4.5 percent) is an undershrub, 1 (4.5 percent) is a semi-undershrub, 11 (50 percent) are perennial herbs, 1 (4.5 percent) is a biennial herb and 3 species (13.6 percent) are annual herbs. By ecological groups, 16 species (72.8 percent) are xerophytes, 5 (22.7 percent) are mesoxerophytes and 1 species (4.5 percent) is a halophyte. As noted in the classification scheme (Figure 1) and the geobotanical description (Table 1), *Stipa capillata* L. is the dominant species of *Astracanthesum caspica – Stiposum capillata* association and its abundance was evaluated by 3-4 points, while the abundance of subdominate *Astracantha caspica* (Bieb.) Podlech. was 2 to 3 points.

The structure of the phytocenosis consists of three stories: the first story included *Rhamnus pallasii* Fisch. et C.A.Mey. (120 cm in height); the second story included *Salsola dendroides* Pall. and the third level included *Stipa capillata* L., *Stipa szovitsiana* (Trin.) Griseb. and other herbs (40 to 70 cm in height). The total projective cover varied between 55 percent to 75 percent. It should be noted that the species *Collema cristatum* (L.) Web. related to mosses is sparsely distributed on the soil surface of the winter pastures where dry steppe vegetation is spread.

3.1.2 *Onobrychisetum – Festucosum* formation group

This formation group (*Onobrychisetum – Festucosum*) is composed of two associations: *Onobrychisetum vaginalis – Festucosum rupicola* and *Onobrychisetum cyri – Festucosum valeciaca*. This vegetation was observed in gray-brown soils of the Khizi district. *Festuca rupicola* Heuff. dominates *Onobrychisetum vaginalis – Festucosum rupicola* association with an abundance of 2 points and the subdominate *Onobrychis vaginalis* C.A.Mey. also has 2 points. 20-25 species were found in the species composition of the association. The total projected ground cover varied between 60 percent to 70 percent. The dominant species of *Onobrychisetum cyri – Festucosum valeciaca* association is *Onobrychis cyri* Grossh., its abundance was evaluated by 3 points, whereas the subdominate *Festuca valeciaca* Gaudin. has 2 points. 30-35 species were determined in the species composition of this association. The total projected ground cover varied between 70 percent to 90 percent.

It should be noted that *Astracantha caspica*, *Onobrychis vaginalis*, *O.cyri*, as well as *Festuca rupicola* and other species spread in shrubby-leguminous-cereal-grassy dry steppe vegetation are the main forage crops for large and small cattle in winter pastures and these plants are resistant to drought and frost. *Astracantha caspica* is an endemic species belonging to rare and endangered species of Azerbaijan [2].

3.2 Different grassy-leguminous dry steppe formation class

This formation class includes 1 formation group (*Artemisetum-Astracanthosum*) and 1 association (*Artemisetum lerchiana-Astracanthosum microcephala*). This vegetation was recorded in mountain gray-brown soils of Khizi at 935 m above sea level around Baybayim mountain. *Astracantha microcephala* (Willd.) Podlech. dominates the association with an abundance of 3 points, whereas the subdominate *Artemisia lerchiana* Web. has 2 points. The study determined that the formation classes of dry steppe vegetation were spread at 500 m to 900 m above sea level and were replaced by semi-desert phytocenoses in the lower regions [17]. It was concluded that the species composition and structure of the formations in both vegetation types differ from one another.

4 Conclusion

The research conducted shows that from the legumes recorded in the three formation groups (*Astracanthesum – Stiposum*; *Onobrychisetum-Festucosum*; *Artemisetum-Astracanthosum*) the species *Astracantha caspica* (Bieb.) Podlech., *Onobrychis vaginalis* C.A.Mey., *Onobrychis cyri* Grossh. and *Astracantha microcephala* (Willd.) Podlech. play a significant role in strengthening a forage base and enhancing soil fertility and their preservation should be one of the most important issues.

It should also be noted that *Festuca rupicola* Heuff., *Stipa capillata* L. and other cereals found in the studied steppe vegetation type along with the legumes are drought and frost-resistant species and are considered the primary source of food for large and small cattle in winter pasture areas. Taking into account that numerous valuable, rare and endangered species recorded in the legumes dominated steppe vegetation of Azerbaijan (*Astracantha caspica* (Bieb.) Podlech. and others) have high forage value, their preservation is of great importance to agriculture and economy of the country.

References

- Cherepanov S.K. *Vascular plants of Russia and adjacent states the former USSR*. Cambridge University Press. Cambridge, USA, 1995, 992 pp.
- Flora of Azerbaijan*. Publishing House of Academy of Sciences Azerbaijan Soviet Republic, Baku, Azerbaijan. vol.I to VIII, 1950 to 1961.
- Gurbanov E.M. Plant world of Nakhichevanchay river basin. Baku State University. Baku, Azerbaijan, 1996, 248 pp.
- Gurbanov E.M. Flora and vegetation of Atropatena province (within Azerbaijan Republic). utoreferat of dissertation for the degree of doctor of biological sciences. Baku, Azerbaijan, 2004. 59 pp.

5. Gurbanov E.M., Mammadova Z.J. The ecological-geobotanical map of some phytocenoses formed by legumes in natural vegetation of Azerbaijan. Copyright Agency of Azerbaijan Republic. Certificate #7462 about registration of work. Baku, Azerbaijan, 2013.
6. Grossheim A.A. Plant cover of the Caucasus. "MOIP" Publishing house. Moscow, Russia, 1948, 267 pp.
7. Hajiye V.J. Map of plant cover of Azerbaijan (scale 1:600 000). Azerbaijan State Land and Mapping Committee. Baku, Azerbaijan, 2005.
8. Hajiye V.J., Kulyeva Kh.G., Vahabov Z.V. Flora and plants cover of Talish high mountains. Publishing house "Science", Baku, Azerbaijan, 1979. 150 pp.
9. Hajiye V.J., Aliyev D.A., Guliyev V.Sh. et al. The plants of high mountains growing in the Lesser Caucasus. Publishing house "Science", Baku, Azerbaijan, 1990. 212 pp.
10. Hatamov V.V. Steppe vegetation of Azerbaijan. Science: Baku, Azerbaijan, 2002. 264 pp.
11. Instruction for indexes, transcription and color marks of typological classification units of natural forage areas of Azerbaijan Republic. Baku, Azerbaijan, "Vatan", 2004, 48 pp.
12. Ibrahimov A.Sh. The vegetation of Nakhchivan Autonomous Republic, its productivity and botanical-geographical zoning. Abstract of dissertation for obtaining the degree of doctor of sciences in biology. Baku, Azerbaijan. 2007. 44 pp.
13. Isayev Y.M. Vegetation of winter pasture of Azerbaijan, its forage importance. Abstract of dissertation for competition of doctor of biological sciences academic degree. Baku, Azerbaijan, 1957, 35 pp.
14. *International Code of Botanical Nomenclature* /Leningrad, 1975; Sidney, 1983; Saint Louis, 1999.
15. Mammadova Z.J. Leguminous phytocenoses spread in the shrub vegetation of upland xerophytic and mountain steppe belt. Bulletin MSOU, Series of "Natural sciences", №5. Moscow, 2014. pp. 32-34.
16. Mammadova Z.J. The role of legumes met in the steppes of the western part of Azerbaijan, in the strengthening of forage reserves. Scientific-practical conference on actual problems of contemporary biology and chemistry dedicated 92nd anniversary of Heydar Aliyev. I part. Ganja, Azerbaijan, 2015. pp. 64-65.
17. Mammadova Z.J., Gurbanov E.M. Legumes with new areas of distribution determined in the flora of Azerbaijan. Jokull journal (ISSN: 0449-0576). Volume. 66, Issue. 1. Iceland, Jan.2016. P.16-23.
18. Nuriyev R.M. Flora and vegetation of the mountain steppe of Nakhchivan ASSR. Abstract of dissertation for competition of doctor of biological sciences academic degree. Baku, Azerbaijan, 1978, 26 pp.
19. Prilipko L.I. Plant cover of Azerbaijan. "Science" Publishing house, Baku, Azerbaijan, 1970, 319 pp.
20. Shennikov A.P. *Introduction to Geobotany*. Publishing House of the Leningrad University, Leningrad, Russia, 1964, 447 pp.
21. Shukurov E.S. Flora, plant cover of the northern-western regions of Azerbaijan, protection of biodiversity and productivity use. Abstract of dissertation for obtaining of candidate of biological sciences degree. Baku, Azerbaijan, 2003, 26 pp.
22. The Red Book of Azerbaijan Republic. Rare and endangered species of plants and fungi. (Second edition). Publishing House "East-West". Baku, Azerbaijan, 2013. 676 pp.
23. Whole Geographical Map of Azerbaijan Republic (scale in 1: 500 000). Baku. State Soil and Map Drawing Committee; 2005.