



Assessment of the populations of the species *Medicago glutinosa* Bieb. in the flora of Azerbaijan

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Abstract

When studying the species composition of phytocenoses produced by legumes in mountain xerophytes, steppes, subalpine and alpine meadows of various botanical geographical regions of Azerbaijan, new distribution areas of 18 species of legumes were identified. One of the species with newly defined range is *Medicago glutinosa* Bieb. During the research an assessment of the current status of populations of this species was conducted, their ontogenetic structure, age spectra, phytocenoses it formed, species composition, structure were studied and endemic, rare and endangered plants here were discovered, as well as opportunities for the adaptation to environmental conditions were identified. During the study assessment on IUCN criteria was conducted. The species *Medicago glutinosa* Bieb. was referred to as the “Least Concern” (LC).

Keywords: populations, *Medicago glutinosa*

Introduction

Of the 60 species of medick genus (*Medicago* L.) which belong to the legume family (*Fabaceae* Lindl.) and distributed in the Mediterranean countries, 20 are found in Azerbaijan, of which one species is cultivated [2, 8]. Thus, the species belonging to this genus are annual and perennial herbaceous plants, leaves are ternate with stipules. The beans are few-seeded, sickle or kidney-shaped, spirally twisted, usually thorny. Most of them are fodder plants. The high protein and fatty substances and low cellulose in the content of the genus indicate that they are of great nutritional value [8, 12]. The species included in the genus are distributed in all regions of Azerbaijan from lowland to middle mountain range, in different growing conditions, especially in arid lands, grassy slopes, stony-gravelly, clayey soils, gardens and plantations, among weeds, glade areas of the forest and meadows [3, 9, 13]. The representatives of genus are rich in the composition of grasses in hayfield and pasture meadows, which increases their feed value ratio. One of the species of the genus with such a high feed value is the species *Medicago glutinosa* Bieb.

Wild species of the genus are little studied. There is a lot of variation in traits due to hybridization between species [1, 5, 6]. The species *Medicago glutinosa* Bieb. of the genus is an endemic species of Azerbaijan, and there is a great need to collect detailed information about it and specify its habitats. Therefore, the current state of populations of the species *Medicago glutinosa* Bieb. Was studied by us and its new habitats were identified.

Thus, cenopopulation studies conducted in modern times are indispensable for the efficient use of economically important plants, restoration of natural cenoses, creation of agrophytocenosis, conservation of endemic, rare and endangered species [10, 11]. Recently, the development of practical measures for the efficient use of biological resources and conservation of plants has been carried out at the level of cenopopulation research around the world.

In view of this, for the first time the dynamics of development of cenopopulations of the species *Medicago glutinosa* Bieb. with new distribution areas discovered in the

flora of Azerbaijan were studied, its viability was assessed, as well as opportunities for adaptation to environmental conditions were identified.

Materials and Methods

The species *Medicago glutinosa* Bieb. of the genus *Medicago* L. widespread in the flora of Azerbaijan was taken as a research material. While conducting research in various botanical and geographical regions of Azerbaijan, the species *Medicago glutinosa* Bieb. found in the region, mainly in the east of the Greater Caucasus (Guba region), in the upper mountain belt, rarely in bushes, on clayey-stony rocks is also found in the association *Viciaetum pannonica-Festucosum rupicola*, in the summer pastures and mountain forest-meadow soils of Astara region located in the mountainous part of Lankaran. The goal is to assess the current state of the population of this species in the new distribution range (2013-2015). During the studies of cenopopulation, only young and transition-type cenopopulations were observed, no crisis situation was noted, and the type of viability was “in developing”. Based on the observations, an assessment on IUCN criteria was also made, the species *Medicago glutinosa* Bieb. is classified as a “Least Concern” (LC) [1, 3, 18].

The methods developed by T.A. Rabotnov, A.A. Uranov and their schools were used to study the assessment of cenopopulations of the studied species [15, 19, 20, 21].

In sample areas, limits of all individuals were calculated according to age states, density of cenopopulation was estimated at 1m² with quantity and population indicators such as restoration index I_r, replacement index I_r, age index Δ, effectiveness index ω were used [11, 21].

The main indicators of the viability of the cenopopulation were assessed according to the classification of A.P. Ishbrid and Yu.A. Zlobin [11, 21]. The viability of cenopopulation (Q-vitality) was classified as follows according to Yu.A. Zlobin:

1. Cenopopulation in developing - (Q=1/2(a+b))>c;
2. Cenopopulation in equilibrium - (Q=1/2(a+b))=c;
3. Cenopopulation in crisis - (Q=1/2(a+b))<c.

According to A.P.Ishbrid ^[11], vitality is calculated using the vitality index, which is in a state of development, equilibrium and crisis (I_Q - vitality;). In determining the viability of the population, young, middle-aged and old states of generative organs were taken as a basis and the age state of cenopopulations of the studied species was determined ^[15, 17, 19].

During geobotanical and fluorostatic studies, the species composition, structure of the association *Viciaetum pannonica-Festucosum rupicola* of the formation *Thymuseta-Vicioetum-Festucosum* of forb-legume-grass meadow-steppe formation class of meadow-steppe vegetation type were determined, assessment was implemented according to the species criteria. Ecological-geobotanical, as well as many methods were used in the determination of plants, as well as endemic, rare and endangered species found there by systematic taxa, as well as in the study of life forms ^[4, 7, 14, 16, 18].

Results and their discussion

The species *Medicago glutinosa* Bieb. is a perennial herb plant with a height of 30-60 cm, stem is procumbent, ascending-erecting, densely leafy. Stipulas are subulate, sharp at the tip, the leaves are elongated oval. The leaves are 5-7 mm wide and 5-20 mm long. The number of flowers in the inflorescence is up to 7-40. The flowers are bright, golden-yellow, sometimes the petals are light blue, up to 8-12 mm long. It forms an abundant green mass, often with long stems. The root system of the glandular medick is strong and spreads to a depth of 50-60 cm in the soil, forming a large number of small roots. This characteristic of the root system has a great impact on the improvement of soil structure. The beans are twisted, spiral-shaped (1-3). The diameter is 6-9 mm. It blooms in June-July and bears fruit in July ^[2, 8, 18].

It is widespread in Azerbaijan mainly in the east of the Greater Caucasus (Guba region), in the upper mountain belt, rarely in bushes, clayey-stony rocks ^[2, 8, 18].

The studies were carried out in meadow-steppe vegetation type, the association *Viciaetum pannonica-Festucosum rupicola* of the formation *Thymuseta-Vicioetum-Festucosum* of forb-legume-grass meadow-steppe formation class, in summer pastures, mountain forest-meadow lands of Astara region located in the mountainous part of Lankaran. The species *Medicago glutinosa* Bieb. which is sparsely distributed in the vegetation of this association under study has been identified as a species with new distribution range for the mountainous part of Lankaran.

During the study current state, ontogenetic structure, age spectra of cenopopulations of the species *Medicago glutinosa* Bieb. were studied in the new distribution area. Changes in age states depending on the type of vegetation and the location of occurrence were observed (Table 1).

Table 1: The structure of the ontogeny of the cenopopulation in which *Medicago glutinosa* Bieb. species is spread

CP	Ontogenetic age states									Σ
	j	im	v	g ₁	g ₂	g ₃	Ss	s		
ICP	2013	8	9	16	17	15	11	-	-	76
	2014	9	11	12	14	14	13	8	-	81
	2015	7	14	12	12	10	8	2	4	69
	Σ	24	34	40	43	39	32	10	4	226
	%	10,6	15	17,7	19	17,2	14,1	4,4	1,8	99,8

Ontogeny of the studied species *Medicago glutinosa* Bieb. was normal in the *Viciaetum pannonica-Festucosum rupicola* association. All age states of ontogeny, including subsenile and senile age states, were observed during cenopopulation studies. The ontogenetic spectrum had to be characteristically centralized according to the biology of the species. Studies have shown that the cenopopulations of the *Medicago glutinosa* Bieb. species in the field of study are resistant to various ecological and phytocenotic conditions, some are complete with members, some are incomplete with members (it was incomplete due to the absence of subsenile and senile individuals in cenopopulations in 2013-2014) and ontogenesis ended with a variant of low morphogenesis: primary sprout - main axis.

The restoration of cenopopulations of species and ontogenetic state have gone more vegetatively. It should be noted that the reason for the incompleteness of cenopopulations in the areas where the species *Medicago glutinosa* Bieb. is widespread is connected with the exposure of this area to strong anthropogenic and various negative environmental influences.

During the assessment of the cenopopulations of the species *Medicago glutinosa* Bieb., young and transition cenopopulation types were identified (Table 2).

Table 2: Assessment of cenopopulations of the species *Medicago glutinosa* Bieb.

CP type	Ontogenetic age states, in %									Indexes			
	j	im	v	g ₁	g ₂	g ₃	ss	s	I _r	I _r	Δ	ω	
Young	2013	10,5	11,8	21	22,4	19,7	14,5	-	-	0,77	0,77	0,30	0,60
Transition	2014	11,1	13,6	14,8	17,3	17,3	16	9,9	-	0,78	0,65	0,36	0,57
Young	2015	10,1	20,3	17,4	17,4	14,5	11,6	2,9	5,8	1,1	0,92	0,31	0,51

The types of cenopopulation were young in 2013 ($\Delta\omega=0,30-0,60$) and 2015 ($\Delta\omega=0,31-0,51$) and transition ($\Delta\omega=0,36-0,57$) in 2014.

Based on the results obtained, an assessment was also conducted on IUCN criteria. The species *Medicago glutinosa* Bieb. is classified as “Least Concern” (LC). Populations of this species were identified as relatively endangered. It should be noted that unsystematic grazing and anthropogenic impacts are the main reasons for the weakening of population development. As a result of inefficient use of phytocenoses found in the studied species, the soil vegetation was degraded, many useful forage plants found there, as well as endemic, rare and endangered species, were in danger of extinction.

The species *Medicago glutinosa* Bieb. in the Greater Caucasus is especially more common in Gonagkend area, seeds of the species *Medicago glutinosa* Bieb. were collected from that area and research works were carried out for their cultivation in the experimental area with desert vegetation type in Absheron peninsula. First, the quality of the seeds was studied. Certain rules were followed to prepare the soil for planting.

Seedlings formed from seeds sown in plowed soil in autumn began to grow rapidly in early spring. Despite the fact that sometimes the winter is frosty, seedlings of the species *Medicago glutinosa* Bieb. didn't perish in conditions with desert type of vegetation in Absheron peninsula. It was found that its young seedlings are resistant not only to cold, but also to drought, due to the development of the root system as needed before the onset of heat.

The species *Medicago glutinosa* Bieb. completed its vegetation period as in natural conditions forming a good bush in the clayey, saline-clayey soil in the background of sagebrush-saltwort groups in the desert condition. Under these conditions, the normal vegetation of the species *M. glutinosa* in the bogharic form indicates that it is not only a xerophyte, but also a partial xerohalophyte plant.

During the study, the dynamics of development of cenopopulations of the species *Medicago glutinosa* Bieb. were studied and it was determined that cenopopulations are both normal and fragmented (diagram 1). The dynamics of the cenopopulation of this species was observed in the association *Viciaetum pannonica-Festucosum rupicola* of the formation *Thymuseta-Vicioetum-Festucosum* in the mountainous part of Lankaran, which is a new distribution area. Restoration intensity increased to $I_b=1,1$. The observation of two peaks in the development dynamics of 2013 led to an increase in density. This is due to the long vegetation period in that group of plants. Such deviations are one of the factors hindering the future development of the species, resulting in latent fluctuations. Therefore, long-term monitoring should be carried out in the area.

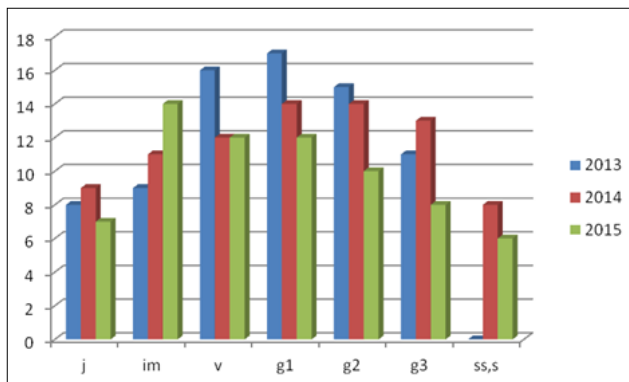


Fig 1: Dynamics of development of the species *Medicago glutinosa* Bieb. in the new distribution range for 2013-2015

Based on the results of cenopopulation studies, the viability of the species *Medicago glutinosa* Bieb. was also assessed. It was determined that, in areas where the species *Medicago glutinosa* Bieb. is widespread, as well as in *Viciaetum pannonica-Festucosum rupicola* association (in the Astara region) which is a new distribution area, viability was vegetative in 2013 and 2015, and generative in 2014. No crisis situation was observed. For 3 years, the type of viability of the cenopopulation was “in developing”.

Conclusion

During the phytocenological study the species *Medicago glutinosa* Bieb. in the *Viciaetum pannonica-Festucosum rupicola* association in summer pastures, in mountain forest-meadow lands of Astara region located in the mountainous part of Lankaran has been identified as a species with a new distribution area for the mountainous part of Lankaran.

All age states of ontogeny, including subsenile and senile age states were observed during the cenopopulation studies of the species *Medicago glutinosa* Bieb.

During cenopopulation studies of the species *Medicago glutinosa* Bieb., which is considered the most valuable of perennial natural clovers, young and transition types of cenopopulation were also identified. It has become clear that populations of species are relatively endangered. It was

found that unsystematic grazing and anthropogenic impacts were the main reasons for the weakening of population development, as a result, the soil vegetation were degraded, many useful forage plants found there, as well as endemic, rare and endangered species, were in danger of extinction.

During the study, an assessment was made according to the species criteria. The species *Medicago glutinosa* Bieb. was referred to as “Least Concern (LC)”.

In areas where the species *Medicago glutinosa* Bieb. is widespread, as well as in *Viciaetum pannonica-Festucosum rupicola* association which is a new distribution area, the type of viability of the cenopopulation was “in developing” during 3 years. No crisis situation was observed.

Depending on the natural bioecological conditions of the species *Medicago glutinosa* Bieb., which is not yet sufficiently studied in the flora of Azerbaijan, both naturally and under cultivation, its more valuable forms should be obtained in terms of feed quality by studying the intraspecific systematics. It is recommended to cultivate this species in bogharic condition of Azerbaijan in dry conditions. *Medicago glutinosa* Bieb. is also an important forage crop for hayfields and pastures, and due to its xerophytic features in its morphological structure, it yields even better when planted with a mixture of other forage plants.

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