

MORPHOLOGICAL INDICATORS AND MYCOBIOTA OF *ORCHIS SIMIA* LAM. PLANT GROWN IN TWO DIFFERENT ENVIRONMENTAL CONDITIONS (AZERBAIJAN)

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<https://doi.org/10.5281/zenodo.13842121>

Abstract. The article is devoted to the study of ecological, morphological features of the plant and mycobiota of the rhizosphere of the territories of natural distribution of the *Orchis simia* Lam. plant in the Khizi and Shabran regions of Azerbaijan in 2022-2023. A total of 6 soil samples and 10 plant samples were taken for analysis. Research shows that the morphological indicators of the plant depend on environmental conditions and the composition of mycorrhiza.

Keywords: *orchis simia* Lam., salep, morphometric parameters, mycorrhiza.

Introduction. Orchid refers primarily to plants with exotic flowers that grow in tropical climates. However, there are other groups of terrestrial orchids that are naturally distributed throughout the country, some of which are known as salep orchids because a substance called salep is obtained from their roots. The Orchidaceae family is one of the largest families of flowering plants in the world, accounting for approximately 1/10 of all flowering plants edirlər [2]. According to the latest data, in Azerbaijan the genus is represented by 21genuses and 54 species [7].

So, orchids are considered a natural treasure with very small seeds that have no analogues. The unique feature of these seeds is that they do not have endosperm, cotyledon leaves and germinal tubercle. From this point of view, the presence of suitable conditions (light, heat, humidity) and symbiotic relationships with mycorrhizal fungi is important to ensure seed germination, development and growth of protocorms. However, depending on the species, the lifespan of seeds can vary from 2 months to 18 years.

It is also known from the literature that orchids are myco-heterotrophic during germination and many species depend on fungi as a carbon source until maturity [3].

As mentioned, the extraction of a substance called salep from tubers, which is widely used in medicine and food industry, has recently led to an increase in the extraction of tubers and a reduction or even complete destruction of such plants. For one reason or another, biodiversity in nature has been sharply declining in recent years [5]. In this regard, the study of orchid physiology is important for the proper use and conservation of their species resources [8].

Therefore, *Orchis simia* Lam of the genus *Orchis* L, widespread in the territory of the Khizi and Shabran regions of Azerbaijan, was used in the research work. The ecological indicators of the distribution areas of the plant species, the micromycete composition of soil samples taken from the rhizosphere, as well as the morphological indicators of plant samples were studied.

Materials and methods The research work was carried out in April-May 2022-2023 using demographic and geobotanical methods in the territory of the Khizi and Shabran regions located in the north-eastern part of the Greater Caucasus in Azerbaijan.

Orchis simia Lam (Monkey orchid) of the genus Orchis L. was taken as the object of the study.

Climate and edaphic factors of the research areas. According to geobotanical zoning, the Khizi and Shabran districts belong to the botanical-geographical region of the Guba mountain range of the Greater Caucasus. The Khizi district has a mild, hot climate with dry summers, while the Shabran district has a semi-desert and dry desert climate with mild winters and dry, hot summers [6].

For the integral characterization of the ontogenetic structure of the studied cenopopulation, quantitative indices ($\bar{I}_r, \bar{I}_{rep}, \bar{I}_a$) developed by L.A.Zhukovo and Glotovo were calculated. And demographic indicators (Δ - age index, ω - efficiency index.) were calculated according to Uranov and Zhivotzky.

Soil samples were taken according to standards (ГОСТ 17.4.3.01-83 ГОСТ 17.4.4.02-84). Mycological analyzes were performed on the collected soil samples.

Results and discussion. The monkey orchid was studied in relatively open areas (602-656 m above sea level) around the village of Altiagaj, in the oak forest (Quercuse to Carpinusetum) of the village of Gizilgazma, Khizi district (at an altitude of 768-1016 m above sea level). At the time of the research, the projective cover of the herbaceous layer was about 70% and 80%. In the area of the village of Galaalti, Shabran district (696 m above sea level), the object of study was studied in oil pumps in the hornbeam-birch forest (Carpinuseto-Aceretum), and in these areas the projective cover of the herbaceous layer was 75-80%. The distribution of the studied plant at the level of cenopopulations (cp) in both regions was diffuse-group. In rare cases, it is also found singularly.

The soil of the studied plant, collected in the territory of the Khizi district, corresponds to the clay type, and in the area of the Shabran district – to the mountain-brown type of soil. This is consistent with the literature data [6].

During field studies conducted in 2022 and 2023, the environmental indicators of the regions were reflected as follows.

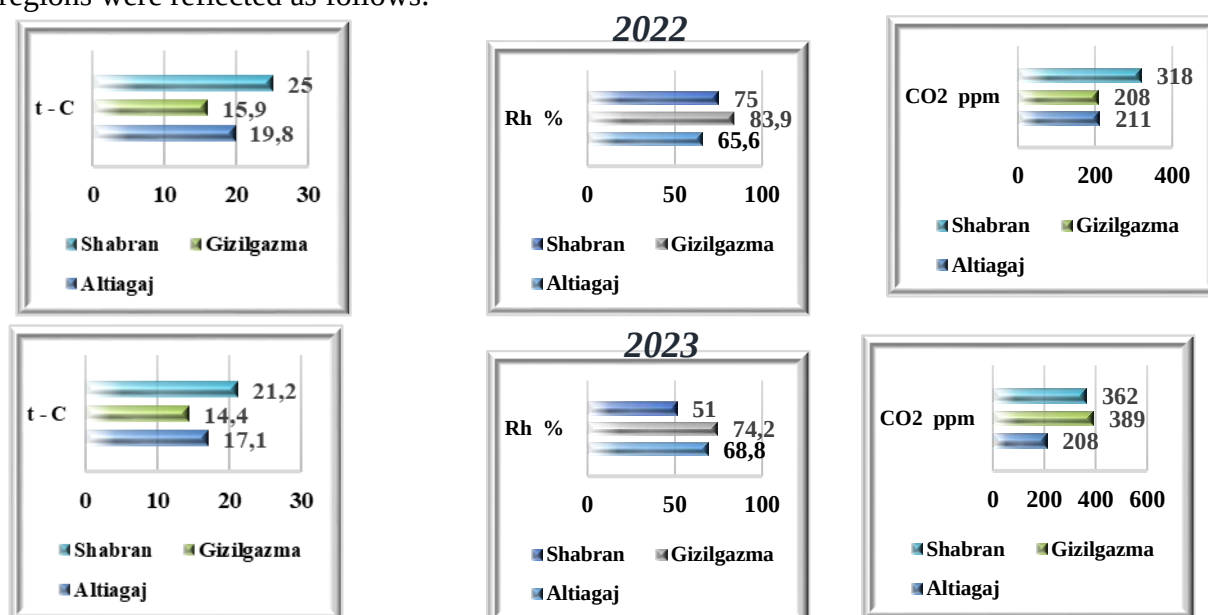


Figure 1. Air temperature, humidity, amount of carbon dioxide in the studied areas in 2022 and 2023.

During the research, some demographic indicators and morphometric indicators of the hay population based on GPS coordinates, percentage indicators of vegetative and generative individuals and the number of individuals in the age group in the study areas of the plant are presented in the following table (Table 1) (morphometric indicators of plants were carried out on 10 generative individuals).

The area where the plant was collected		Gps	Plant height (cm)	Length of inflorescence (cm)	Number of flowers (in numbers)	sheet length (cm)	Sheet width (cm)	Percentage indicators of vegetative and generative individuals		İ _r	İ _{rep}	I _a	Δ	ω	Δ-ω görə sp-nün tipi													
V%	G%																											
2022																												
Shabran-Galaaltı CP III	Khizi- Gizilgazma CP II	Khizi-Altiagaj CP I	40°54'8'' 049°1'55''	40°54'18'' 049°5'20''	40°54'43'' 049°0'11''	28.4±1.22 (3.99%)	29.8±1.042 (3.50%)	28.4±2.742 (11.50%)	7.4±0.294 (3.98%)	8.9±0.566 (5.83%)	7.2±0.416 (5.58%)	25±0.864 (3.08%)	9.7±0.836 (8.66%)	4.1±0.181 (4.42)	42.9	57.1	2	1.33	0.14	0.22	0.41	young						
2023																												
Shabran-Galaaltı CP VI	Khizi- Gizilgazma CP V	Khizi-Altiagaj CP IV	41°6'12'' 048°54'53''	41°13'46'' 048°56'29''	40°53'34'' 049°0'32''	28.2±0.636 (2.26%)	24.8±0.562 (2.26%)	21.9±1.64 (7.47%)	5.17 ±0.144 (2.79%)	5.17 ±0.144 (2.79%)	6.5±0.662 (±10.24%)	26.3±3.31 (12.57%)	35.67 ±1.44 (4.04%)	6.3 ±0.334	5.6 ±0.401	2.8±0.237 (8.58%)	2.4±0.141 (5.89)	2.8±0.237 (8.58%)	41.7	58.3	0.71	0.71	0	0.2	0.58	0.45	young	aged
53.3	46.7	0.53	0	0.26	0.56	young																						

Table 1. Some demographic indicators and morphometric indicators of the studied cenopopulation of the species *Orchis simia* Lam. in the Khizi and Shabran regions $\dot{I}_r$ - regeneration index, $\dot{I}_{rep}$ - replacement, I_a - aging index, Δ - age index, ω - efficiency indicator.

CP I- Khizi-Altiagaj, CP II- Khizi- Altiagaj, CP III- Khizi-Gizilgazma, CP IV- Khizi-Gizilgazma, CP V- Shabran, CP VI- Shabran

Based on the results obtained, it can be said that the morphometric parameters of the *Orchis simia* plant species in all three sites in 2022 were higher.

During the research, a mycological analysis of soil samples taken from the rhizosphere of the monkey orchid plant was also carried out (Table 2).

Species \ Area	Khizi Gizilgazma 2022/2023	Altiagaj 2022	Shabran Galaaltı 2023
<i>Absidia ramosa</i>			+
<i>Alternaria alternata</i>	++	+	+
<i>Aspergillus niger</i>	++	+	+
<i>A.ochrcseus</i>	+		
<i>A.versicolor</i>			+
<i>Cladosporium cladosporioides</i>	+		+
<i>Fusarium semitectum</i>			+
<i>F. culmorum</i>	+		
<i>F.oxysporium</i>	++	+	
<i>F.sporotrichioides</i>			+
<i>Gibberella fujikuroi</i>			+
<i>Mucor mucedo</i>	+	+	+
<i>Mortiriella alpina</i>	+		
<i>M. hiemalis</i>	+		
<i>Penicillium chrysogenum</i>	++		+
<i>P. brevicompactum</i>	+		
<i>P. purpurogenum</i>	+		
<i>P.expansum</i>			+
<i>P. janthinillum</i>		+	
<i>Rhizopus stolonifer</i>		+	
<i>Thielaviopsis basicola,</i>			+
<i>Trichothecim roseum</i>	++		
<i>Trichoderma asperellium</i>	+		+
<i>T.atroviride</i>			+
<i>Trichoderma hamatum</i>		+	
<i>T.harzianum</i>	++		
<i>T.polysporum</i>			+
<i>T.viridee</i>		+	+
<i>T koningii</i>	+		
<i>Verticillium nigrescen</i>	+		
<i>Verticillium albumil</i>	+		

Table 2. Mycological analysis of soil samples taken from the plant rhizosphere during 2022-2023.

The general results of the analyses conducted on the quantitative composition of fungi indicate that the soils of the Galaalti village area are richer (4.5x10³ keV/g) (Gizilgazma - 4.5x10³ keV/g, Altiagaj - 3.7x10³ keV/g, Altiagaj - 3.7x10³ keV/g).

The obtained results suggest that there is a positive relationship between the morphological parameters of plants and the quantitative composition of their mycobiota. The richness of the

mycobiota of the rhizosphere of plants with high morphological parameters indicates the possibility of using fungi when introducing orchids in the future. Thus, the protection of these species can be ensured if certain environmental conditions are created for them.

REFERENCES

1. A.A. Uranov, Age spectrum of phytopopulations as a function of the time of energy wave processes, *Biological Sciences*, (1975), no. 2, 7-34.
2. Cribb P.J., S.P. Kell, K.W. Dixon & R. L. Barrett. 2003 Orchid conservation: a global perspective. Pp 1-24. In: K.W. Dixon, S.P. Kell
3. Hanne N. Rasmussen “Recent developments in the study of orchid mycorrhiza” *Plant and Soil* 244: 149–163, 2002. © 2002 Kluwer Academic Publishers. Printed in the Netherlands
4. Hongxia Liu, Yibo Lio, Hong Liu Studies of Muccorrhizal Fungi of Chinese Orchids and Their Role in Orchid conservation in Chine- a review *The Botanical Review*, 2010 DOI: 10.1007/s12229-010-9045-9
5. Jihnsen C.N., Balmford A., Brook B. W., Buettel J.C., Galetti M., Guangchun L., Wilmshurst J.M. 2017/ Biodiversity losses and conservation reponses in the Anthropocene. *Science* 356(6335): 270-275/Doi: 10.1126/science/aam9317
6. M.P.Babayev, V.H.Hasanov, Ch.M. Jajarov, S.M. Huseynova Morphogenetic diagnostics, nomenclature and classification of soils of Azerbaijan., Baku, “Science” 2011
7. R.T. Haydarova, P. Karakhani, A.Y. Huseynova, Taxonomy of the Orchid family (Orchidaceae Juss.) in the Greater Caucasus (within Azerbaijan), *Scientific works of NASA Institute of Botany*, (2016), no. 36, 15-18.
8. Shibao Zhang , Yingjie Yang, Jiawei Li, Jiao Qin, Wei Zhang, Wei Huang, Hong Hu “Physiological diversity of orchids” <https://doi.org/10.1016/j.pld.2018.06.003>
<http://www.keaipublishing.com/en/journals/plant-diversity/>