

Ontogenetic Structure And Phytocenotic Characteristic Of Coenopopulations Of Rare Species *Platanthera Chlorantha* (Cust.) Reichenb. In Guba District Of Azerbaijan

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In the article two coenopopulations of the rare species *Platanthera chlorantha* (Cust.) Reichenb. occurring in Guba district of Azerbaijan is described . The age spectrum, abundance, density and morphometric features of populations have been determined. The type, ontogenetic condition and structure of coenopopulations have been studied. It is established that one of the coenopopulations is in transition and another one is young. Both of coenopopulations are incomplete because of lack of senile (s) individuals.

Keywords: *Platanthera chlorantha* (Cust.) Reichenb., coenopopulation, ontogenetic structure, phytocenotic characteristic, morphometric features of populations

INTRODUCTION

Family *Orchidaceae* Lindl. (*Orchids*) - one of the most numerous families among flowering plants. Complex bio-ecological features, active anthropogenic impact on habitat and collection of plants from natural habitats have led most species of this family to the classification as rare and endangered [Maksimov, 1985]. In this connection, the creation of effective methods for the reproduction of orchids and the restoration of the number of disturbed populations very relevant. *Orchidaceae* family includes over 1,500 species from 460 genera, distributed mainly in the tropics.

In Azerbaijan 48 species from 19 genera of the family *Orchidaceae* were recorded. One of the genera of this family is the genus *Platanthera* Rich., represented by 70 species common in the northern temperate zone and in the Caucasus. Of these, only 2 species – *Platanthera bifolia* (L.) Rich. and *P. chlorantha* (Cust.) Reichenb. are distributed in Azerbaijan (Rzazade, 1952).

P. chlorantha and *P. bifolia* - are officinal herbs. *P. bifolia* was included in the State Pharmacopoeia from the 4th to 8th edition, and *P. chlorantha* was included in the 7-8th edition as the source of the salep. Both types are also included in the State Register of Russia in 2004 and 2008 [Kiseleva, Smirnova, 2009]. There is an essential oil in the flowers of these plants (Coenopopulation ..., 1988). In the aboveground parts of *P. chlorantha* has phenolic carboxylic acids and their derivatives (glucoside of o-hydroxycinnamic acid) (Herissey, Delauney, 1922), organic acids and their derivatives and glycoside loriglossin (Delauney, 1922) and in the leaves - flavonoids (quercetin,

kaempferol) (Williams, 1979). Extracts of *P. chlorantha* plants have antioxidant properties (Maksimov, 1985; Nikitchenko, et al., 1997).

The object of the study is *Platanthera chlorantha* (Greater butterfly-orchid), which is rare and species included in the 2nd edition of Red Book of Azerbaijan with the status VUD2 (IUCN) (Red Book ..., 2013) (Fig. 1). This is a perennial plant, cryptophyte (geofit), tubers oblong-ovate styloid terminal. The stem is 30-50 cm height, with 1-3 small lanceolate leaves and two large, broadly oval or obovate, narrowed into a broad stalk in the lower part of the stem. Inflorescence is multiflorous, friable, 7-25 cm long. Bracts ovate-lanceolate, pointed, lower slightly longer than ovary. Leaflets of perianth oblong or ovate-lanceolate, obtuse, greenish-white, slightly odorous. The lip is linear-lanceolate, 11-14 mm long, blunt, with a bent arcuate-curved, up to 2.7 cm in length, with a spur that is thickened to the apex. Another with broad binder and very widely divergent spaced nests (Rzazade, 1952). Blossoms and fructies in May-June. It is propagated by tubers.

P. chlorantha is European-Mediterranean, non-moral species with a general distribution in Europe (except the north of Finland, the north of the Scandinavian Peninsula and the southwest of the Iberian Peninsula), North Africa, South-West Asia (Turkey, northern Iran) and The Caucasus (Efimov, 2006). In Azerbaijan the territory of *P. chlorantha* covers the areas of the southern part of Lesser Caucasus and central regions, Gobustan, the Lenkoran mountainous region and all parts of the Greater Caucasus. It is distributed from lowlands to the middle mountain zone in forests and shrubs (Rzazade, 1952).

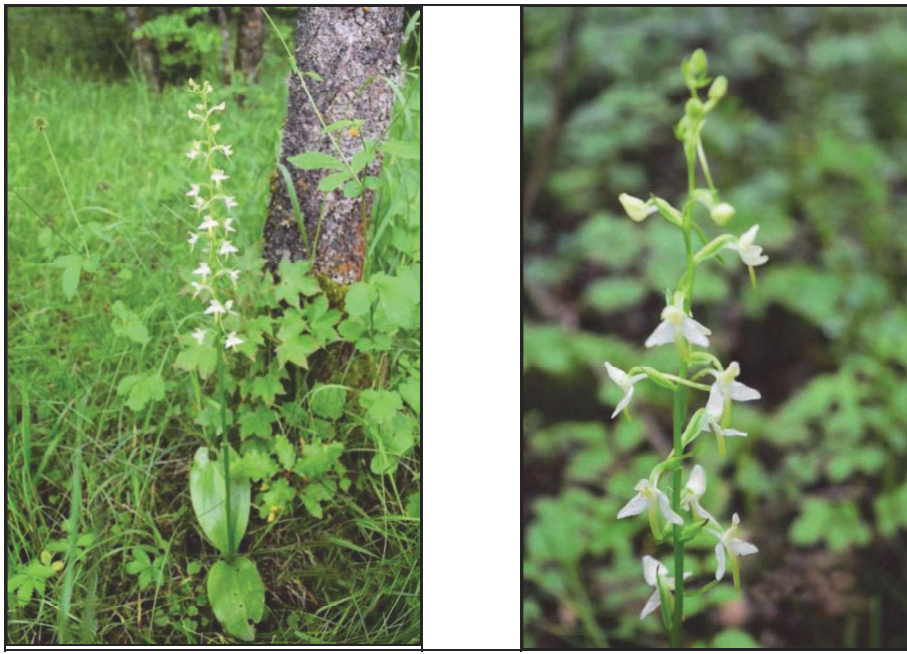


Fig. 1. *Platanthera chlorantha* (Cust.) Reichenb.

According to the classification of the life forms of I.V.Tatarenko (1996), greater butterfly-orchid refers to vegetative annuals with a thickened spindle-shaped stem tuberous tuberoid. It grows from the lowland (rarely) to the middle mountain zone in mixed and broad-leaved forests, among shrubs, in moist meadows and on fringes of the forest. *P. chlorantha* is mycosymbiotroph, which is characterized with eumycetic antiparasitic mycorrhiza (Kruger, Shardakova, 1980).

The purpose of this study was to study the ontogenetic structure and the condition of coenopopulations (CP) of *P. chlorantha* in Guba region.

MATERIAL AND METHODS

Description of investigation area. The investigations were conducted in the summer 2016 in Gachresh and Girizdehne forest of Guba region. From the view point of natural and climatic conditions Guba is a region with a moderate climatic type and a uniform distribution of precipitation. The ratio of continental climate on average is 165-205. Soils of mountain-forest type, granulometric composition light loamy, clayey (Mamedov, et al., 2010).

Methods of research. The description of vegetation and phytocenoses was carried out according to the generally accepted methods in geobotany (Lavrenko, 1974). In studying the ontogenetic and demographic structure of the coenopopulation, the principles and methods adopted by

T.A.Rabotnov, A.A. Uranov and their followers (Coenopopulation ..., 1988; Uranov, 1975).

pH of collected soil samples was measured by measuring instrument Soil pH Moisture.

Morphometric analysis of individuals of *P. chlorantha* were conducted according to Y.A.Zlobin (2013). Ontogenetic (age) spectrum was studied as the main demographic parameters of the coenopopulation. To study the abundance and ontogenetic structure of *P. chlorantha* coenopopulations 7-8 small transects (1 m²) were laid in general model areas (10 m²). To determine the ontogenetic spectrum at these sites, the total number of individuals and the number of individuals of different age groups were calculated. The type of coenopopulation was determined by the delta-omega (Δ - ω) classification of normal population of A.A.Uranov and L.A.Zhivotovsky (1975; 2001).

$$\Delta = \frac{\sum k_i \cdot n_i}{N};$$

where k_i – «value» of i ontogenetic status; n_i – number of individuals of i of ontogenetic structure in populations; N – total number of individuals in population.

$$\omega = \frac{\sum n_i \cdot e_i}{n_i};$$

where n_i – absolute number of plants of i –age state; e_i – efficiency of plants of i -ontogenetic status.

RESULTS AND DISCUSSION

The basic habitats of plant. *P. chlorantha* is detected in the forest of Gechresh and Girizdehne in Guba district.

Phytocenotic characteristic of habitat. Coenopopulation 1 (CP1) - *P. chlorantha* is found in small groups in the forests of Gechresh. Here projective covering of this plant like as diffuse-group and its placed from each-other in 2-3 m. The soil is black and humid. The pH of the soils is measured and average indicator was 5.9. It shows that the soil is weak acidic. The number of individuals were in 1 m² 3-5, in 10 m² 30-35. The average density was 4,25 individuals / m². *P. chlorantha* takes part as a component in cenosis in association of *Fagus orientalis* + *Carpinus caucasica* + *Acer campester* with shrubs *Rubus caesius* L., *Mespilus germanica* L., *Rosa corymbifera* Borkh., with herbs *Arum elongatum* Steven (2-3point), *Anacamptis pyramidalis* (L.) Rich. (2-3 point), *Dictamnus caucasicus* (Fisch.et C.A.Mey.) Grossh. (1-2 point), *Euphorbia condilocarpa* Bieb. (3 point), *Gymnocarpium robertianum* (Hoffm.) Newman (4 point), *Cephalanthera rubra* (L.) Rich. (1 point).

Ontogenetic states. In the investigated area, the total number of juvenile (j) individuals are -5, immature (im) - 7, virgin (v) -6, young generative (g1) - 9, mature generative (g2) - 4, old generative (g3) - 2, subsenile (ss) - 1. Senile (s) individuals were not registered (Fig. 2). The percent of vegetative individuals at CP 1 are 56% and generative individuals are 44%.

Phytocenotic characteristic of habitat. Coenopopulation 2 (CP2) - *P. chlorantha* was

investigated in the peanut-culture forest (Faguseto-Carpinusetum) around Girizdehne area. Here it is found alone. The number of individuals were in 1 m² 2-4, in 10 m² - 36-40. The average density was -5.1 individuals /m². *Astrantia maxima* Pall (2-3 point), *Stachys macrantha* (C.Koch) Stearn (3 point), *Serratula quiquifolia* Bieb (2 point), *Achillea millefolium* L. (2-3 point), *Salvia glutinosa* L. (2 point), *Lavatera thuringiaca* L. (2-3 point), *Arctium lappa* L. (2 point), *Campanula rapunculoides* L. (2-3 point), *Hypericum perforatum* L. (2-3 point), *Pimpinella peregrina* L. (1 point) distribute together with this plant in cenosis.

Ontogenetic states. Investigations have shown that in this area the number of individuals: juvenile (j) is 6, immature (im) - 5, virgin (v) - 8, young generative (g1) - 11, mature generative (g2) - 3, old generative (g3) - 2, subsenile (ss) - 1. Individuals with senile (s) status have not been identified. It is estimated that vegetative individuals in CP 2 are 53% and generative individuals are 47% (Fig. 3).

Fig. 2 and 3 show that the highest percentage in both coenopopulations is g1 individuals. But in generally the percentage of vegetative individuals in two coenopopulation is predominant.

Ontogenetic structure. According to A.A. Uranov and L.A. Zhivotovsky (1975; 2001) were calculated the index of the ontogenetic status of SP 1 and SP 2 of *P. chlorantha*, determined that their price varies considerably in some cases: aging index (Ia) - 0,027-0,038; recovery index (Ir) - 0,420-1,187; replacement index (Ir) -0,397-1,117; ageness index (Δ) - 0,19 -0,266-0,350; efficiency index (ω) -0,509-0,681 (Table 1).

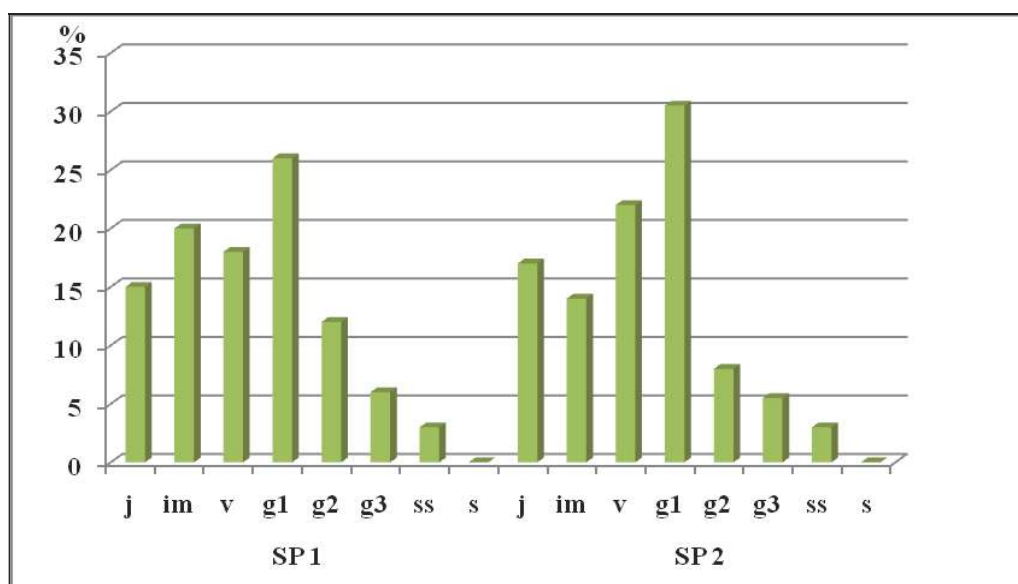


Fig. 2. Ontogenetic spectrum of coenopopulations of *Platanthera chlorantha* (Cust.) Reichenb., (%).

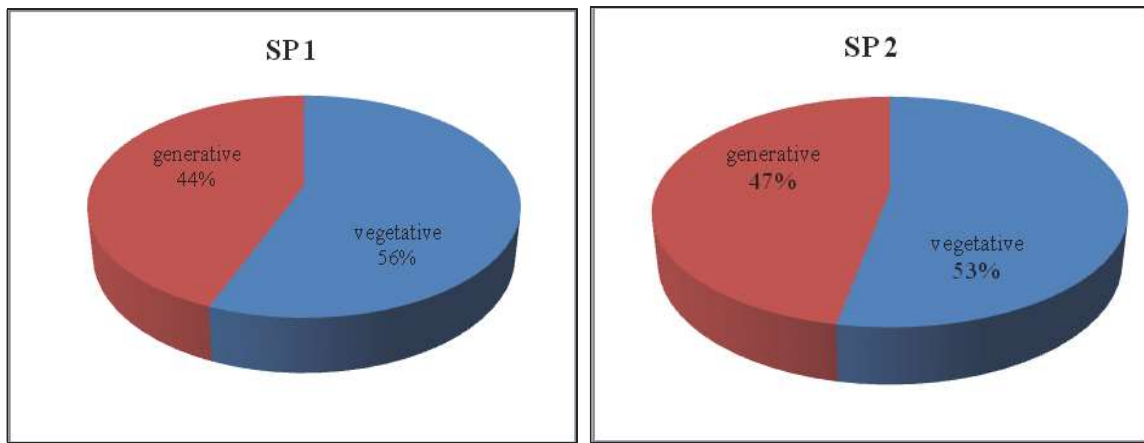


Fig. 3. Comparison of vegetative and generative individuals in the coenopopulations of *Platanthera chlorantha* (Cust.) Reichenb. (%).

Table 1. Characteristics of coenopopulations of *Platanthera chlorantha* (Cust.) Reichenb.

No	n	X _a	X _v	X _g	Ir	Ia	Irep	Index of age (Δ)	Efficiency index (ω)	Type of CP
CP1	34	4,25	2,25	2,0	0,420	0,038	0,397	0,350	0,681	Transition
CP2	36	5,14	2,57	2,42	1,187	0,027	1,117	0,266	0,509	Young

Note: n - number of CPs; X_a - total average density of plants, individuals / 1 m²; X_v-density of the vegetative individuals, individuals / 1 m²; X_g-density of generative individuals, individuals / 1 m²; Ir - recovery index; Ia - aging index, Irep- replacement index; Δ - age index; ω- efficiency index.

Table 2. Morphometric characteristics of ontogenetic states of *Platanthera chlorantha* (Cust.) Reichenb.

Indicators	Ontogenetic state					
	j	im	v	g1	g2	g3
Leaf length, sm	2.70±0.41	5.12±0.34	6.84±1.14	20.38±1.64	23.44±2.34	21.45±1.12
Leaf width, sm	0.32±0.14	2.12±0.22	3.56±0.85	6.84±1.78	8.21±2.11	9.78±3.25
Height of plant, sm	-	-	-	27.85±7.59	30.76±6.42	31.56±5.96
Inflorescence length, sm	-	-	-	6.22±2.88	7.35±3.56	8.45±2.65
Number of flowers	-	-	-	5.61±2.72	6.23±1.18	8.78±1.23
Length of flowering shoots, sm	-	-	-	21.63±4.99	24.89±3.58	25.98±2.36

Ontogenetic structure. According to A.A. Uranov and L.A. Zhivotovsky (1975; 2001) were calculated the index of the ontogenetic status of SP 1 and SP 2 of *P. chlorantha*, determined that their price varies considerably in some cases: aging index (Ia) - 0,027-0,038; recovery index (Ir) - 0,420-1,187; replacement index (Irep) -0,397-1,117; ageness index (Δ) - 0,19 -0,266-0,350; efficiency index (ω) -0,509-0,681 (Table 1).

Morphometric characteristics. During the morphometric analysis of individuals of *P. chlorantha* accounted for six basic parameters: the height (h), inflorescence length (Lfl), number of flowers (Nfl), sheet length (LI), leaf width (SI), length of flowering shoots (Lflsh). Based on the actual material for each of the morphoparameters calculated the average price and average arithmetic fault (Table 2).

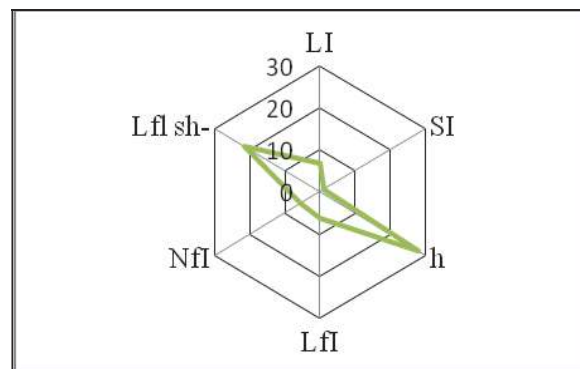


Fig. 4. Morphogram of the individuals structure of *Platanthera chlorantha* (Cust.) Reichenb.

The radial diagram-morphogram (Fig. 4) was compiled by the obtaining average price of morphoparametres (Zlobin, 2013).

CONCLUSION

1. As a result of the investigations, two coenopopulations of *P. chlorantha* species were detected in the forests around Gechresh and Girizdehne village of Guba region, their ontogenetic state, number and density of individuals of coenopopulation were determined.
2. Both coenopopulations are incomplete due to the absence of senile (s) individuals.
3. The type of first coenopopulation is "transition", second coenopopulation is "young" and according to these their condition is satisfactory.
4. Observations show that the decreasing species of rare plant *P. chlorantha* because of producing only with the rooting, weakening self-renewing process and removing of its tubers by humans for the medicinal features.

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***Platanthera chlorantha* (Cust.) Reichenb. Nadir Növünün Quba Rayonundakı Senopopulyasiyalarının Ontogenetik Strukturu Və Fitosenotik Xüsusiyyətləri**

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Məqalədə *Platanthera chlorantha* (Cust.) Reichenb. nadir növünün Quba rayonunda senopopulyasiyaları (SP 1 və SP 2) təsvir edilmişdir. Yaş spektri, fərdlərin sayı, sıxlığı aşkarlanmış, populyasiyanın morfometrik xüsusiyyətləri təyin edilmişdir. Aydın olmuşdur ki, SP 1 keçid, SP 2 isə cavan tiplidir, hər iki senopopulyasiya senil (s) fərdlərin yoxluğu səbəbindən tam deyildir.

Açar sözlər: *Platanthera chlorantha* (Cust.) Reichenb., *senopopulyasiya*, *ontogenetik struktur*, *fitosenotik xüsusiyyətlər*, *populyasiyanın morfometrik xüsusiyyətləri*

Онтогенетическая Структура И Фитоценотическая Характеристика Ценопопуляций Редкого Вида *Platanthera Chlorantha* (Cust.) Reichenb. В Губинском Районе

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В статье описаны ценопопуляции (ЦП1 и ЦП2) редкого вида *Platanthera chlorantha* (Cust.) Reichenb. в Губинском районе Азербайджана. Выявлены возрастной спектр, численность, плотность и определены морфометрические особенности популяций. Установлено, что ЦП1 - переходная, а ЦП2 – молодая, обе ЦП неполночленные, т.к. в них не были выявлены сенильные (s) особи.

Ключевые слова: *Platanthera chlorantha* (Cust.) Reichenb., *ценопопуляция*, *онтогенетическая структура*, *фитоценотическая характеристика*, *морфометрические особенности популяций*