

Current state of local populations *Tulipa greigii* Regel (Liliaceae) in Uzbekistan

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Abstract. Our research was carried out in the ridges of the Western Tien Shan (Uzbekistan). The study analyzed the age structure of 9 local populations (LP) of *Tulipa greigii* Regel. The ontogenetic structure of *T. greigii* local populations is represented by two types of spectrum – left-sided (LP 1, 2, 4, 5, 6, 8, 9) and centered (LP 3, 7). The studied local populations of *T. greigii* are normal, incomplete. It is noted that the studied local populations are young and mature. The scientific justification of the ways of ecological improvement of coenopopulation. In the implementation of scientific work, the methods of traditional geobotanical and cartographic remote study of plant formations were applied.

Keywords: Western Tien Shan, endemic, local population, ontogenetic structure, Uzbekistan.

1 Introduction

Central Asia is the center of origin and the main species diversity of the species of the genus tulip - *Tulipa* L. [9]. One of the historically formed centers of tulip formation is located in deserts and semi-deserts, the other is in high-altitude areas, the third center is considered to be Pamir-Alai [8]. The fourth, completely original and peculiar, is located in the foothills and mountains of the Western Tien Shan. Wild species of tulips of the Western Tien Shan have long attracted and attract the attention of scientists and all people who love the beauty of nature. *Tulipa greigii* Regel - occurs in the Northern and Western Tien Shan in single specimens, rarely in small groups (Uzbekistan, Kazakhstan, Kyrgyzstan). It grows on the clay and gravelly slopes of the lower belt of mountains. A rare species with a greatly shrinking range. It was described in 1873 by E. Regel. Central Asian wild tulip species attracted the attention of Dutch breeders immediately after their introduction into culture. *Tulipa greigii*, introduced for the first time into culture in St. Petersburg in 1873, was awarded a first-class diploma in 1877.

The ontogenetic structure is one of the essential features of the population; this side of the structural organization ensures the ability of the population system to self-support and determines its stability [6]. The analysis of plant ontogenesis gives an idea of the long-term fate of species populations. Rare and endemic plants distributed in arid regions of the republic, a lot of research on their coenopopulations [3, 12]. The data obtained are posted on the world's international GBIF website [2, 4, 7].

The purpose of this work is to study the ontogenetic structure of *T. greigii* local populations in different ecological and cenotic conditions in Uzbekistan.

2 Materials and methods

Field research was performed during 2020-2021 by traditional phytosociological methods with description of plant associations, collection of

herbarium specimens and photographing of surveyed plots. The ontogenetic structure of coenopopulations in the different ecological and phytocenological conditions was determined by the transect (20x1 m) method (Fig.1). Present study of ontogeny carried out by using straight methods and approaches [2, 5, 11]. The population structure was also studied by conventional methods [2, 11].

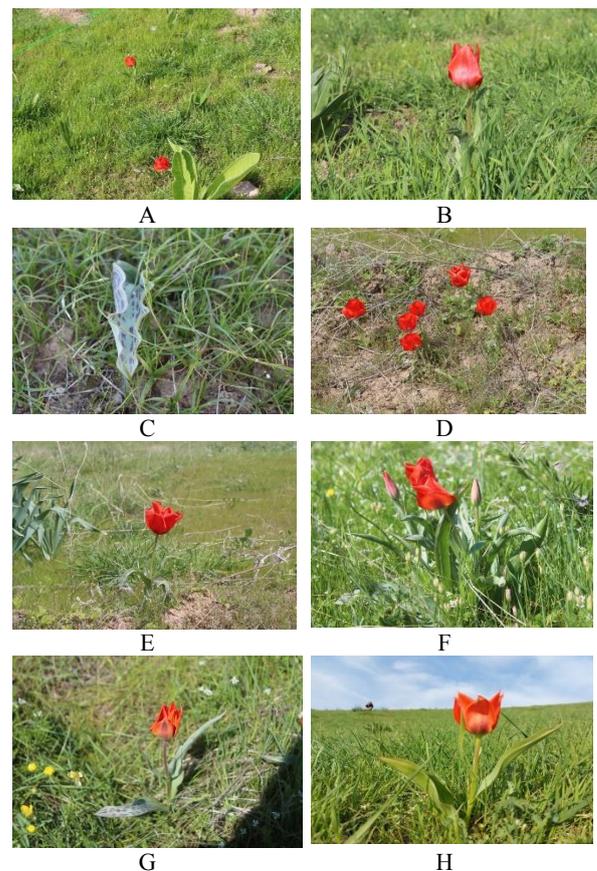


Fig.1. Different local populations of *Tulipa greigii* (Uzbekistan)

Coenopopulation's ontogenetic structure was defined as the ratio of species at different ontogeny stage in local population. One species is taken as a measure unit. The studies of the population's structure were carried based on concept

of typical ontogenetic spectrum [13]. Coenopopulation described according to classification of A.A.Uranov and O.V.Smirnova [10].

Demographic structure of plant populations and the age indexes was studied (Fig.1). A map with the location of GIS price populations (Geographic Modeling System) was prepared using ArcGIS 10.6.1. 5 states (j, im, v, g, s) were identified in the age spectrum. Our research was carried out in the ridges of the Western Tien Shan, where we studied the ontogenetic structure of 9 local populations of *T. greigii* (Fig. 2).



Fig.2. Study area

3 Result and discussion

Based on the analysis of the age composition, the type of local populations was determined. The ontogenetic structure of *T. greigii* is represented by two different types of spectra: left-sided (LP 1, 2, 4, 5, 6, 8, 9) and centered (LP 3, 7). In CP with the left-sided type of spectrum, the proportion of virginal individuals is high (Table). Only in the ninth local population the participation of juvenile plants is high (38.54%). Spectra of this type are formed in areas with precipitation and in conditions when the plant bears fruit abundantly. In addition, cattle are not grazed in these areas in early spring, which, in turn, has a positive effect on the viability of young plants. It was revealed that the proportion of plants of the virginal state in cenopopulations 1, 2, 4, 5, 6, 8 it varies from 40 to 75%. The abundance of virginal individuals in these local populations suggests, on the one hand, that the plant reproduces well by seeds, and on the other hand, that this ontogenetic state lasts much longer in arid regions than other stages of ontogeny (Table.1).

In a local population with a centered spectrum type, the proportion of generative individuals is maximal (LP 3, 7). In them, the proportion of generative plants ranged from 47.62% to 56.67%. No young individuals were observed in both local populations. It is noticed that during the breeding period by direct sowing, young plants cannot move to the next stage due to various factors. In particular, spring floods and sudden weather changes at the beginning of the year lead to the death of young individuals.

Table.1. Ontogenetic structure of *Tulipa greigii* local populations

№ LP	Ontogenetic structure				
	j	im	v	g	s
1	22.73	9.09	40.91	22.73	4.54
2	25.71	21,46	40	12.86	0
3	0	0	42,86	47.62	9.52
4	4.17	4.17	58.33	20.83	12.5
5	0	0	75	25	0
6	8.33	16.67	62.5	12.5	0
7	0	6.66	36.67	56.67	0
8	13.33	22.22	44.44	15.56	4.4
9	38.54	9.38	28.13	21.87	2.08

The number of individuals of the post-generative period in local populations is very small. There are no senile individuals in local populations 2, 5, 6, 7. In other LP the share ranges from 2.08 to 12.5%. The analysis of ontogenetic spectra in various ecological and phytocenotic conditions allowed us to construct the basic spectrum of *T. greigii* (Fig. 3). The peak (the highest point of the curve) corresponds to the virginal axes (47.16%). The next place is occupied by individuals of the generative state (29,10%).

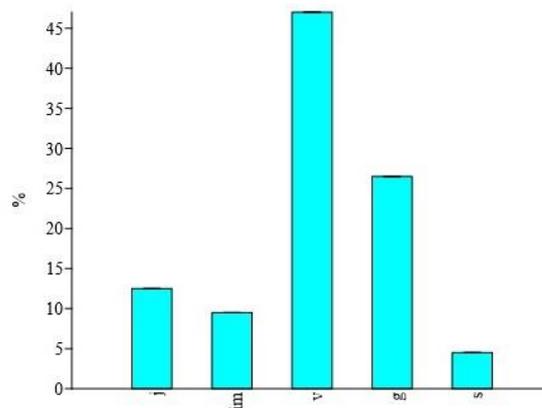


Fig.3. The average value of the ontogenetic structure of *Tulipa greigii*

Analysis of the ontogenetic structure of *T. greigii* has shown that most cenopopulations are young (LP 1, 2, 4, 5, 6, 8, 9), two (LP 3, 7) are mature. High yield, the usefulness of the formed fruits contributes to the maintenance of a young type of local populations. *T. greigii* in local populations, the total number of lumps was observed from 20 to 96 soles. The density of soils in 1m2 area is 1-4,8 units, their ecological density is 1,8-7,38 units (Table.2). It was observed that the recovery index of local populations was around 0,14-1,30. The fact that the aging index in the studied cenopopulations is almost zero (0-0.1), is explained by the absence or lack of local populations of senile-era lumps. This situation is associated with the fact that most of the soils died in the generative period.

Table 2. Demographic indicators of *Tulipa greigii*

№	Total number of individuals, pcs.	Density of individuals, pcs (1m ²)	P _{ecol} (1m ²)	I _r	I _a	Type LP
1	22	1.2	2.44	0.31	0.04	Young
2	70	3.5	5	0.14	0	Young
3	21	1.05	2.1	1.11	0.10	Mature
4	24	1.2	2.66	0.31	0.14	Young
5	20	1	1.8	0.33	0	Young
6	24	1.2	2.4	0.14	0	Young
7	30	1.5	2.72	1.30	0	Mature
8	45	2.25	3.21	0.19	0.04	Young
9	96	4.8	7.38	0.8	0.02	Young

Note: (I_r) – index recovery, (I_a) – index aging, P_{ecol} - ecological density.

4 Conclusion

Thus, it was found that the majority of *T. greigii* cenopopulations have a left-sided spectrum, where a high proportion of moles is observed the breath of individuals. The studied cenopopulations of *T. greigii* in different ecological-phytocenotic conditions are satisfactory. Individuals go through all stages of ontogenesis. Ontogenetic spectra differ due to ecological-phytocenotic growing conditions and different degrees of anthropogenic load. However, in cenopopulations with a centered spectrum, many seeds are formed, but young seedlings often die as a

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result of the action of various abiotic factors. This will require further monitoring of these price populations.

Maps reflecting the distribution and vital state of cenopopulations have been compiled, which will be recommended as a source material for conducting long-term monitoring studies on the state of the studied cenopopulations. A collection of the gene pool of natural populations of species of the genus *Tulipa* L. has been created on the territory of the Tashkent botanical garden in ex situ conditions.

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