# RHYTHM OF EPHEMEROIDS' DEVELOPMENT IN WEST PAMIRO ALAY, TAJIKISTAN

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The peculiarities of rhythm of ephemeroids' development of different florocoenotypes which are typical for West Pamiro Alay (Tajikistan) are analysed. We give proof of the subdivision of vegetation with ephemeriod type of development into 3 groups: apparent or true ephemeroids; pseudo-ephemeroids and hemiephemcroids.

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*Key words.* Ephemeroids, Tajikistan, Pamiro Alay.

## توسعه گیاهان کوتاه زی گون در غرب پامیر آلای، تاجیکستان

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ویژگیهای گیاهان کوتاه زی گون فلوروسنو تیپ‌های مختلف غرب پامیر آلای درتاجیکستان مورد تجزیه و تحلیل قرار می‌گیرد. شواهدی بر تقسیم مناطق انتشار مربوط به گیاهان کوتاه‌زی گون به ۳ گروه کوتاه‌زی گون‌های واقعی، شبه کوتاه‌زی گون‌ها و نیم کوتاه‌زی گون‌ها ارائه می‌گردد.

## Introduction

The wide distribution and abundance of ephemerous and ephemeroids is a peculiar feature of the vegetation of West Pamiro Alay as a part of the Ancient Mediterranean region. In a wide sense of a word, ephemers and ephemeroids belong to the ephemerous vegetation which is typical for Pamiro Alay. They are the communities of mesophyte and microtherm herbs which are characterised by vegetation in winter-spring half a year with long period of dormancy in their annual life cycle. Ephemers and ephemeroids set up independent formations (semisavanna and ephemeretum as well as they are widely represented in the herbage of xerophyllous sparse forests (shiblyak) and broad-leaved forests (black forests) which are characteristic for the florocoenotypes of Pamiro-Alay. Phytocenotypic characteristic of vegetation is given according to the classification after P. N. Ovchinnikov (1957).

## Observations

In a taxonomic respect the ephemeroids of West Pamiro Alay are extremely different. They are widely represented in *Liliaceae, Amaryllidaceae* and *Umberlliferae.* The ephemeroids are heterogenous by the type of area and their genetic origin. We can meet them in different florocoenotypes in high-altitude profile from 300 till 3500 m above sea level, from jangals and desert of Ancient Mediterranean type to subalpic meadows, steppes and cryophyton (Fig. 1). They are greatly widespread in semisavanna and xerophyllous sparse forests (shiblyak) and broadleaved forests (black forests). Ephemeroids are different by their habitus and morphology. There are rather small plants *(e. g. Gagea)* and gigantic herbs with well developed strong root storage organs *(e. g. Eermurus, Ferula, Allium*) between them. Ephemeroids are mainly polycarpics, but there are monocarpics as well. Storage substances are accumulated by them in different storage root organs; thickened roots, rootstocks, bulbs and tubers.

The rhythm of ephemeroids' develpment in West Pamiro Alay is assembled under the influence of climatic conditions of the easten part of Ancient Mediterranean region, it is synchronized to these conditions. Typical peculiarites of the Mediterranean climate are contrast between two seasons of the year with

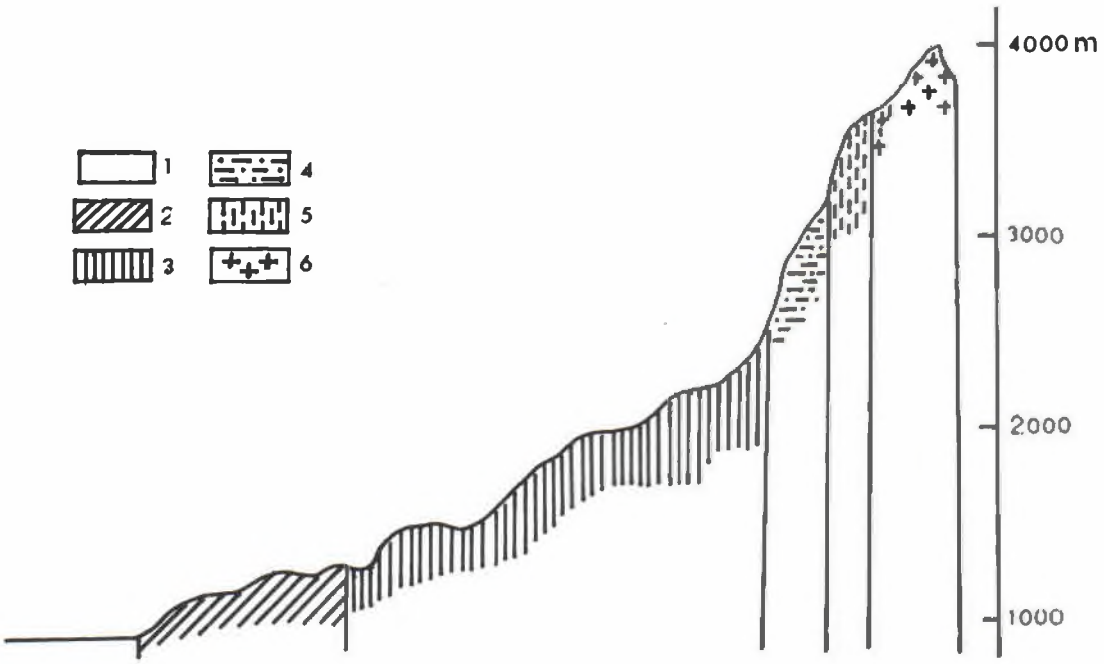


Fig. 1 Manner of vegetation distribution in the high-altitude profile of West Pamiro Alay. 1. Deserts and low-herbs semisavannas. 2. Shibljak-hemixerophyllons sparse forests and high grasses semisavannas. 3. Mountain thermophyllons and mesophyllons summergreen, broadleaved forests. 4. Meadows, traganthoid, high-herbs semisavanns. 5. Steppes. 6. Cryophyton.

clearly expressed precipiation heterorhythm, warm, humid winter and long, dry and hot summer. Under these conditions the varieties, which differed in their genotype and origin were subjected to convergence and acquired common features in morphology, anatomy, rhythm of annual development and physiologic adaptation to the unfavourable environmental factors. Under the condition of climate aridization in West Pamiro Alay the florocoenogenesis was aimed at the adaptation to the possible vegetation during winter-spring period of a year at low temperature and high air and

soil humidity, shortening of the vegetation period and vegetation break under sharp transfer from warm humid season to hot droughty one. These are common traits of ephemerogenesis.

All ephemers and ephemeroids of West Pamiro Alay are consolidated by general law. They vegetate during winter-spring warm and humid part of a year and enter into the dormant satae under the effect of high summer temperature and heavy soil dry up. This law differs them from all other gropus of plants.

At the same time concrete manifestation of the peculiarities of annual rhythm of development in ephemeroids depend greatly on the specific features of the native climatic conditions of the region, gypsometric level in high-altitude profile of West Pamiro Alay, florogenetic content of the varieties in each vegetation belt. It determines the fact that calendar time of the beginning of vegetation, passing of separate stages of development and termination of vegetataion in the ephemeroids in different botanical-geographic regions is not the same. It is discussed in the articles by Barabonov (1966, 1967, 1970), Zaprjagaeva (1971), Kudryasheva (1974), Karimov (1981). Thus in the belt of low-herbaceous semisavanna (300-600 m above sea level) the vegetation period in ephemeroids begins in autumn, after autumn rains; in the belt of shiblyak and black forest (800-2500 m above sea level) it begins at the end of February-March; and in the belt of alpic meadows, different-herbaceous steppe and large-herbaceous semisavanna (2500-3500 m above sea level) it begins at the end of June.

In low-herbaceous semisavanna the ephemeroids' vegetation breaks in April-May and they are in dormant state till November-December. In shiblyak and black forests ephemeroids' vegetation breaks not later then June-beginning of July and dormant state lasts till the end of February-March. In subalpic meadows, different-herbaceous steppe and large-herbaceous semisavanna the ephemeroids' vegetation breaks at the end of July-beginning of August and they are in dormant state during 10 months.

Since the group of ephemeroids in West Pamiro Alay consists of heterogeneous florogentic elements, it is natural that genotype and origin of the varieties resulted in the peculiarities of the adaptation to climatic rhythm of this region

as well as in annual rhythm of development.

On the basis of analysis of West Pamiro Alay vegetation, which is characterized by ephemeroid type of development we proposed to divide it to the following groups; apparent or true ephemeroids; pseudo-ephemeroids; hemiephemeroids.

## True ephemeroids

Biologic and ecologic traits of the plant varieties which consists this group allow us to single out ephemeroids from herbaceous plant varietes. True ephemeroids are characterized by intensive growth, rapid development and high physiologic activity during short period of vegetation under high humidity and average temperature. True ephemeroids belong to mesophytes according to their relation to the humidity, but at the same time different representatives of ephemeroids are not similar according to temperature factor. Temperature values for initiation of vegetation and its break as well as the temerature optimums for growth and other physiological processees vary in wide range. Our study proved that appartent or true ephemeroids may be subdivided into 3 subgroups.

*Subgroup of microthermic ephemeroids.* Vegetatain begins immediately after withdrawal of snow cover under low air soil teperature. The most distinctive representatives of this subgroup are: *Gagea, Croucus korolkovii* Regel & Maw, *Juno bucharica* (Foster) Vved., *Corydalis ledebouriana* Kar. & Kir. Microtherimc ephemeroids determine initiial aspects of flowering stage in florocoenotypes of West Pamiro Alay. Flowering stage in this type of vegetation goes on under temperature +4 - +12°C.

*Subgroup of oligothermic ephemeroids.* Vegetation begins either at the same time of microthermic ephemeroids or at higher temperatures, but it breaks later. Typical representatives of this subgroup are: *Bongardia chrysogonum* (L.) Boiss. *Tulipa, Rhinopetalum bucharicum* (Regel) Losinsk. Flowering stage goes no under the temperature +12. -+23°c.

*Subgroup of mesothermic ephemeroids* This subgroup consists of late-flowering more exacting for high temperature varieties. e. g. *Eremurus, Allium, Ferula.* Flowering stage of Mesothermic ephemeroids goes on at the air temperature +22 - +30°C.

While characterizing this group of ephemeroids we must make a proviso that

the boundaries between subgroups of true ephemeroids are conventional. There are some plant species which occupy intermediate position according to temperature factors among the subgroups. So it is very difficult to refer them to any concrete subgroup.

## Pseudo-ephemeroids

Vegetation period of the plant species in this group lasts from 4-6 months-from November-December till April-May *(Poa bulbosa* L., *Carex pachystylis* Gay) till 8 months-from October-November till June [*Hordeum bulbosum* L., *Elytrigia thrichophora* (Link) Nevski]. But the vegetation period may be much shorter, i. e. it may be close to that one in true ephemeroids in case of unfavourable environmental conditions (e. g. dry autumn, long cold winter with rather small precipitation). Vegetation period may last for 10 months in case of favourable environmental conditions and artificial irrigation.

## Hemiephemeroids

This group consists of the plant species which have some common traits with ephemeroids or are in close relation to them *(Dactylis glomerata* L., *Zerna inermis* (Leyss.) Lindm, *Stipa szovitsiana* Trin. *Digraphis arundinacea* (L.) Trin. and others. These plant species have ephemeroid type of development in the conditions of West Pamiro Alay; many of them begin to grow in late autumn (at the period of high humidity) or in spring and vegetation breaks at the beginning of draught, moreover it breaks later than in true ephemeroids. There are some differences between hemiephemeroids and true ephemeroids. We do not observe in many of them that the above soil organs of the ephemeroids fully dry up and die, the peduncle or the lower part of the stem remains green. The hemiephemeroids have no clear storage organs like true ephemeroids. At last the most part of hemiephemeroids belong to hemycriptophytes. These species which we ascribe to hemiephemeroids can be considered as transitional to ephemeroids of meadow and forest origin being subjected to ephemerization (Ovchinnlkikv 1971).

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