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Bioecological Characteristics of Crataegus Turkestanica Pojark. In the Kungurbuka Mountains of The Chatkal Range (Uzbekistan)

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Abstract: This article presents the results of research on the study of some biological and ecological features of one of the species of Crataegus – C. turkestanica Pojark. Issues such as the association of this species with plant communities, the density of individuals in cenopopulations, the influence of environmental factors on fruit yield were studied and the operational reserves of fruits in the studied territory were calculated.

Keywords: Plant community, coenopopulation, age composition of the coenopopulation, density of individuals, stock density, biological stock, operational stock.

Introduction: The studied territory - Mount Kungurbuka is located within the boundaries of 410 30' - 410 40' north latitude and 690 45' - 700 00' east longitude and administratively belongs to the Bustanlyk district of the Tashkent region. It is located on the western part of the Chatkal range of the Southwestern Tien Shan. Its total length from southwest to northeast is about 20 km, and its width ranges from 5 to 12 km. The total area of the research area is more than 150 km2. The northern and northwestern parts of the research area are bordered by the Chirchik River. The foothills of the Karzhantau ridge are located on the right bank of the river, almost

parallel to the research area. In the north there is one of the largest in the republic, the Charvak reservoir, which arose at the confluence of the large rivers of the Western Tien Shan, the Pskov, Koksu and Chatkal. With a dam height of 145 meters, the water capacity of the Charvak reservoir is 1.7 billion m3. The southern border of the territory reaches Galvasai, and the eastern border reaches Ishakkupriksai and Archali Pass. The western spurs of the Maly Chimgan Mountain with the highest point of 2098 m begin from that place.

Kungirbuka Mountain is characterized by an arid and subarid climate, with significant temperature fluctuations and low rainfall. Conditions vary depending on altitude, which directly affects the composition of vegetation and phytocenotic characteristics of species. The flora of Kungirbuka Mountain is quite rich in species. According to our calculations, the region has more than 600 species of vascular plants, and among them there are many medicinal plants that have pharmacological properties and are used in scientific and folk medicine. In this article, we present the results of many years of research on the study of an interesting and promising tree species Crataegus turkestanica Pojark (Hawthorn). This species is of great importance in the formation of Kungurbuka plant communities, for strengthening soils on slopes and in preventing erosion.

Kungirbuka Mountain is subject to significant temperature fluctuations: in summer it can be hot here, and in winter temperatures drop significantly. Crataegus turkestanica tolerates such climatic stresses due to its drought resistance and ability to survive cold winters.

Crataegus turkestanica is a species of plants in the Rosaceae family, which is an important component of the vegetation of mountain ecosystems in Central Asia, including Mount Kungirbuka in Uzbekistan. This plant is found at different altitudes, preferring slopes and gorges where it forms stable plant communities.

The range of Crataegus turkestanica covers Kopetdag, Pamir Alai, Tien Shan, Afghanistan and Iran. This plant grows on rocky and fine-grained slopes, scree, among rocks, on outcrops of gypsum-bearing clays, along the banks of rivers and streams as part of various communities, sometimes as single trees among grassy vegetation, from the remnant mountains and foothills to the middle belt of mountains [1].

The branches of the hawthorn are brownish-gray in color; and the shoots are glabrous or slightly hairy, thin, reddish-brown. The spines are absent or, less often, few, thin, 12-15 mm long. The leaves are bright green, slightly lighter on the underside, on hairy petioles, slightly shorter or equal to the leaves. On short shoots, leaves with a wedge—shaped, often wide base, 10-30 mm long, 7-30 mm wide, the lower ones are three-divided, the upper ones are up to 3.5 cm long, five-divided. On sterile shoots, the leaves are much larger, up to 5 cm long and wide, five or seven-branched, with incised blades, often wider than those of the leaves of short shoots, and with a cut base. Inflorescences are 12-15-flowered, often with slightly hairy axes and pedicels. Flowers with a diameter of 16-18 mm; sepals narrowly lanceolate, reaching to the middle of the hypanthium; stamens 18-20; column 1, straight or bent. The fruits are broadly ellipsoidal, 11-13 mm long, 9-11 mm wide, dark red, with 1 stone. Flowering in June. Fruiting since September [2, 3].

Hawthorn is suitable for mountain forest reclamation. Surface prostrate root systems strengthen the soil well, preventing it from being washed away. A good honey plant, the wood is beautiful, durable, and easy to process [4]. It is used in folk medicine, as well as the Pontic hawthorn [5]. The most complete information on the biochemical composition and use of hawthorn fruits is given in the works of M.S. Zokov, M.H. Malikov, E.H. Botirov [6]. Hawthorn flowers and fruits are used for functional disorders of cardiac activity, atrial fibrillation, paroxysmal tachycardia, myocarditis, atherosclerosis, heart obesity, vegetative dystonia, circulatory insufficiency in elderly people, rheumatism, insomnia, hypertension and other diseases [7–9]. In folk medicine, an infusion of flowers and fruits is taken orally for heart neurosis, hypertension, suffocation caused by heart ailments, a rush of blood to the head and severe nervous shocks [8-10]. Hawthorn preparations improve the blood flow of the coronary artery and contraction of the heart muscle, therefore it is widely used for cardiovascular disorders such as arrhythmia, myocardial infarction, heart failure [8, 11]. The most important biologically active components of hawthorn include flavonoids, proanthocyanidins and triterpene saponins [7, 10-15]. The main flavone and flavonol glycosides are vitexin, hyperoside, quercitrin [7, 10]. It has been established that it is flavonoids and triterpene saponins that determine the diverse biological activity of hawthorn extracts–cardiotonic, antiarrhythmic, hypotensive, hypolipidemic, antidepressant, diuretic, antioxidant [7, 11, 13, 14]. Hawthorn fruits are also rich in pectin substances (PV), which are widely used as a food additive (thickener and jelly-forming agent) [13, 16, 17]. Aqueous solutions of hawthorn fruit pectin are characterized by a high viscosity index and are effective in the preparation and stabilization of emulsions compared with commercial citrus peel pectins [18].

METHODS

Field materials for these studies were collected in the

period from 2022 to 2024 in the Kungurbuka mountains as part of various plant communities. Geobotanical descriptions of communities have been carried out, herbarium materials of various age conditions of the studied species, as well as other species, have been collected.

Generally accepted methods are used in the description of cenopopulations [19; 20; 21; 22; 23]. Ontogenetic states are given by comparative morphological methods [24; 25].

Biological and operational reserves of raw materials are determined according to generally accepted methods [26; 27; 28].

RESULTS AND DISCUSSION

In Central Asia Crataegus species are represented by 9 species. More species are found in the Middle mountains, in the foothills. Of these, 5 species grow in Uzbekistan [2, 3]. Crataegus species are significantly xerophytic and light-loving plants. A typical form of cohabitation of all types of hawthorns is sparse woodland. One of the most common species of the genus is Crataegus turkestanica.

The crown forms of the genus Crataegus, depending on the nature of the main trunk, the number, size and location of the main, secondary and subsequent branches, are divided into several types. According to these characteristics, C. turkestanica belongs to the tree type.

Most individuals of this species have secondary summer or autumn growth, depending on favorable conditions. The leaves are in most cases deeply dissected, almost to pinnate, and bear large bracts that remain until autumn.

Observation of adult individuals of Crataegus turkestanica showed that the branches of the lower and middle tiers have a lot of thorns, they are absent above. Under conditions of prolonged and extreme dryness, the prickliness of the species degraded, since these conditions did not favor the growth of twigs that turned into thorns, crossing it at the earliest phases.

Species with small spines are considered more primitive, and species with large smooth spines, sometimes long-lived, are more progressive.

We must recognize some Asian species of Crataegus as an intermediate group, since one part of them approaches the European small–banded ones, the other - the American large-banded ones.

Crataegus turkestanica It is widely distributed in the Southwestern Tien Shan (Southwestern Tien Shan), including in the Kungurbuka mountains of the Chatkal range. In the western spurs of Kungurbuka Mountain, there are large thickets of Crataegus turkestanica (up to 2 hectares) in the belt between 960-1480 m above sea level, where it occurs as part of various formations, less often in the form of pure plantations. The range of the population of this species is expanding more and more year after year. Below, the more drought-tolerant Crataegus pontica C.Koch is mixed with Crataegus turkestanica. More complete plantings of the species are formed on soft loess slopes covered with brown soils. Under these conditions, their density increases to 0.7.

We studied the age composition in ten coenopopulations of the species, where sites with a total size of 2500 m2 were placed, they were placed in different habitats of the species with different conditions. In five of these coenopopulations, the number of Crataegus turkestanica individuals reached from 369 to 424 individuals of normal condition. In only three coenopopulations, their number did not exceed 200 individuals, but recently cut down individuals by humans for fuel were visible (Table 1).

Table 1

The age composition and number of individuals in the coenopopulations of *Crataegus turkestanica* Pojark. in the mountains Kungurbuka

Age -related condition	Coenopopulations									
	1	2	3	4	5	6	7	8	9	10
Virginal, **v**	18	26	51	19	76	53	49	35	79	50
Generative: **g_1**	24	29	73	9	81	75	79	38	77	39
g_2	32	36	115	41	138	108	126	43	142	35
g_3	27	15	99	14	44	92	30	24	25	28
Subsenil, **ss**	10	19	13	11	23	34	13	17	16	24

Senil, **s**	13	17	9	5	19	10	11	17	13	21
Oppressed individuals	10	12	14	11	18	9	29	15	19	22
Cut down individuals	9	17	30	13	25	16	32	29	39	31
Total	**143**	**171**	**404**	**123**	**424**	**397**	**369**	**218**	**410**	**250**

At the time of the description of the age states of Crataegus turkestanica, no juvenile and immature individuals were found in any of the ten coenopopulations. This means that they had either dried up by that time or were not there at all. From this, we can conclude that these coenopopulations no longer restore themselves by seed reproduction. This is facilitated by grazing and early mowing of grass.

The bulk of the number of individuals are individuals of the generative state (g1, g2, g3), especially many g2 individuals (from 32 to 142 individuals in a coenopopulation). This means that all the studied coenopopulations feel good, bloom and bear fruit abundantly. But there is a small number of old individuals (state ss, s), which no longer bear fruit (from 5 to 34 individuals in coenopopulations).

The most important point is that in all ten coenopopulations there were depressed or completely cut down individuals of Crataegus turkestanica (from 9 to 29 individuals and from 9 to 39 individuals, respectively).

Thus, the total number of individuals of all studied age states in the coenopopulations varies from 123 (CP-4) to 424 (CP-5) (Table 1).

The main part used in Crataegus turkestanica is the fruit. In this regard, the size of the fruit plays a major role in determining the yield and raw material reserves. How the fruit parameters (length, width, stalk length) change can be seen from the data in Table 2, where the fruit width varies from 7.9 (CP-8) to 10.7 (CP-5) mm, and the length from 9.1 (CP-8) to 12.5 (CP-7). Thus, the shape of the fruit also changes depending on the ratio of their length and width.

Table 2

Size of *Crataegus turkestanica* Pojark fruits in different coenopopulations (in mm, dry)

Fetal index	**Coenopopulations**										**Average indicator**
	1	2	3	4	5	6	7	8	9	10	
Fruit length	10,1	11,2	10,5	12,1	12,4	11,1	12,5	9,1	10,2	11,5	11,1
Fruit width	8,4	8,3	8,2	9,8	10,7	10,5	10,2	7,9	8,9	9,9	9,3
Length of the stalk	11,1	12,3	10,5	9,4	10,1	8,7	12,0	11,5	11,1	12,2	10,9

Research on the study of the fruit reserves of Crataegus turkestanica Pojark. was carried out in the same coenopopulations. As the data in Table 3 show, the total operational stock of raw fruits in all studied 10 coenopopulations is about 7 tons of raw weight.

Table 3

Total exploitable stock of *Crataegus turkestanica* Pojark fruits in the Kungurbuka Mountains

№	Coenopopulations	Total area, ha	Productivity, kg/piece	Yield, kg/ha	Operating reserve, kg
1	Chinorkent	1,2	17,398	420,452	504,542
2	Chaynaksay 1	0,8	14,481	615,442	492,354
3	Buluksu	2,1	7,412	416,484	874,616

4	Humsonlik uchgan	1,4	8,214	310,958	435,342
5	Chaynaksay 2	2,1	9,462	662,34	1 390,914
6	Kuruksay	1,8	7,288	441,329	794,392
7	Ovrazak	2,3	6,552	290,566	668,304
8	Karankulsay (upper reaches)	1,5	7,09	425,4	638,1
9	Karankulsay (middle current)	2,4	6,768	355,32	852,768
10	Karankulsay (lower reaches)	2,0	8,481	343,480	686,961
Total		**17,6**			**7338,293**

CONCLUSION

It was revealed that Crataegus turkestanica dominates and plays the role of an edificator in many communities of the vegetation cover of the studied area. It was established that the number of individuals increases every year and the range of the species expands. During the study, we came to the conclusion that this species is the most progressive and widespread species in the vegetation cover of Mount Kungurbuka. But they are very negatively affected by human economic activity. In this regard, measures to protect the vegetation of Mount Kungirbuka (including Crataegus turkestanica) should be multi-level and include both environmental actions (creation of reserves, monitoring of plant populations) and active involvement of the local population through environmental education and sustainable use of resources.

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