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## **The age composition of populations of *Crataegus ambigua* in the natural conditions of Mangyshlak**

In article results of studying of age structure of populations of *Crataegus ambigua* are given in gorges of Mangystau Region. It is revealed that populations of *Crataegus ambigua* in natural populations are characterized by different age structure and a state. Hawthorn populations in the gorge Karasay, Akmysh, Kezim and Tulkili Sai it is possible to characterize as the young developing with prevalence the pre-generative of individuals; in gorges Kendirly, Zhemsemsay and Sultan Epe — as unstable and restored after a long drought; in gorges Samal and Emdikorgan — as steady middle-aged with prevalence of young and middle-aged generative plants; in the gorge Karakosayym — as degrading and unstable. Additional security actions in gorges Karakosayym, Kendirly, Zhemsemsay and to Sultan Epe are necessary for preservation of populations of a rare and endemic plant a hawthorn doubtful and restoration of a condition of populations.

*Keywords:* Mangyshlak, *Crataegus ambigua*, populations, age structure, rare species.

### *Introduction*

One of the most important problems of modernity is storage of the biological diversity, as in natural conditions, so in especially created reserved areas. Kazakhstan, as the modern state, during independent years ratified a row of UN Conventions on storage and rational use of biodiversity, among them were Rio de Janeiro Declaration about environment and development (1992), Convention on Biological Diversity (1994), The Global Plan of actions for storage and using of vegetation genetic resources for reproduction of foods and agriculture (1996), International Convention on genetic resources of plants for production of food products and development of agriculture (2004) [1–4].

A ratification of above noted international conventions suggests that present days it is need big investigations for inventory and storage the genetic biodiversity, as flora, so fauna of Republic of Kazakhstan.

At the territory of Mangystau region such important object for researching if *Crataegus ambigua* [5, 6], which is vitamin-containing plant and herb, rare plant, also it is included in list of wild relatives of cultivated plants of Kazakhstan.

The aim of present researching was to conduct assessment of age composition of *Crataegus ambigua*'s populations in different conditions of Mangystau.

### *Objects and methodology*

Objects of researches were wild natural populations of rare and endemic plant in Kazakhstan — *Crataegus ambigua* C.A. Mey ex A. Beck. The study was conducted during 2015–2017 years at peninsula Mangyshlak (the Northern Aktau and the Western Karatau) and peninsula Tyubkaragan. 10 populations of *Crataegus ambigua* were analyzed: Akmysh, Samal, Zhemsemsay, Sultan Epe, Karakosayym, Kezim, Karasay, Kendirly, Emdikorgan and Tulkilisay.

Research conducted by route and reconnoitering and semi-portable methods [7, 8]. In field conditions carried out the description of the revealed populations with participation of *Crataegus ambigua*, carried out collecting herbarium material, assessment of a ratio of age groups of plants.

Ontogenetic conditions of individuals of a hawthorn were analyzed on the basis of reference materials [9–12]. For trees of hawthorn young individuals in the form of subgrowth, virginal individuals, young generative and adult generative plants allocated.

### *Results and discussion*

Growing in different conditions, the hawthorn differs in various indicators in the course of vegetation, productivity and development [13, 14]. At inventory of population have allocated 4 groups of uneven-age hawthorns: young individuals (root or seed origin); virginal (large individuals, but not reached the generative period); young generative plants; adults generative plants (Table 1).

The age state of plants of *Crataegus ambigua* in the natural population of Mangystau

Location	Total plants	Age state							
		Young individuals (subgrowth)		Virginal		Young generative plants		Adults generative plants	
		Pieces	%	Pieces	%	Pieces	%	Pieces	%
Gorge Akmysh	357	163	45.7	42	11.8	102	28.6	50	14.0
Gorge Samal	104	16	15.4	12	11.5	44	42.3	32	30.9
Gorge Zhemsemsay	120	19	15.8	4	3.3	47	39.2	50	41.7
Gorge Sultan Epe	415	89	21.4	34	8.2	175	42.2	117	28.2
Gorge Karakosayym	130	35	26.9	3	2.3	88	67.7	4	3.1
Gorge Kezim	97	22	22.7	21	21.6	50	51.6	4	4.1
Gorge Karasay	288	86	29.9	53	18.4	105	36.5	44	15.3
Gorge Kendirly	423	190	44.9	44	10.4	151	35.7	38	8.9
Gorge Emdikorgan	55	15	27.3	11	20.0	22	40.0	7	12.7
Gorge Tulkilisay	155	59	38.1	27	17.4	50	32.3	19	12.3

Our results have shown that in the conditions of Mangystau the largest number of individuals of *Crataegus ambigua* is noted in Kendirli's gorges (423 individuals), Sultan Epe (415 individuals) and Akmysh (357 individuals). The minimum number of plants is revealed in gorges Kezim (97 individuals) and Emdikorgan (55 individuals).

The young individuals which have formed at the expense of root young growth are most widespread in the gorge Akmysh (163 individuals), in the minimum quantity — in gorges Samal (16 individuals) and Zhemsemsay (19 individuals). Seed and vegetative renewal of hawthorns in the gorge Akmysh was higher, than in other gorges.

The fructifying individuals of a hawthorn (the generative period) in a large number are characteristic of the gorge to Sultan Epe — 292 plants. The gorge Akmysh, which has 152 individuals, is in the second place. For species population in the gorge Kezim the smallest quantity of hawthorns in a generative phase — 54 individuals is noted.

Akmysh at hawthorns the vitality is estimated at the gorge as satisfactory, individuals are partially oppressed that is expressed in smaller sizes of adult generative individuals. Young individuals healthy, without external signs of damage (Fig. 1).



A



B

Figure 1. Young generative (A) и adult generative (B) plants of *Crataegus ambigua* at gorge Akmysh

In the gorge Samal in comparison with other gorges vitality of plants is good, hawthorns in phytocoenosis have normal blossom and fructify, and there are individuals of all age groups. Representatives of all age groups are healthy, without external signs of damages and diseases. Root renewal (Fig. 2) is observed.

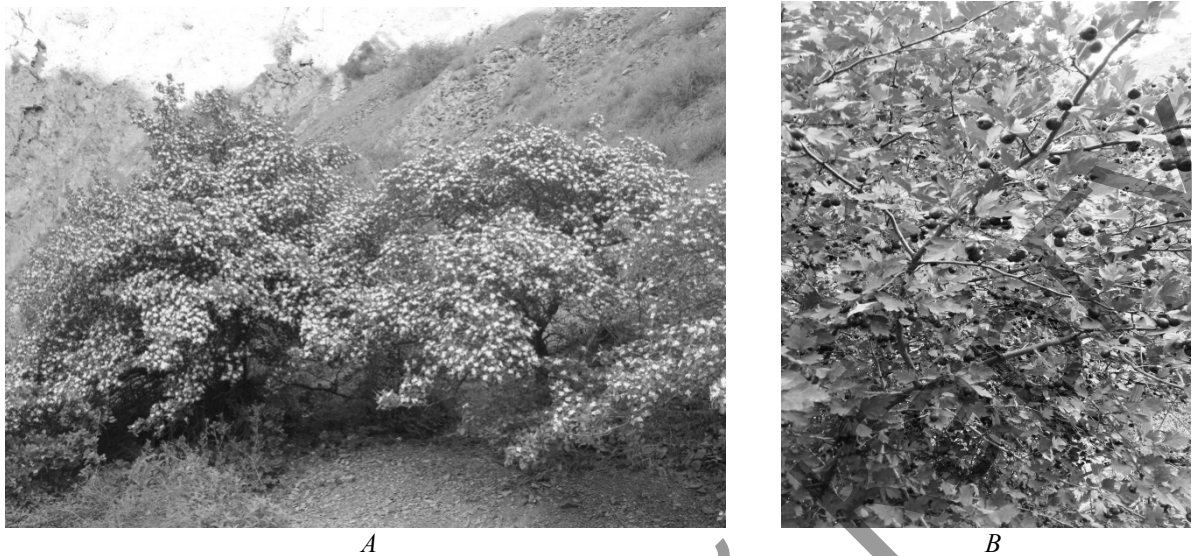


Figure 2. Flowering (A) and fruitening (B) plants of *Crataegus ambigua* in gorge Samal

In the gorge Zhemsemsay at hawthorns vitality is satisfactory, individuals are oppressed; strongly weakened adult trees (30–35 %) prevail. Crowns are thinned with considerable stressed branches, leaves have died off light-green and small, considerable sites of bark.

In the gorge to Sultan Epe vitality also is satisfactory; some individuals in depression (15–20 %), there are individuals of all age groups. At the majority of hawthorns crowns is weak, separate branches have dried out, leaves light-green. Individuals plentifully blossom, but fructification average. The renewability goes at the expense of root young growth. In the gorge Karakozayym vitality is satisfactory, the oppressed state is observed only at three old plants; they are infected with an orange-yellow raid lichens. There are individuals of all age groups. At the majority of hawthorns the crowns openwork, leaves dark-green, renewability goes at the expense of root young growth. Individuals in population plentifully blossom and fructify, adult individuals reach the sizes, normal for this species.

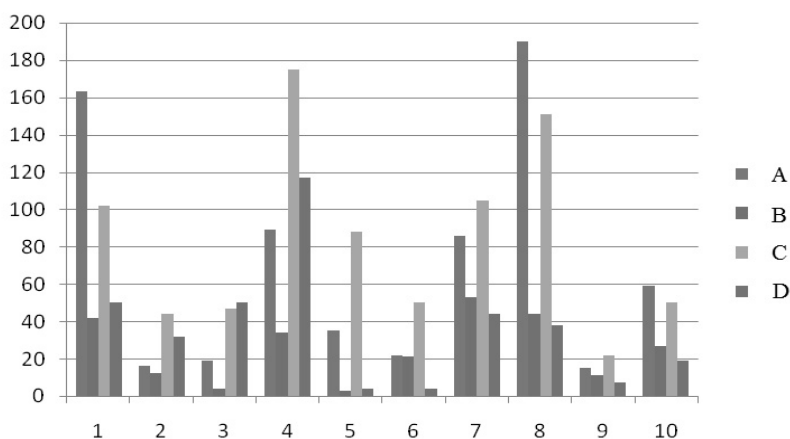
In the gorge Kezim vitality is good, individuals in a population plentifully blossom and fructify. Individuals of all age groups meets, especially there is a lot of young generative plants. The crowns at the majority of hawthorns are openwork, leaves are dark-green, and renewability goes at the expense of root young growth. Adult individuals reach the sizes, normal for this species.

The ratio of age groups of plants in gorges isn't identical that reflects a condition of populations more in detail. So, the prevalence in structure of populations of young people the pre-generative individuals testifies to a young condition, a possibility of further development; middle-aged individuals — about stability of population; old individuals — about degradation of population with the prospect of dying off.

In the gorge Karasayym young individuals have made about 30 % of the total number of plants (Fig. 3), virginal plants are 18.4 %.

The share of young generative individuals are big (36 %). The share of middle-aged individuals is estimated at the level of 15.28 %. Thus, population of *Crataegus ambigua* in the gorge Karasay can be characterized as the young, developing with prevalence the pre-generative and young generative individuals.

In Kendirli's gorge 2 peaks of age groups of plants of *Crataegus ambigua* are noted. The first peak is the share of young plants, the second peak is young generative plants. At the same time the share the virginal plants and middle-aged remains very low. Such ratio is formed in population at experience of extremely adverse conditions during the last period. A part of population has been destroyed, possibly, in result of a long-term drought, but at present there is its restoration. Thus, doubtful in Kendirli's gorge we can characterize population of a hawthorn as unstable and restored.



*A* — young individuals; *B* — virginile plants; *C* — young generative plants; *D* — adult generative plants; gorges: 1 — Akmysh; 2 — Samal; 3 — Zhemsemsay; 4 — Sultan Epe; 5 — Karakosayym; 6 — Kezim; 7 — Karasay; 8 — Kendirli; 9 — Emdikorgan; 10 — Tulkilisyay

Figure 3. Ratio of age groups of *Crataegus ambigua* in some gorges of Mangyshlak

In the gorge Emdikorgan the prevalence of generative individuals of a hawthorn is noted. So, the share of generative individuals has made 52.7 %, the pre-generative individuals are 47.3 %, that is various age groups of plants are evenly presented. Thus, hawthorn population in the gorge Emdikorgan can be characterized as middle-aged and steady with dominating of young generative individuals.

In Tulkili Sai's gorge the share of young people and the virginal individuals has made 55.5 %, generative individuals are 45.5 %. Thus, we can characterize this population as young and developing.

In the gorge Akmysh the dominating number of individuals treats young individuals; the second position is taken by young generative plants. The share the virginal plants was low, and a share middle-aged generative. Population can be characterized as the young, developing with prevalence the pre-generative individuals.

In the gorge Samal is observed the shift of an age range towards generative plants. So, in this gorge young generative plants prevail, the share of middle-aged individuals is rather high, sub-growth is about 30 % of the total number of individuals. Hawthorn population in the gorge Samal is middle-aged and steady with domination of young generative individuals, renewal at rather high level.

In the gorge Zhemsemsay and Sultan Epe populations have 2 peaks in an age range — subgrowth and middle-aged generative individuals. As and in Kendirli's gorge, population of a hawthorn has been partially damaged after drought (there was a loss of a part the pre-generative plants), at present there is a gradual restoration of an age range what the large volume of young plants from root young growth and seed origin testifies sufficient to. Populations can be characterized as unstable, but developing.

The most critical situation develops in the gorge Karakozayym where the prevalence of young generative plants is noted whereas the share middle-aged and the virginal are very low. Population is characterized as degrading, unstable. However, growth of peak of sub-growth in the form of young plants testifies to a tendency to restoration of an age range of population.

In gorges Kezim and Tulkili say of hawthorn population young steady and developing, with a high share of sub-growth and young generative plants.

### Conclusion

Thus, populations of *Crataegus ambigua* in natural populations of Mangystau Region are characterized by different age structure and state. So, populations in the gorge Karasay, Akmysh, Kezim and Tulkili sai it is possible to characterize as the young people developing with prevalence the pre-generative individuals; in Kendirli's gorges, Zhemsemsay and Sultan Epe — as unstable and restored after a long drought; in gorges Samal and Emdikorgan — as steady middle-aged with prevalence of young and middle-aged generative plants; in the gorge Karakosayym — as degrading and unstable.

Additional security actions in gorges Karakosayym, Kendirli, Zhemsemsay and to Sultan Epe are necessary for preservation of populations of a rare and endemic plant *Crataegus ambigua* and restoration of a condition of populations.

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### Маңғышлақ табиғи жағдайындағы күмәнді долана популяциясының жастық құрамы

Мақалада Маңғыстау облысы сайларындағы күмәнді доланалар популяциясының жастық құрамын зерттеу нәтижелері келтірілген. Күмәнді доланалардың табиғи популяциясы әртүрлі жас құрамымен және жағдайларымен ерекшеленеді. Қарасай, Ақмыш, Кезім және Түлкілі сайларында таралған күмәнді доланалардың популяциясы виргинильдік дарактары басым жас, дамушы, Кендірлі, Жемсемсай және Сұлтан Епе сайларында — тұрақсыз және көпжылдық құрғақшылықтан кейінгі қалпына келуші, Самал және Емдіқорған сайларында — жас және орта генеративтік өсімдіктер басым тұрақты ортажас, Қаракөзайым сайында құлдыраушы және тұрақсыз сипатқа ие. Сирек және эндемдік күмәнді долананың популяциясын сақтап, қалпына келтіру үшін Қаракөзайым, Кендірлі, Жемсемсай және Сұлтан Епе аңғарларына қосымша күзет шараларын ұйымдастыру қажет.

*Кілт сөздер:* Маңғышлақ, күмәнді долана, популяциялар, жастық құрам, сирек түр, эндемик.

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### Возрастной состав популяций боярышника сомнительного в природных условиях Мангышлака

В статье приведены результаты изучения возрастного состава популяций боярышника сомнительного в ущельях Мангыстауской области. Выявлено, что популяции боярышника сомнительного в природных условиях характеризуются разным возрастным составом и состоянием. Популяции боярышника в ущельях Карасай, Ақмыш, Кезим и Тулкили сай можно характеризовать как молодые, развивающиеся, с преобладанием прегенеративных особей; в ущельях Кендири, Жемсемсай и Сұлтан Епе — как

неустойчивые и восстанавливающиеся после длительной засухи; в ущельях Самал и Емдикорган — как устойчивые средневозрастные, с преобладанием молодых и средневозрастных генеративных растений; в ущелье Каракозайым — как деградирующие и неустойчивые. Для сохранения популяций редкого и эндемичного растения боярышника сомнительного и восстановления состояния популяций необходимы дополнительные охранные мероприятия в ущельях Каракозайым, Кендирли, Жемсемсай и Султан Епе.

*Ключевые слова:* Мангышлак, боярышник сомнительный, популяции, возрастной состав, редкий вид.

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