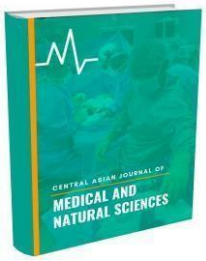

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Article

Phytocenotic and Resource Study Characteristics of *Arum Korolkowii* Regel in the Kungurbuka Mountains (Western Tien Shan)

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Abstract: The purpose of this article is to study the coenopopulation of *Arum korolkowii* Regel in the Kungurbuka Mountains (Western Tien Shan), identify the confinement of Arum korolkowii to plant communities, identify the main commercial thickets, and investigate the main parameters of phytocenotic and resource characteristics in this area.

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

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1. Introduction

Mount Kungirbuka is located within Uzbekistan and is part of the western Tien Shan. Its vegetation is a unique example of mountain and foothill ecosystems of Central Asia. The vegetation of this region depends on the altitude, climate and soil conditions, which can vary even in small areas in the mountains. The region's flora includes both steppe and mountain species, as well as endemic and rare plants.

Arum korolkowii Regel is a herbaceous plant of the family Araceae, native to the mountains of Central Asia, including Uzbekistan. It is found on shady slopes, in ravines, and among shrub communities on soils that can retain more moisture than more open areas. Arum korolkowii is a member of the herbaceous layer of plant communities, often found in mixed communities with herbs and shrubs. It can be found in the undergrowth of sparse forests or near water sources where the soil moisture is slightly higher. Species in this genus play an important role in maintaining biodiversity due to their unique flower shape, which attracts specialized pollinators such as flies (Fig.1, 2).

Figure 1. General view of the coenopopulation Arum korolkowii Regel in the generative phase

Figure 2. The coenopopulation Arum korolkowii Regel in the fruit ripening phase

Tolerance to shady conditions is expressed by the fact that Arum korolkowii is well adapted to growing in shady places and in conditions of moderate humidity, which allows it to occupy a unique ecological niche in mountainous areas. Unique symbiosis with

pollinators: arums have an unusual pollination mechanism, attracting flies with their flowers, which contributes to successful reproduction in conditions where pollinating insects may be limited in number.

The article presents the results of research on the distribution of Arum korolkowii in the Kungurbuka Mountains by phytocenoses, phytocenotic and resource characteristics of coenopopulations.

Arum korolkowii – poisonous plant of the family Araceae. All parts of the plant are highly poisonous when fresh, especially the tubers. In folk medicine, the roots are used for scorpion and poisonous animal bites, acute forms of hemorrhoids and eczema. An extract from the dry roots is used against colds and catarrh of the respiratory tract[1]. In terms of resource studies, this species has not been previously studied in this area.

The aim of this work is to study the association of Arum korolkowii with plant communities, identify the main commercial thickets, investigate the main parameters of phytocenotic and resource characteristics in this area and outline ways of their rational use.

2. Materials and Methods

The materials for these studies were collected in the period from 2022 to 2024 in various parts of Mount Kungurbuka. When carrying out phytocenotic and resource studies, we paid special attention to determining the age composition, spatial structure of coenopopulations and natural reserves of raw materials of Arum korolkowii.

In describing coenopopulations and studying their spatial structure, generally accepted methods were used [2;3;4;5;6]. Ontogenetic states are given by comparative morphological methods [7;8]. Ontogenetic tactics and strategies are identified according to B.M. Mirkin [9; 10], A.R.Ishbirdin, M.M. Ishmuratova [11;12].

To determine the biological and operational reserves of raw materials, generally accepted methods were used [13;14;15].

3. Results and Discussions

We analyzed the conditions of different arum cenopopulations, as this has great theoretical and practical significance. The best and most complete method for studying the state and structure of coenopopulations (CP) of any species, including *Arum korolkowii*, is population analysis. And here, an important element is the clarification of the age structure, the characteristic of which is its age spectrum.

We studied the age spectra of Arum korolkowii cenopopulations during 2022-2024 in various parts of Mount Kungurbuka. First of all, the main locations of coenopopulations were identified, their association with plant communities was determined, then the age structure of coenopopulations within these communities was studied, the state of coenopopulations was assessed, after which the reserves of medicinal raw materials were calculated.

We determined the reserves of arum raw materials in the coenopopulations that are part of the 29 plant community. The characteristics of the habitats and coenopopulations of arum are given in Table 1. As can be seen from the data in this table, the studied coenopopulations differ in their ecological and phytocoenotic conditions.

Table 1

Characteristics of the locations of *Arum korolkowii* Regel coenopopulations in the Kungurbuka Mountains

№ CP	Location	Plant community	Associated species	C
1	2	3	4	5
1	Lolazarsay	Ass.Juglands regia+Achillea millefolium	*Gymnospermum albertii, Veronica argetuserrata, Tanacetum pseudoachillea, Arum korolkowii, Phlomis thapsoides, Prangos pabularia,*	3
2	Lolazarsay	Ass.Malus sieversii+Achillea millefolium	*Ranunculus pratense, Artemisia absinthum, Corydalis ledebouriana, Arum korolkowii*	3
3	Lolazarsay	Ass.Malus sieversii+Rosa canina	*Ceratosepalus testiculatus, Asperugo procumbens, Rumex confertus, Equisetum arvense, Arum korolkowii*	2
4	Lolazarsay	Ass.Acer semenovii+ Rosa kokanica+ Arum korolkowii	*Rosa kokanica, Verbascum songoricum, Potentilla reptans, Euphorbia helioscopia, Arum korolkowii, Galium aparine*	2
5	Lolazarsay	Ass.Crataegus turkestanica+ Arum korolkowii	*Artemisia vulgaris, Poterium polygamum, Stachys betonicifolia, Glyzirrhiza glabra, Thalictrum minus*	2
6	Lolazarsay	Ass.Juniperus zerawschanica+Prangos pabularia	*Ziziphora pedicellata, Origanum tytthanthum, Tulipa greigii, Eremurus robustus, Arum korolkowii, Polygonatum severtzovii*	2
7	Chaynaksay	Ass.Crataegus turkstanica+Rosa canina	*Rosa kokanica, Rosa persica, Hypericum scubrum, Arum korolkowii, Ceratosephalus testiculatus*	3
8	Chaynaksay	Ass.Crataegus turkestanica+ Salvia sclarea	*Eminium regelii, Leonurus turkestanicus, Arum korolkowii, Hypericum perfoliatum, Onopordum acanthium,*	3
9	Chaynaksay	Ass.Prunus divaricate+Rosa canina	*Efedra equisetina, Eminium regelii, Vexibia pachycarpa, Arum korolkowii, Geranium pusillum*	3
10	Kichikkutan	Ass.Acer semenovii+ Crataegus turkestanica	*Rosa kokanica, Corydalis ledebouriana, Geum urbanum, Arum korolkowii, Agrimonia asiatica, Daucus carota*	3
11	Kichikkutan	Ass.Crataegus turkestanica+ Helichrysum maracandicum	*Cnicus benedictus, Cichorium intybus, Arum korolkowii, Ranunculus pratensis, Potentilla reptans*	3
12	Kattakutan	Ass.Rosa canina+ Cotoneaster melanocarpa	*Berberis vulgaris, Amygdalus spinosissima, Rosa canina, Ranunculus repens, Arum korolkowii, Eminium regelii*	3

13	Kattakutan	Ass. Rosa canina+Leonurus turkestanicus	*Cnicus benedictus, Artemisia absinthum, Arum korolkowii, Helichrysum maracandicum*	3
14	Kuruksay	Ass.Malus sieversii+Rosa kokanica	*Spiraea pilosa, Anemone petiolulosa, Arum korolkowii, Eranthis longistipitata*	2
15	Kuruksay	Ass.Malus sieversii+Prunus divaricata	*Korolkovia severtzovii, Thalictrum minus, Arum korolkowii, Eminium regelii*	2
16	Kuruksay	Ass.Prunus divaricate+Rosa fedschenkoana	*Amygdalus spinosissima, Rosa persica,Salvia sclarea, Leonurus turkestanicus, Korolkovia severtzovii, Arum korolkowii*	1
17	Kuruksay	Ass. Malus sieversii+Acer semenovii+ Berberis integerrima	*Leonurus turkestanicus, Arum korolkowii, Korolkovia severtzovii, Corydalis ledebouriana, Gymnospermum albertii*	2
18	Katta tuptol	Ass. Malus sieversii+Acer semenovii+Salix olgae	*Prangos pabularia, Arum korolkowii, Artemisia absinthum,Ulugbeckia chimganica, Iris songorica*	3
19	Kichik tuptol	Ass.Salix olgae+Crataegus turkestanica	*Rosa kokanica, Thermopsis alterniflora, Leonurus turkestanicus, Arum korolkowii*	3
20	Kuygantekis	Ass.Rosa canina+Amygdalus petunnikovii	*Ligularia thomsonii, Helichrysum maracandicum, Anemone petiolulosa, Tulipa dubia, Geranium collinum, Arum korolkowii*	2
21	Humsonlik uchgan	Ass.Rosa kokanica+ Amygdalus spinosissima	*Ferula tenuisecta, Carduus coloratus, Clematis orientalis, Salvia sclarea, Handelia trichophylla, Arum korolkowii*	2
22	Ovrazak	Ass.Crataegus pontica+Arum korolkowii	*Berberis integerrima, Amygdalus petunnikovii, Adonis parviflora, Thalictrum minus, Daucus carota*	1
23	Irgayli	Ass.Cotoneaster melanocarpus+ Rheum maximovizcii	*Cotoneaster melanocarpus, Cardamine impatiens, Capparis herbacea, Arum korolkowii*	1
24	Kurgaz	Ass.Stipa capillata+ Tanasetum pseudoachillea	*Bromus tectorum, Achillea millefolium, Euphorbia franchetti, Crambe kotchyana, Eremurus regelii, Arum korolkowii*	2
25	Buluksu	Ass.Crataegus turkestanica+ Psoralea drupacea	*Capparis herbacea, Alhagi kirghisorum, Echinops tschimganicus, Arum korolkowii,*	3
26	Archali	Ass.Juniperus zerawshanica	*Pyrus korshinskyi Rosa canina, Cerasus erythrocarpa, Thalictrum minus, Arum korolkowii*	1
27	Karankulsay (upper reaches)	Ass.Juniperus zarawschanica+ Rhus coriaria	*Pyrus korshinskyi, Achillea millefolium, Taraxacum montanum, Arum korolkowii*	1
28	Karankulsay (middle current)	Ass.Crataegus turkestanica+Rosa canina	*Crataegus pontica, Rosa persica, Spiraea pilosa, Acroptilon repens, Arum korolkowii*	2

29	Karankulsay (lower reaches)	Ass.Crataegus turkestanica Onopordum acanthium	*Echinops tschimganicus, Tussilago farfara, Arctium tomentosum, Haplophyllum latifolium, Arum korolkowii*	3

Note. C-degree of anthropogenic load: 1-weak; 2-medium; 3-strong.

The age structures of *Arum korolkowii* coenopopulations in the Kungurbuka Mountains are presented in Table 2. It was found that almost all coenopopulations did not have juvenile individuals (19 CP out of 29 CP). Only 10 CP had juvenile individuals from 1.0% (CP-14) to 10.8% (CP-12). The comparatively highest proportion of juvenile individuals is found in CP-6 (6.7%), CP-13 (8.0%), CP-12 (10.8%). Immature individuals are also quite rare. Only in CP-1 and CP-12 are there comparatively more (12.3% and 6.6% respectively). The main part of all coenopopulations consists of virginal (CP-1, CP-2, CP-3, CP-4, CP-19, CP-23) or generative (CP-5, CP- 6, CP-8, CP-9, CP-10, CP-11, CP-13, CP-15, CP-16, CP-17, CP-18, CP-20, CP-21, CP-22, CP-25, CP-26, CP-27, CP-28, CP-29) individuals or both virginal and generative individuals in almost equal numbers (CP-7, CP-12, CP-14, CP-24). In the coenopopulations, subsenile individuals were present in very small numbers, and senile individuals were not found.

The area of thickets where it is possible to harvest raw materials (tubers) of this plant is not very large. They range from 0.011 to 0.141 hectares. All 29 communities studied can be divided into three groups: - the first group includes 23 communities with an area from 0.011 to 0.049 ha; - the second group, with an area from 0.050 to 0.080 ha, includes 3 communities, the third group includes 2 communities with an area over 0.080 ha. The total projective coverage of the territory occupied by the studied communities is very diverse and ranges from 45 to 100%. Based on the projective cover, all the studied communities were divided into three groups: - with a total projective cover from 45 to 60%; - with a total projective cover from 60 to 80%; - and with a projective cover over 80%. The role of Arum korolkowii in these phytocenoses is also different. The projective cover with Arum *korolkowii* in different plant communities varies from 20 to 75%. But these percentages do not quite clearly highlight the role of arum, since the total projective cover in these communities is different, therefore, arum has a different role in the life of these communities. For example, in Lolazarsay, arum was studied as part of several communities. In CP-1 and CP-2 in the forb-nut and apple communities, the projective cover of arum is close and amounts to 24 and 22%, respectively. But in the first and second cases, the total projective cover amounts to 80 and 60%, respectively. This means that the role of arum in this situation is greater as part of the second community.

Table 2

Age structure of the Arum korolkowii Regel CP in the Kungurbuka Mountains

№ CP	Age groups, %					
	j	im	v	g	ss	s
1	0	12.3	77.0	9.6	1.1	0
2	0	3.4	80.7	13.1	2.8	0
3	0	5.3	56.1	38.6	0	0
4	1.3	0	67.2	31.5	0	0
5	0	0	0	95.5	4.5	0
6	6.7	2.9	23.8	66.6	0	0
7	3.2	4.7	45.0	47.1	0	0
8	4.0	0	0	94.3	1.7	0
9	0	1.1	23.9	72.6	2.4	0
10	0	0	11.6	83.1	5.3	0
11	1.1	1.5	15.2	69.8	12.4	0
12	10.8	6.6	33.6	48.5	0.5	0

13	8.0	0	17.8	61.5	12.7	0
14	1.0	3.1	39.3	56.6	0	0
15	0	1.9	11.1	87.0	0	0
16	0	0	7.9	88	4.1	0
17	0	0	0	98.9	1.1	0
18	0	0	30.2	69.2	0.6	0
19	0	0	65.4	32.8	1.8	0
20	2.7	0	34.2	58.2	4.9	0
21	0	0	0	85.9	14.1	0
22	0	4.7	21.2	72.0	2.1	0
23	0	1.4	76.3	22.3	0	0
24	3.9	2.0	44.5	48.5	1.1	0
25	0	2.2	33.7	63.1	1.0	0
26	0	7.5	12.5	73.1	6.9	0
27	0	0	0	92.0	8.0	0
28	0	0	19.9	80.1	0	0
29	0	0	5.3	94.7	0	0

As studies show, the largest operational reserves of medicinal raw materials were found in CP-15, CP-24, CP-4, CP-9, CP-11, CP-12, CP-14, CP-16, CP-18, CP-21, CP-26, CP-27, and the smallest in CP-22, CP-23, CP-6, CP-8, CP-10, CP-28 (Table 3).

Table 3

Reserves of medicinal raw materials (tubers) *Arum korolkowii* Regel in the Kungurbuka Mountains (air-dry weight)

№ CP	Density of raw material stock, g/m²	Operational stock of medicinal raw materials, kg	Possible annual harvest volume, kg
1.	36,5±3,2	9,125±0,31	0,9±0,02
2.	28,0 ±2,0	7,840±0,50	0,8±0,05
3.	56,5 ±5,2	8,475±0,11	0,8±0,01
4.	39,0 ±4,0	12,480±1,33	1,2±0,09
5.	29,5 ±2,8	7,965±0,78	0,8±0,06
6.	38,5 ±3,5	5,005±0,32	0,5±0,05
7.	45,5 ±4,8	9,100±1,01	0,9±0,11
8.	23,5 ±3,4	4,230±1,00	0,4±0,10
9.	29,0 ±3,2	12,180±1,43	1,2±0,16
10.	46,5 ±4,6	6,510±0,62	0,7±0,06
11.	34,0 ±4,2	17,340±1,51	1,7±0,09
12.	40,5 ±3,8	10,935±0,80	1,1±0,07
13.	29,5± 2,9	8,850±0,81	0,9±0,09
14.	67,0± 5,4	12,730±1,22	1,3±0,72
15.	44,0± 4,1	62,040±2,35	6,2±0,12
16.	28,0± 3,7	18,200±0,72	1,8±0,08
17.	50,5± 6,8	7,070±0,91	0,7±0,10
18.	36,5± 4,3	10,220±0,92	1,0±0,07
19.	51,5 ±4,8	7,725±0,74	0,8±0,11
20.	23,5 ±3,2	8,460±0,90	0,8±0,09
21.	29,5±2,3	12,095±1,01	1,2±0,12
22.	41,0±4,3	6,970±0,64	0,7±0,09
23.	40,5±3,9	4,455±0,32	0,4±0,03
24.	38,5±4,0	34,650±1,71	0,3±0,22
25.	30,5±3,3	7,015±0,46	0,7±0,02

26.	39,5±4,2	20,540±1,13	2,1±0,12
27.	40,0±3,9	25,200±0,52	2,5±0,08
28.	37,5±4,1	6,750±0,40	0,7±0,03
29.	31,0±3,4	8,990±0,32	0,9±0,02
Total:		373,19±27,13	34±2,03

4. Conclusion

As a result of the conducted research it was revealed that all studied coenopopulations of Arum korolkowii Regel in the mountains of Kungurbuka are normal, incomplete. The low proportion of juvenile individuals indicates the difficulty of self-maintenance processes. Arum korolkowii. Regel does not form continuous large thickets in the studied area. The total area of all 29 studied arum cenopopulations is 1.064 ha. The total exploitable stock of this species in the studied coenopopulations is about 400 kg, and the annual harvest volume is about 34 kg of air-dried raw materials.

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