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Abstract. In this scientific article, the bioecological characteristics and seed germination of *Rheum L* species growing in Karakalpakstan were studied. The aim was to scientifically substantiate issues such as the study of plants belonging to the species *Rheum L*, the identification of natural reserves, and the development of reproduction technology. The following species of *Rheum L*: *Rheum tanguticum*, *Rheum maximowiczii*, *Rheum turkestanicum*, *Rheum tataricum* - are present, and the following 2 species of Tartarian rhubarb and *Rheum turkestanicum L* grow in the Republic of Karakalpakstan. The raw material of the Tartarian rhubarb plant (underground roots of the plant) is included in the list of the State Drug Fund of the Republic of Kazakhstan. The roots and fruits contain valuable tannins and colorants (orange-red) used to process the skin. It is also used in traditional medicine as a means of treating diseases of the stomach. With this in mind, the Tartarian rhubarb plant growing in Karakalpakstan was selected as the object, and scientific experiments on phenological observations under natural conditions were carried out in the Ustyurt Plain of the Republic of Karakalpakstan. In this process, leaf diameter, flowering phases and plant distribution were observed during plant growth, and the effects of wind speed, temperature and humidity on growth and development in nature were studied. In the scientific article, the seed germination of Tartarian rhubarb was studied in the laboratory and in the field using the methods given in the literature for seed multiplication and seedling preparation.

1. Introduction

According to the Resolution of the President of the Republic of Uzbekistan dated April 10, 2020 "On measures for the protection, cultivation, processing and rational use of available resources of medicinal plants growing in the wild" increasing the export potential of the industry, as well as the need to integrate education, science and production processes [1, 2].

Therefore, in order to ensure the implementation of laws and decisions on the creation of raw materials for the cultivation of medicinal plants, to study the medicinal plants belonging to the local flora, to develop methods of cultivation and supply to local pharmaceutical companies, to meet the

population's demand for natural medicines taking into account the demand for such natural medicinal plants today, we have chosen the Rhubarb species as a scientific object [3, 4]. The aim was to scientifically substantiate issues such as the study of plants belonging to the species of rhubarb, the identification of natural reserves, the development of reproduction technology.

Rhubarb (*Rheum L.*) - a family of perennial herbaceous plants, vegetable crops [5, 6]. There are about 50 species that grow mainly in Asia. In Uzbekistan, 3 species grow wild. Rhubarb species are grown in European countries, USA, China, Central Asia. The leaf band is consumed from the spring, it is used in the preparation of sauces, compotes, pickles, jams, candies, kvass. The roots of some species have long been used as a preservative. The root and rhizome contain 3-6% anthraglycosides, 6-12% growth substances.

If we look at the history of the introduction of rhubarb species in medicine, in 2700 BC, this plant was used as a means of expulsion in China. In the 13th century, the famous tourist Marco Polo visited China and was the first to inform Europeans about ravoch. In 1871, the famous Russian traveler N.M. Przhevalsky found a wild species of this plant in the Kokunur River and sent its seeds to St. Petersburg. Rhubarb species are grown in the St. Petersburg Botanical Garden and are distributed as a cultivated plant [7].

The following species of rhubarb are available, and the following 2 species of *Rheum tataricum L* and *Rheum turkestanicum L* grow in the Republic of Karakalpakstan [8] (Figure 1).

Figure 1. Tartarian rhubarb plant, growing in Karakalpakstan.

Rheum tanguticum has healing properties. This has been known to the Chinese people for 3,000 BC. The Tangut ravochi was brought to Russia in 1872 from Central China by Nikolai Mikhailovich Przhevalsky. Eduard-von Regel, the future director of the St. Petersburg Imperial Botanical Garden, received the precious plant. It is noteworthy that the shape and color of ravoch seeds resemble buckwheat seeds because they are interconnected. A few years later, expeditions organized by Regel found the plant in the wild in Central Asia, Siberia, the Caucasus, and the Far East [9, 10].

Rheum maximowiczii - perennial plant, the rhizome is thick, the stem is leafless, strong, 40–100 cm in height and 8–20 mm thick. All leaves are large, short, flattened, usually 2-3 times shorter, 18-50 cm long and 20-60 cm wide, round, slightly wavy in height, with veins on both sides at the base or only above the surface and protruding veins at the bottom very densely covered [11].

Rheum turcestanicum is a perennial herb. It is found in the south-eastern part of the Kyzylkum desert, in the high mountains in the regions of Kulatau, Menshikli, (Kazantau). Considered the best forage in the pasture, the leaves of the plant are an excellent aquatic food for animals, often replacing

water, loved by sheep and goats, as well as cattle. The plant has not been sufficiently studied scientifically. The roots are sometimes used as a surrogate for tea. The presence of tannins in roots and fruits is also a valuable plant as a nutrient [12].

Tartarian rhubarb is a desert perennial ephemeral herb belonging to the family *Polygonaceae* L. Tartarian rhubarb. endemic type is very common in the Aral Sea, South Balkhash and Western Kazakhstan. The main source of raw material is the underground part of the plant, which consists of strong vertical roots. The raw material of the Tartarian rhubarb plant (underground roots of the plant) is included in the list of the State Drug Fund of the Republic of Kazakhstan [6].

Tartarian rhubarb has large leaves, 25–60 cm. The flowers are pale yellow or red in color, 2–3 pieces are collected in one place. The roots and fruits contain valuable tannins and colorants (orange-red) used to process the skin. It is also used in traditional medicine as a means of treating diseases of the stomach.

The leaves of the long-lived Tartarian rhubarb occupy 80-90 cm of land. Tartarian rhubarb is found everywhere in the Ustyurt district of the Republic of Karakalpakstan. Tartarian rhubarb grows from early spring, lifting the soil with small buds with a section of roots close to the ground. Vegetative development begins in early spring. In mid-summer, self-growth stops the developmental processes and produces seeds. Tartarian rhubarb blooms in the last 10 days of April, and its seeds ripen in late May.

The average number of seeds of middle-aged Tartarian rhubarb is not less than 700-800 pieces. It is reminiscent of the taste of very tasty acid if eaten by separating the stem from the outer bark of the plant. The content of water in tartar rhubarb reaches 90-95%.

Perennial plant with strong roots has 15-17% tannins in the roots and the bark of the fruit is 7 to 13%, quality 65-70% and tannins in the seeds from I.V. Larin data up to 18%, system, rhizome 5-6 cm thick, vertical black covered with brown..

Ustyurt is one of the largest deserts in Central Asia and differs from other deserts in the world by its geographical location, relief, flora and fauna and other features. The Ustyurt region covers 21.3 million hectares, of which 7.2 million hectares are in Karakalpakstan. The surface of Ustyurt is a wide undulating plain, some parts of which are disturbed by marked elevations and large depths between them. The soil cover is very diverse, consisting of gray-brown gypsum soils with a thickness of 40-180 cm. The climate is sharply continental, with hot dry summers and very cold winters, strong winds, low rainfall (70-110 mm per year), unstable snow cover, and sharp changes in seasonal and diurnal temperatures [6].

2. Materials and methods

The Tartarian rhubarb plant was selected as the object, and scientific experiments on phenological observations under natural conditions were carried out in the Ustyurt plain of the Republic of Karakalpakstan. In this process, leaf diameter, flowering phases and plant dispersal were observed during plant growth. The effects of abiotic factors on the growth and development of tartar rhubarb in nature, including the effects of wind speed, temperature, and humidity, have been studied. Different coordinates were obtained to determine the distribution area of the Tartarian rhubarb and how many plants were distributed (Figure 2).

Figure 2. Calculation of the distribution of Tartarian rhubarb growing in Karakalpak conditions.

In our subsequent experiments, we carried out work to determine the seed germination of the Tartarian rhubarb plant, propagate from seed and prepare seedlings in the laboratory and in the field, and this work was carried out in the light of the literature and scientific research.

High quality medicinal plants can be obtained only from healthy seeds. Empty, damaged, unripe seeds have no habitat and need to be sorted. Low-value mixtures should not be used. Sown seeds should have high germination capacity and cleanliness. These parameters are determined by the State Seed Inspection in accordance with the methods established by GOST. The seeds germinated very well and were specially processed to get healthy plants from them.

3. Results and discussion

Determining the quality of seeds in the breeding of medicinal plants is an important issue. Seed quality indicators include seed weight per 1000 seeds, seed purity, germination energy, and germination rate (Figure 3) [5,6].

Figure 3. Tartarian rhubarb seed size and weight of 100 seeds.

Tartarian rhubarb seeds range from dark brown to reddish-brown, elongated, double-grained, 10-15 mm long and 5-7 mm wide. The weight of 1000 seeds is 40 grams. In determining the purity of the

seed, its complete ripeness, integrity, damage to the anterior part of the seed, seeds twisted or bent to one side, straw mixed with the seed were studied.

To determine the purity of the seeds of the Tartarian rhubarb plant, 3 samples of 0.4 g from each option were taken and each seed sample was examined using a separate magnifying glass and fully ripened, whole seeds into one piece, damaged, twisted, crooked, second piece, between seeds straw, broken seed pieces were divided into a third piece. Each of the separated seed pieces was weighed on a separate scale to determine their weight, and the percentages were determined relative to the weight of the total sample (0.4 g) obtained. The results obtained are presented in Table 1.

Table 1. Tartarian rhubarb plant seed quality indicators.

Options	Weight of seed sample obtained, g	Fully ripe and whole seeds		Damaged seeds (curved, broken)		Mixtures (straw, broken seed pieces)	
		g	%	g	%	g	%
1	-	-	-	-	-	-	-
2	0.400	0.280	70.0	0.060	15	0.060	15
3	0.400	0.300	75.0	0.060	15	0.040	10
4	0.400	0.344	86.0	0.036	9	0.020	5

The results of the experiment in Table 1 show that they were not taken into account because of the low number of seeds in option 1 of the experiment, the best selected seeds in the remaining options of the experiment (options 2, 3, and 4) accounted for 70-86% of the total weight.

Seed quality indices of the Tartarian rhubarb plant were recorded as 86.0% in 4 options of the highest experimental experience among these options. Other indicators of seeds, i.e., the amount of damaged seeds and mixtures, were found to be somewhat lower (9%, 5%) in the 4 options mentioned above.

Other indicators of seeds, i.e., the amount of damaged seeds and mixtures, were found to be somewhat lower (10.0%, 5.0%) in the 4 options mentioned above. Seed germination energy is the most important quality indicator; fully germinated, well-purified, perennial seeds have a high germination energy, which results in a fertile, vigorous environment that adapts quickly to disease and pest resistance.

Complex biochemical processes take place during seed germination energy and germination. The biochemical processes that take place in seeds are greatly influenced by the temperature, humidity and air regime of the environment. For germination of seeds of many medicinal plants, the air and ambient temperature should not be lower than 25-27 ^{0}C; 50-80% of water by weight of seeds is required for germination of seeds. When the temperature and water are sufficient, the seeds begin to absorb oxygen rapidly, resulting in activated biochemical metabolism in the seeds, i.e. the oxidation of polyphenols and amines under the influence of various farmers, the lipase enzyme converts fats into glycerin and fatty acids.

The seeds are harvested in May before the leaves turn yellow and dry out. Harvesting of leaf pods and seeds begins in 2–3 years, and the preparation of root material in 3–4 years. In the experimental field, the seeds of the options were harvested on May 18, May 27-30 (seeds obtained in May, germination is determined in August). In the experimental field, 10 seeds of plants grown in each option were counted to determine the germination energy and germination of Tartarian rhubarb seeds. The seeds were placed in Petri dishes with filter paper at the bottom and pipetted with water. The Petri dishes were stored at room temperature at an average temperature of 25 ^{0}C for 6-7 days after soaking.

In determining the germination energy, the germination of grass from seeds was taken into account and the emergence of grasses and roots during germination. According to the results of scientific research, the seeds collected on May 18 were not fully ripe, so their germination energy and

germination were very low. At the same time, at 10 days after soaking the seeds in water, the germination energy was 22.0-31.5% according to the options, and germination was 25.3-35.6%.

The germination energy of seeds collected on May 27 from plants in the experimental options was 41.0-47.7% for 8 days, and germination was 43.3-51.7%. As the seeds harvested on May 30 were relatively fully ripe, the germination energy of these seeds was 60.0% in option 2, 61.3% in option 3, and 65.2% in option 4 on day 8.

Seed germination was 62.7% in 2 option, 65.0% in 3 option, and 70.6% in 4 option. Based on the data obtained, it can be concluded that the germination energy and germination of Tartarian rhubarb seeds depends on the method of sowing the plant (from seed and seedlings by years) and the ripening time of the seeds.

Among the experimental options, the highest seed energy and germination were recorded in 4 options, i.e., seeds collected from 2-year-old seedlings on 30 May. Seed germination energy was 65.2 and germination was 70.6%. These figures were 5.2-7.9% higher for option 2 and 3.9-5.6% higher for option 3 (Figure 4).

Figure 4. Tartarian rhubarb seed germination.

The Tartarian rhubarb plant growing in Karakalpakstan was selected as the object, and scientific experiments on phenological observations under natural conditions were carried out in the Ustyurt Plain of the Republic of Karakalpakstan. In this process, leaf diameter, flowering phases and plant distribution were observed during plant growth, and the effects of wind speed, temperature and humidity on growth and development in nature were studied.

Tartarian rhubarb sprouts from early spring, lifting the soil with small buds with a section of roots close to the ground. Vegetative development begins in early spring. In mid-summer, the growth of the azine stops the developmental processes and gives the seeds. Tartarian rhubarb blooms in the last 10 days of April, its seeds ripen in late May. The average number of seeds of middle-aged Tartarian rhubarb is not less than 700-800 pieces. The content of water in tartar rhubarb reaches 90-95%. Perennial plant with strong roots has 15-17% tannin in the roots and the bark of the fruit is 7 to 13%, quality 65-70% and tannins in the seeds are up to 18%, system, rhizome 5-6 cm thick, covered with vertical dark brown .

In determining the germination energy of Tartarian rhubarb seeds, it was taken into account that the germination of grass from the seeds, and the emergence of grasses and roots during germination.

According to the results of scientific research, the germination of seeds from plants in the experimental options was 62.7% in 2 options, 65.0% in 3 options, and 70.6% in 4 options.

4. Conclusions

Based on the data obtained, it can be concluded that the study of bioecological characteristics of rhubarb species growing in Karakalpakstan includes the following species of rhubarb species: *Rheum tanguticum*, *Rheum maximowiczii*, *Rheum turkestanicum*, *Rheum tataricum* - the following 2 species of Rhubarb and from them the Tartarian rhubarb plant was selected as the object, and scientific experiments on phenological observations under natural conditions were carried out in the Ustyurt plain of the Republic of Karakalpakstan. In this process, the diameter of the leaves, flowering phases and distribution of the plant during the growth of the plant were observed, and the effect of wind speed, temperature and humidity on the growth and development of nature was studied.

It was found that the germination energy and germination of seeds of the Tartarian rhubarb plant depends on the method of sowing the plant (from seed and seedlings by years) and the ripening time of the seeds.

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