

On Reserves of *Hippophae rhamnoides* L. Fruit on the Territory of the Zarafshan National Nature Park of Uzbekistan

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Abstract

The article is devoted to the study of stocks of *Hippophae rhamnoides* fruits on the territory of the Zarafshan National Park. *Hippophae rhamnoides* is a medicinal plant. This species is a naturally distributed plant. All parts of *Hippophae rhamnoides* are a source of biologically active substances, especially flavonoids, carotenoids, phytosterols and others. In the course of field studies, 10 monitoring sites were selected in the size of 10 × 10 m, and the productivity of one site in the amount of 10 × 10 averaged 51.33 ± 8.24 kg. According to the results obtained, it was revealed that the biological reserve averages 21.9 tons, respectively, the operational reserve is 13.14 tons and the volume of annual harvesting averages 1.31 tons. When the water level of the Zarafshan River rises, some plants are damaged.

Keywords

Hippophae rhamnoides, Zarafshan National Natural Park, Fruit Stock, Monitoring Plots

1. Introduction

In recent decades, *Hippophae rhamnoides* L. has become the object of numerous studies to make it persuasive and supportive. The increased interest in this crop is due to the content in its fruits, leaves and bark of such biologically active substances as fat- and water-soluble vitamins, carotenoids, minerals, flavonoids, polysaccharides and others. Thus, in terms of vitamin E content, *Hippophae rhamnoides* surpass almost all fruit and berry crops [1] [2].

Hippophae rhamnoides L. is a valuable food, vitamin and medicinal plant, various parts of which are used to treat diseases as a traditional medicine in many countries of the world. In China and Mongolia, it is used to relieve cough, treat enterocolitis, diarrhea, gastrointestinal and dermatological diseases [3] [4].

All parts of *Hippophae rhamnoides* are a source of biologically active substances, especially flavonoids, carotenoids, phytosterols and others. Extracts obtained from various organs of the plant have high antioxidant, antibacterial, antimicrobial, anti-inflammatory, anti-carcinogenic and anti-radiation properties [5].

Derivatives of quercetin, kaempferol and isorhamnetin were found in the leaves and fruits of *Hippophae rhamnoides* [6] [7] [8]. As a result of studies on the form diversity of plants in the Greater Caucasus, 15 populations of *Hippophae rhamnoides* were identified with more than 55 forms that have economically valuable features, both morphological and biochemical [9] [10].

The range of *H. rhamnoides* is small and is characterized by the fact that in Uzbekistan and neighboring countries, it consists of only one species. The distribution of *H. rhamnoides* in Kyrgyzstan, Tajikistan, Kazakhstan, and Uzbekistan is mentioned in many sources [11].

Studies on the study of biomorphological features were carried out by M.I. Ikramov and F.D. Kabulova [11]. In the studies of Z.Kh. Sarymsakov conducted a study on the stocks of *H. rhamnoides* fruits on two tributaries of the Zarafshan River and revealed 60 - 62 tons of biological stock, respectively, the operational stock averaged 7 - 8 tons [11].

In Uzbekistan, the stock of sea buckthorn fruits was studied by H.K. Khaydarov and, based on the data of his dissertation, the volumes of possible industrial harvesting of sea buckthorn were specified. The largest operational stock of sea buckthorn fruits is concentrated in the floodplain of the Zarafshan River and its tributaries: Akdarya and Karadarya, as well as in the floodplain of the Surkhandarya River. In general, on the territory of the Republic of Uzbekistan, 1200 hectares occupied by sea buckthorn thickets were identified, in which 212.8 tons of fruits can be harvested annually, which are important raw materials for the food and medical industries [11]. The last research on the study of stocks of fruits of *H. rhamnoides* in Uzbekistan was carried out 5 years ago. In this regard, it is relevant to study the current state of stocks of *H. rhamnoides* fruits in the Republic of Uzbekistan.

The purpose of the research is to study the current state of stocks of *H. rhamnoides* fruits in the territory of the Zarafshan National Natural Park.

Study area

The Zarafshan National Natural Park is located in one of the most densely populated places in Uzbekistan, in the zone of intensive farming (**Figure 1**).

It is surrounded by 20 rural settlements, the nearest of which are the villages of Gallakapa, Beshkapa, Naiman, Kiyet, Durman, Urakli, Karabchi, etc. The closest distance between the border of the park and settlements is 50 - 100 m. land. Zarafshan National Natural Park is located in the southeastern part of the

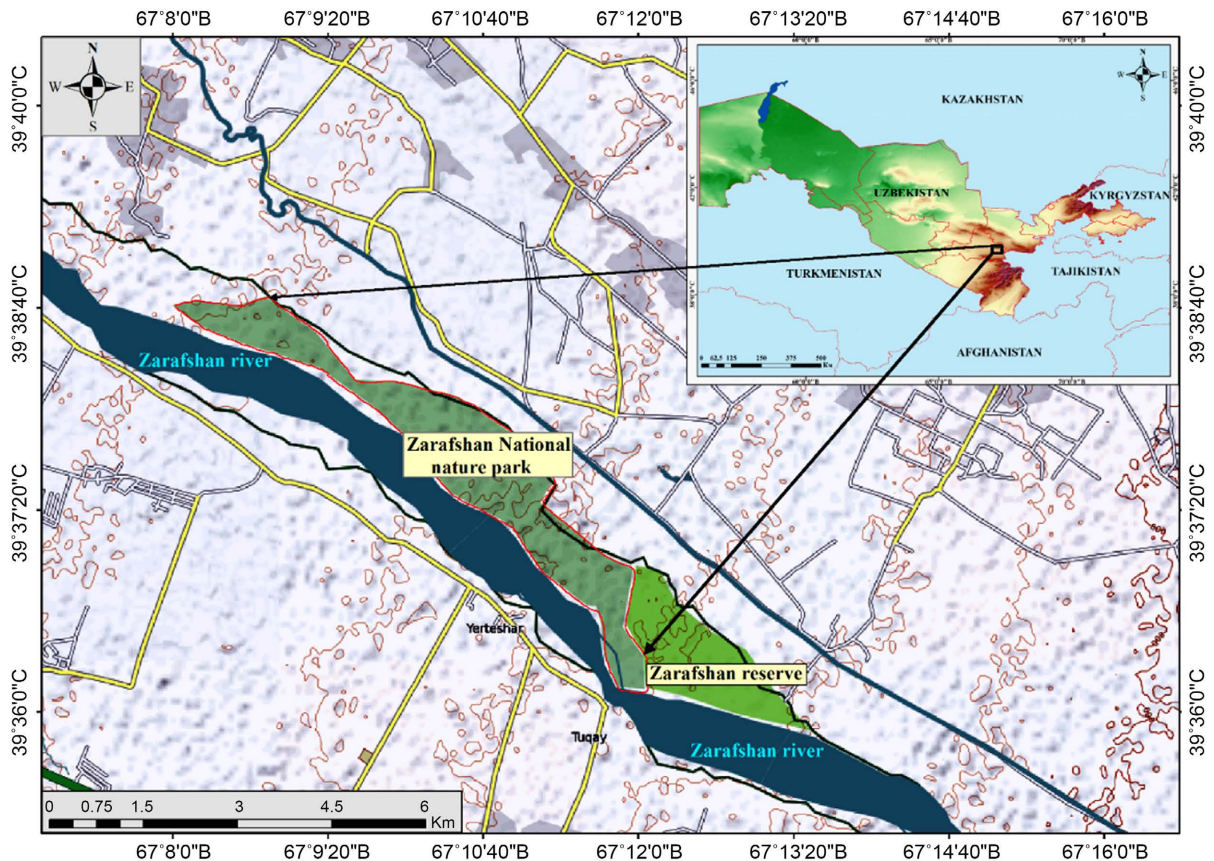


Figure 1. Study area.

Samarkand region, 15 km. from the city of Samarkand and stretches along the right bank of the Zarafshan River upstream to the Pervomaiskaya dam. The territory of the national park is represented by two separate sections (upper and lower). The gap between the sections is 300 m. The width of the sections is from 500 m to 1400 m, the total length is 47 km. The area of the national natural park is 2426 ha [12].

2. Research Methods

To determine the stocks of fruits of *H. rhamnoides*, the methodological manual of K.A. Pupykina *et al.* "Resource science and standardization of medicinal plant materials" [13]. The research results were statistically analyzed according to the method of Rokitsky (1973) [14] and processed using the Past 3 program.

A lot of scientific work has been done in this direction in Uzbekistan [15] [16] [17] [18] [19]. Much research has also been done on species of known importance [20] [21] [22] [23] [24].

3. Object of Research

H. rhamnoides—A branchy, gray-barked thorny shrub in the Elaeagnaceae family.

A small tree or shrub, 2 - 5 m tall, with abundant, short, prickly twigs. The leaves

are short-petiolate, linear-lanceolate, shortly pointed at the apex, wedge-shaped narrowed downwards, 2 - 9 cm long and 3 - 15 mm wide, grayish-green above, silvery-white below from the trichomes covering them.

Flowers small, yellow, fragrant. The fruits are rounded, golden-yellow small drupes, densely sticking to the branches, 8 - 10 mm long and wide. The fruits have a sour taste with a slight bitterness. Flowering time: May, fruits ripen in August - September. Spreading.

It occurs in the southwestern regions of the European part of Russia, in the Caucasus, in Siberia and Central Asia [25] (Figure 2).

4. Results

In the studies of Khaydarov (2018), it was revealed that the productivity of one bush in the territory of Uzbekistan averaged 4 - 6 kg. In the Republic of Buryatia, 1 bush gives an average of 5 - 6 kg and a maximum of 20 - 25 kg. In the Altai Republic, on average, 10 - 12 kg. 7 - 9 kg in Azerbaijan. In Kyrgyzstan, it has been established that productivity reaches a maximum of 10 kg [11].

To determine the stocks of *H. rhamnoides* fruits in the territory of the Zarafshan National Natural Park, 10 monitoring sites were selected in the amount of 10×10 (Figure 3). The presence of plants of different ages was established on each accounting plots (Figure 4).

In our studies, the productivity of *H. rhamnoides* in the territory of the Zarafshan National Natural Park was noted with an average of 4 - 5 kg.

The average indicators on the monitoring sites noted that the presence of plants of different ages amounted to an average of 12.9 ± 0.79 pcs., Fruit-bearing bushes, on average, 11 ± 0.82 pcs. and the productivity of one site in the size of 10×10 averaged 51.33 ± 8.24 kg (Figure 5).

The highest indicators of monitoring sites in terms of productivity were noted at 8 and 5 sites (productivity on average is 70.2 kg) and, in turn, these indicators correlate with the presence of bushes and the number of fruit-bearing bushes (from 14 to 17 pieces). Accordingly, the lowest rates were noted at sites 1 and 6 (average productivity is 31.7 kg). In turn, the productivity of the remaining (4, 3, 7, 9, 10, 2) sites averages 51.5 kg (Figure 6).



Figure 2. *Hippophae rhamnoides* L.

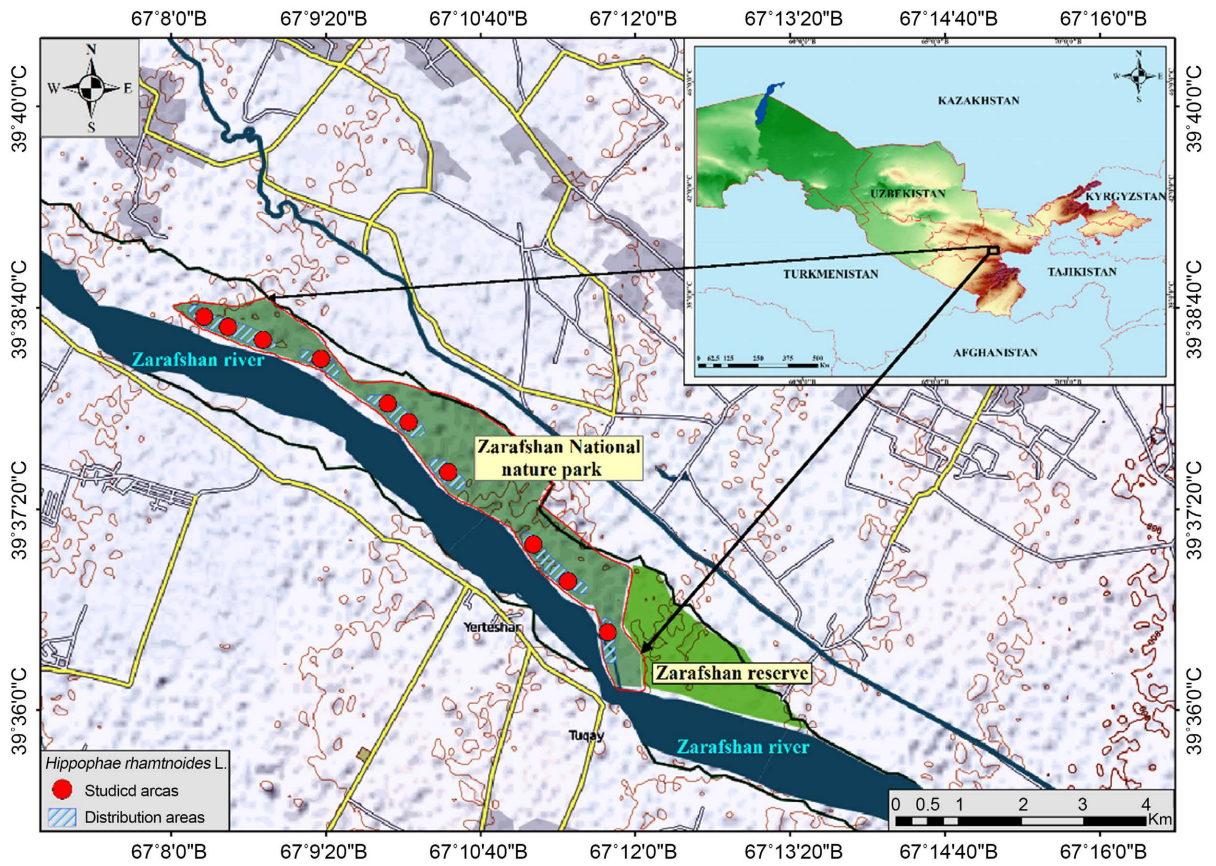


Figure 3. Monitoring plots of *Hippophae rhamnoides* L.





Figure 4. *Hippophae rhamnoides* L. in the Zarafshan National Natural Park.

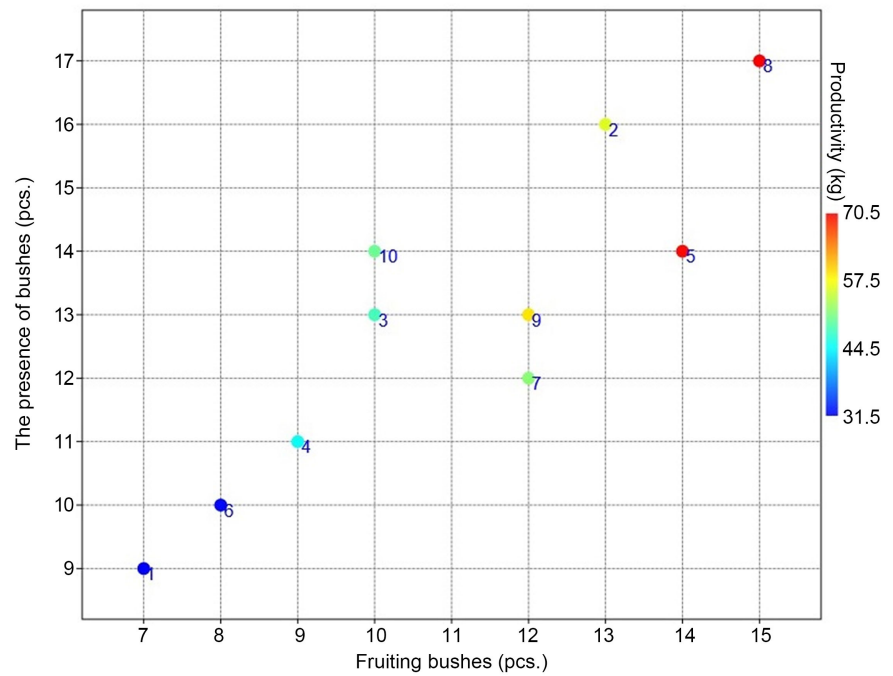


Figure 5. Average productivity indicators on *H. rhamnoides* monitoring sites (10 × 10).

Monitoring area	The presence of bushes (pcs.)	Fruiting bushes (pcs.)	Productivity (kg)
1	↓ 9	↓ 7	↓ 31,5
2	↑ 16	↑ 13	→ 55,9
3	→ 13	→ 10	→ 48
4	↓ 11	↓ 9	→ 45
5	→ 14	↑ 14	↑ 70
6	↓ 10	↓ 8	↓ 32
7	→ 12	→ 12	→ 51,6
8	↑ 17	↑ 15	↑ 70,5
9	→ 13	→ 12	↑ 58,8
10	→ 14	→ 10	→ 50

Figure 6. Indicators at *H. rhamnoides* monitoring sites.

According to the analysis of the distribution of *H. rhamnoides* in the territory of the Zarafshan National Natural Park, areas with a reserve value of about 50.0 hectares were identified. To determine the area from the reserve cost, GPR coordinates of monitoring sites with a size of 10 × 10 were allocated.

Taking into account the monitoring plots, the productivity of *H. rhamnoides* fruits per 1 hectare averages 438.4 kg. The productivity of acreage with a spare value averages 21.9 tons and the possible annual harvest is 1.31 tons.

According to the analysis of the collected and processed materials during field studies on the current state of *H. rhamnoides* stocks, it was revealed that the biological stock is on average 21.9 tons, respectively, the operational stock is 13.14 tons (60% of the biological stock) and the volume of annual harvesting is on average 1.31 tons (10% of the operating reserve).

5. Conclusions

H. rhamnoides as a forest-forming species of the tugai biogeocenosis is indispensable. However, it should be noted that recently there has been an increased interest in this culture from the local population. This is due to its comprehensive use. Sea buckthorn is used not only as a fruit and medicinal plant, but also for other purposes.

Very often, tugai forests are used for crops, as a result of which they are uprooted. Everywhere in the floodplain, where sea buckthorn grows, cattle graze, which very often eats young plants formed with the help of root offspring. This causes great concern, and therefore we were faced with the task of studying the ways of integrated conservation of sea buckthorn in the Zarafshan River valley.

Thanks to the staff of the Zarafshan National Natural Park, today the population of *H. rhamnoides* in the park is stable. According to the results obtained, it was revealed that the biological reserve averages 21.9 tons, respectively, the operational reserve is 13.14 tons (60% of the biological reserve) and the volume of annual harvesting averages 1.31 tons (10% of the operational reserve). For the comprehensive conservation of *H. rhamnoides*, the creation of large-scale plantations in places of natural growth is recommended.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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