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SEED PRODUCTIVITY OF *HYSSOPUS OFFICINALIS* L. UNDER THE CONDITIONS OF KARSHI

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Аннотация. Мақолада Қарши шароитида *Hyssopus officinalis* L. нинг уруғ маҳсулдорлигини ўрганиш натижалари келтирилди. *H.officinalis* L. нинг уруғ маҳсулдорлигини ўрганиш учун генератив фазадаги ўсимликлар танланди ва бир ўсимликдаги тўпгуллар сони, бир тўпгулдаги гуллар сони, тугунчадаги уруғкуртак сони аниқланди ва уруғ маҳсулдорлиги кўрсаткичлари: потенциал уруғ маҳсулдорлиги (ПУМ), ҳақиқий уруғ маҳсулдорлиги (ҲУМ), уруғ маҳсулдорлиги коэффициенти (УМК) ҳисоблаб чиқилди. Натижаларга кўра учинчи ва тўртинчи вегетация йилида маҳсулдорлик кўрсаткичи юқори бўлиб, уруғ маҳсулдорлиги коэффициенти 52,5% ни ташкил этди.

Калит сўзлар: *Hyssopus officinalis* L., доривор ўсимлик, гул, уруғ, уруғкуртак, тўпгул, вегетация, уруғ маҳсулдорлиги.

Аннотация. В статье рассматривается результаты изучения семенной продуктивности *Hyssopus officinalis* L. в условиях Карши. Для изучения продуктивности семян *H.officinalis* L. были отобраны растения в генеративной фазе и было определено количество соцветий на растение, количество цветков на соцветие и количество семенных почек на завязь и рассчитаны показатели продуктивности семян: потенциальную семенную продуктивность (ПСП), реальную семенную продуктивность (РСП) и процент полноценных семян (ПС). По результатам на третьем и четвертом году вегетации продуктивность была высокой, коэффициент продуктивности семян составил 52,5%.

Ключевые слова: Hyssopus *officinalis* L., лекарственное растение, цветок, семя, семяпочка, соцветие, вегетация, семенная продуктивность.

Abstract. The article deals with the results of studying the seed productivity of *Hyssopus officinalis* L. in the conditions of Karshi. To study the yield of *H.officinalis* L. seeds, plants in the generative phase were selected and the number of inflorescences per plant, the number of flowers per inflorescence and the number of seed buds per ovary were determined. According to these data, the indicators of seed productivity were calculated: potential seed productivity (PSP), real seed productivity (RSP) and the percentage of full-value seeds (PS). According to the results in the third and fourth years of the growing season, productivity was high, the seed productivity ratio was 52.5%.

Key words: *Hyssopus officinalis* L., medicinal plant, flower, seed, ovule, inflorescence, vegetation, seed productivity.

Introduction. *Hyssopus officinalis* L. – medicinal hyssop, one of the most widely used medicinal species of the family *Lamiaceae* Lindl. is valuable because it retains a large amount of essential oils on its surface. Since ancient times, many peoples have considered medicinal hyssop a sacred plant and was widely cultivated in the national economy as a medicinal, essential oil, spice [1]. Infusions and decoctions are used for diseases of the respiratory tract, chronic gastritis and profuse sweating, the decoction is recommended to develop appetite, normalize the gastrointestinal tract, improve digestion [2]. In addition, medicinal hyssop is a dietary supplement that treats and prevents respiratory diseases [3].

Homeland of the Mediterranean (Western Europe, Crimea, Caucasus, Iran) and Central Asia (South Kazakhstan and Kyrgyzstan). Naturally grows on dry mountain slopes, on small rocky cliffs, in the foothills and in the middle of mountains, among trees and bushes. The literature also mentions that it is found in the forest-steppe, desert regions of Europe and in some countries at an altitude of 2500 m above sea level [2].

H.officinalis L. was not found in the flora of Uzbekistan [4]. It was first brought to Central Asia in the 1930s, and the first studies were carried out [2]. The Tashkent Botanical Garden was planted in 1948 with seeds brought from the Botanical Garden of the Moscow Pharmaceutical Institute [5]. Planted from seeds brought from the Latvian Botanical Garden to the conditions of the Karshi oasis. Under these conditions, experiments were carried out to study the yield of *H.officinalis* L. seeds, which completely passed the generative period.

Seed productivity is one of the important indicators that a species is fully adapted to living conditions. The dependence of this indicator on a number of environmental factors has been repeatedly noted in the literature [6]. The total number of seeds produced on one plant is the productivity of the seeds [7].

Seed productivity is divided into potential (PSP) and real seed productivity (RSP). PSP – is the total number of seed buds formed on a plant, and how many of these reach the seed is important for agricultural practice. Because several factors show their influence in the development of the seed bud to seed [7]. The number of ripe seeds and fruits is an important indicator and criterion for determining the real seed productivity (RSP). According to the literature, RSP is always much lower than PSP [6, 7].

The purpose of the study - study of the seeds productivity of *H.officinalis* L. in the Karshi oasis.

Research methodology. To study the seed productivity of *H.officinalis* L. in the Karshi oasis, the plants in the generative phase were analyzed and the following were determined: the number of inflorescences per plant, the number of flowers per inflorescence, the number of ovules per ovary. Based on these data, the following indicators of seed productivity were calculated: fruit yield, potential seed productivity (PSP), real seed productivity (RSP), seed productivity coefficient (PS). The seed productivity ratio was calculated by finding the ratio of RSP (number of seeds) to PSP (number of ovules (number of flowers multiplied by 4)) [6, 7]. The morphological characteristics of seeds are given according to generally accepted criteria [8, 9]. The results were analyzed statistically [10]. Seed productivity studies

were carried out on plants in the generative period. For the experiment, 10 bushes were selected from 2, 3 and 4-year-old plants.

Analysis and results. In the conditions of the Karshi oasis, *H.officinalis* L. bloomed in the second year of the vegetation. Under these conditions, *H.officinalis* L. flowers are two-lipped, dark blue in color, collected in spike-shaped inflorescences. Flowers are arranged in 12-20 rings on the inflorescence axis, 10-22 flowers in one ring. The fruit is a coenobium; four eremes (seeds) develop in the coenobium [8, 9]. We described it as a nut resulting from the growth of 4 fruits together [11]. Coenobium is green in color and contains 4 ovules. Depending on the living conditions, from one to four seeds can develop from these ovules. Seeds are long-ovoid, dark brown in color, lumpy surface, 2-2,5 mm long and 1-1,2 mm wide.

When determining the PSP of the *H.officinalis* L., 4 seed buds were taken into account in the ovary formed from one flower.

During 2014-2017, the potential and real productivity of seeds formed in one *H.officinalis* L. bush was determined. Depending on the age of the plant, the number of ripe seeds in one bush and in one inflorescence was calculated, and the productivity of the seeds of the plant was determined. In our study, the generative phase was not observed in the plant in the first year of the vegetation in 2014.

In 2015, in the second year of the vegetation (n=10), 32-38 inflorescences ripened from one *H.officinalis* L. bush, from 53 to 242 flowers on each inflorescence, and up to 6265,8 seeds from each bush. The weight of 1000 seeds was 1,1–1,3 grams, the potential seed productivity was 16708±3278,2, the real seed productivity was 6265,8±1229,3, and the seed productivity coefficient was 37,5%. In 2016, in the third year of vegetation, ripen (n=10) 74-90 inflorescences per bush, from 82 to 260 flowers per inflorescence, up to 26761,4 seeds per bush. It turned out that the weight of 1000 seeds was 1,2-1,4 grams. At this time, the potential seed productivity was 50974,1±6160,5, the real seed productivity was 26761,4±3234,3, and the seed productivity coefficient was 52,5%. In the fourth year of the vegetation 2017, ripen (n=10) 72-86 inflorescences per bush, from 84 to 200 flowers per bush and 22035,5 seeds per bush. The mass of 1000 seeds was 1,2-1,4 grams, the potential seed productivity was 41972,4±4134,5, the real seed productivity was 22035,5±2170,6, and the seed productivity coefficient was 52,5% (Table 1-2).

As can be seen from the table, it was found that there is a difference between the potential and actual seed productivity of *H.officinalis* L. The law that the actual seed yield is always much lower than the potential seed yield [6, 7] is also confirmed in our experiments. The decrease in seed numbers can be caused by a number of internal and external factors, including the inability of some buds to form and bear fruit, the inability of some flowers to pollinate due to insufficient pollinators, as well as the loss of some in unfavorable conditions and damage to seeds by insects.

Table 1

Seed productivity of one bush *H.officinalis* L., (n=10)

Observed years	The number of inflorescences in the bush, pcs.	PSP	RSP	SP, %	Seed weight, gr (1000 pcs.)
2015	35,4±0,7	16708±3278,2	6265,8±1229,3	37,5	1,1-1,3
2016	83,4±1,9	50974,1±6160,5	26761,4±3234,3	52,5	1,2-1,4
2017	78,6±1,7	41972,4±4134,5	22035,5±2170,6	52,5	1,2-1,4

Table 2

Seed productivity of a single inflorescence of *H.officinalis* L., (n=10)

Observed years	Number of flowers per inflorescence, pcs.	The number of ripe seeds in fruits, pcs.	PSP	RSP	SP, %
2015	118,3±23,1	1,5±0,34	473,2±92,6	177,0±34,7	38,2
2016	152,8±18,5	2,1±0,31	611,2±73,9	322,9±38,4	52,8
2017	133,5±13,2	2,1±0,23	534,0±52,6	280,4±27,6	52,5

Observations show that plants produce more flowers and more seeds in the third year of the vegetation. In the fourth year of the vegetation, relatively few seeds were observed. However, in the third and fourth years of cultivation, the productivity index was the same, and the seed yield ratio was 52,5%.

Conclusion. The study of seed productivity under conditions of introduction makes it possible to assess the degree of adaptation of a species to new conditions. The high rates of fruit and seed yields in the studied species indicate a very good adaptability of the species.

Thus, the yield of *H.officinalis* L. is highest in the third and fourth years of the vegetation, when the seed yield coefficient is 52,5%. High growth, development and seed productivity of *H.officinalis* L. under the conditions of Karshi show that he was able to adapt to these conditions. Study of the seed productivity of *H.officinalis* L. under conditions of introduction, it serves as a scientific basis for the creation of territories for its reproduction and cultivation, as well as their effective use.

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