



Ways of Rational Use of Kavrak (Ferula) Plantations

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Abstract: on the formation of the *Ferula kuhistanica* root system under culture conditions, the ways of rational use of plants in obtaining gum-resin from the roots are described

Keywords: kavrak, drug, glue-tar, root, kernel, halva, juice, root navel, cut, Afghan knife..

Introduction.

Kavrak - *Ferula L.* includes about 170 species, and these plant species are widely used by mankind for their nutritional, medicinal, aromatic, essential oil, spicy and honey properties, and their natural resources are increasingly declining (Plunkett et al., 2018). According to some data, there are 180-185 species of kavrak on the earth, 105 species in the countries of Central Asia, 48 species in Uzbekistan, more than 50 species in the mountains of the Western Tien Shan, about 60 species in the Pamir-Alay ridge, 33 species in the western part of the Pamir - Alai Range (Rakhmankulov, Avalboev, 2016). Among the species of kavrak belonging to the genus *Kuhistan*, the kavrak *Ferula kuchistanica*, common in the mountainous regions of the natural flora of Uzbekistan, and the smelly kavrak *Ferula foetida*, common in the desert region, have valuable medicinal properties, and obtaining glue-resin from these species is becoming increasingly popular. As a result, their natural resources are rapidly declining.

Decree of the President of the Republic of Uzbekistan DP-3617 dated March 20, 2018 “On measures to create kavrak plantations in the Republic and increase the volume of processing and export of their raw materials”, Resolution No. RP-116 of 04/27/2022 “On additional measures to promote the development and industrialization of kavrak breeding in the Republic”, Decision No. DP-251 dated May 20, 2022 “On measures to organize the widespread use of medicinal plants in the cultivation and processing and treatment” and Resolution No. RP-139 “On measures to create a value chain by supporting the efficient use of the raw material base Medicinal Plants and Processing” and a number of other legal documents are an expression of the increased attention to this area at the state level in recent years. In the coming years, 1,800 ha of kavrak plantations are planned to be planted in Uzbekistan (Talipov, 2020). Such great attention to the development of the pharmaceutical industry requires specialists in the field of creating plantations for the production of medicinal plants, the development on a scientific basis of agrotechnical measures for their cultivation, suitable for soil and climatic conditions, including the development of scientifically based agrotechnical measures for

growing kavrak plants in cultivated conditions. At the same time, it is important to improve the technology of procurement of medicinal raw materials in order to further establish the rational use of the created plantations of kavrak.

Purpose of the study. The purpose of the research is to develop effective methods for the formation of the root system of the kavrak plant under sowing conditions and for obtaining a drug from it.

Research methods. When conducting research by A. Rabbimov and G.U. Khamroeva (2016) “Methodological recommendations for the introduction and selection of desert nutrient plants” and methods of “digging” the formation of the root system of one-, two-, three- and perennial plants under sowing conditions were studied with using methods (Taranovskaya, 1957; Shalyt, 1960). The technology for collecting resin glue from a plant was implemented by analyzing and improving the method used in practice by entrepreneurs.

Discussion of the research results. Currently, the technology for collecting resin glue from kavrak, implemented by entrepreneurs, does not fully comply with the principles of plant protection (Fig. 1).



Figure 1. Obtaining adhesive-resin from a kavrak, regardless of its age.

Because, on the one hand, the production of adhesive-resin from plants of different ages leads to the death of all existing plants in the population, and on the other hand, to a low yield of the resulting product. It is known that kavrak is a monocarpic plant, it matures in 7-8 years and ends its life with a single formation of seeds. The existing technology for harvesting glue-resin creates the risk of a complete absence of reproductive age kavrak plants in populations and its complete disappearance from nature. Kavrak is an ephemeroïd plant, the growing season of which lasts from the end of May (in the desert) to the end of June (in the highlands), depending on the growing conditions. During this period, he accumulates food reserves in the root. This process takes 7-8 years. Over the years, a sufficient supply of nutrients is accumulated for flowering and seed formation, and it finally blooms, produces seeds and ends its life. There is evidence that up to 1.0 kg of glue-resin can be obtained from one bush of an adult kavrak plant (Talipov, 2020). Our studies show that in the conditions of the foothills (Tepakul massif) of the Nurabad district, sowing seeds of kavrak on plowed and leveled land in December gave good results. At the same time, the depth of seeding into the soil should not exceed 0.5-1.0 cm. In plantations of kavrak, the number of plants per hectare should be 9-10 thousand bushes. To get such a number of bushes, it is advisable to sow the

seeds manually in square nests. When planting, use 5-6 whole seeds per nest. Propagation of kavrak by growing 1-2-year-old seedlings also gives good results. It was established that in the first year Kavrak gave an average of 7 g of roots, in the second - 30.7 g, in the third - 556 g. It has been established that if in 1 year 50-75 g of glue-resin can be collected from 3-4-year-old plants, and 150-570 g from plants older than 5 years (table-1).

Table 1

Productivity of glue-resin Kavrak (*Ferula kuchistanica*) depending on age, g.
Samarkand region, Nurabad district, Tepakul massif, 2021.

Plant age, year	root mass, (min.-max.), g	Glue-resin yield, g
1	6,0 – 7,5	-
2	14,5-52,0	-
3	275,5-972,5	50-75
4	421,7-1234,2	120-452
5 years or more	521,6-1452,7	150-570

As can be seen from the data in the table, not all plants develop equally even under sowing conditions, this is influenced by the state of the soil, its fertility, and water-retaining properties. Therefore, even when collecting glue-resin from artificially created kavrak plantations, although the age of the plants is the same, it is necessary to determine the plants that will be collected in April, that is, it is advisable to select the most developed plants 5-6 years old. This possibility is related to the yellow coloration of the kavrak, which began to grow in early spring, ending the growing season of this year. This period corresponds to the third decade of April. Initially, large plants with correspondingly large roots are isolated in kavrak plantations. Large plants from which resin can be obtained are dug along the girth of the root with a diameter of 30-50 cm to the sides, the root to a depth of 25-30 cm to the root collar, that is, to the thickened part of the root (Fig. 1). The root is cleaned of perennial leaf residues. The excavated earth is thrown back into place, and the root of the kavrak is buried. After 15-20 days, the root of the plant is buried in the soil, the same soil is dug up again. After these processes, the root of the plant, which has acquired a reddish color, is colloquially called the "ripe" root, and the process of extracting the adhesive resin from it begins. Several special tools are needed to efficiently and effectively collect the valuable kavrak resin adhesive. For example: To cut the root of the kavrak and collect the resin, special Afghan knives are needed, the length and width of such a knife are necessary because of the convenience and sharpness for collecting the workpiece (Fig. 2).



Figure 2. Afghan knife

In the process of harvesting, the knife that cuts the harvested area must be sharp. In this case, it is important to cut the root of the kavrak into a thin layer of the exact size from the indicated place. It is also advisable to have a whetstone (whetstone) when using an Afghan knife, especially when cutting a root. In order to preserve the purity of the extracted resin, it is necessary to have a special rag to clean this blade from any foreign elements. Also, to protect the kavrak root from sunlight, wind and various external influences, and especially from dust and various foreign elements, special cardboard papers are needed. Glue-resin is taken with these cardboard boxes and the hole where the cut root is located is smeared. 3-4 days after the second cut, the product is obtained again. For the harvesting process, it is necessary to have a container that is as light as possible, convenient for carrying, and especially the first crop of kavrak - "kernels" - will not fall on each other. Such a container can be made of cardboard or plywood in the form of a basket (Figure 3).



Figure 3. The device used in the collection of the product.

Since the kernel consists of separate pieces, the quality of the product is higher. In the process of harvesting kavrak kernels, there is a relatively unhardened liquid part of the dried kernel at the junction with the root. Placing each kernel individually, rather than one on top of the other, and placing the relatively liquid part of the kernel up ensures that the kernels are of higher quality. If the level of drying of the harvested kernels is low, it is necessary not to mix it with the general harvest until completely dry. Therefore, for storing the kavrak crop, it is desirable that the container be light and convenient, and also have a large surface area. Each time, before removing the adhesive-resin, the root of the plant is cleaned of the earth and various foreign bodies using a special brush (paint brush). The process of taking kavrak resin, as shown above, dug out and re-buried roots in mid-April are dug up again in the same size as before, cleaned of soil and various foreign bodies with special brushes, and from that time the first process of extracting adhesive resin of the season begins. Firstly, to obtain resin, it is necessary to cut off thin sections 2-3 cm long (1.5-2.0 mm thick) from the upper parts of the peeled root with a special Afghan knife. In this case, it is necessary not to injure the bulge in the central part of the root (root navel). If this navel is cut off, next year the plant will no longer grow. The plant cut out from the designated place is covered with special cardboard paper. At the same time, it is necessary to pay attention to the fact that the special cardboard paper does not leave the root of the plant open as a result of various external influences. Because if the root of the plant, cleaned from the surrounding soil, remains open, it may die from external influences such as

sun, rain, wind, or adversely affect the quality of the resulting product. After at least 3 days, a seed-sized crop of kavrak is ready to be harvested from the section of the kavrak root cut. This crop is harvested with special Afghan knives and cut as described above. This cut is preferably made from a previously cut or other part of the root of the same size and thickness. This process continues until October-November, depending on the climate of the autumn season. From one bush you can harvest up to 30 crops. Depending on the yield and quality of the resin, the first 3 collections of glue-resin are designated as "kernel", the 2nd collection as "halva", and the remaining collections as "juice". This process may also vary depending on the collection technology. One person can harvest 0.8-1.0 kg of kernels per day. Of course, this depends on the number of plants prepared for production. In general, it is considered convenient for 2 people to harvest kavrak at the same time. Because one person first takes the cover that covers the root of the plant, that is, cardboard paper, collects the resin and puts it in a container, and the second person cuts off the place where the resin was taken from the root or another part of the root and covers the root cover. In the period of October-November of the autumn season, in the spring, dug out kavraks are covered with soil around the roots, and planting 5-6 pieces of kavrak seeds to a depth of 0.5-1.0 cm creates the basis for the resumption of kavrak plantations.

Conclusions. Currently, the production of adhesive-resin from the kavrak plant is a profitable activity, and therefore the number of entrepreneurs involved in this type of activity is increasing. As a result, the natural resources of the kavrak are declining from year to year, and even 2-3-year-old plants are harvested, which increases the risk of complete extinction of this species. Therefore, it is important to establish plantations for the production of kavrak and, after the plants reach 5-6 years of age, receive products from them, plant seeds instead of harvested plants, increase the number of plants in the plantation, maintain continuity in the collection of glue-resin, create a stable source of income and, most importantly, provide protection of valuable species.

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