

Comparative Analysis of Indicators of the Abundance of Honey Plants in the Southern Aral Sea Region

Toreniyazova Venera Smagulovna –

Basic doctoral student

Mambetullayeva Svetlana Mirzamuratovna-

Doctor of Biological Sciences, Professor Karakalpak Scientific Research Institute of Natural Sciences, Nukus, Uzbekistan, e-mail: svetmamb@mail.ru

Annotation. The article presents the results of research on the ecological assessment of honey plants in the Southern Aral Sea region. The ecological characteristics are considered, the distribution area of honey plants by ecological groups is analyzed. The honey-bearing flora of the region is highly endemic. The dependences between the specific raw phytomass of the studied species and different population parameters are established. Exponential and linear types of regression dependence for the considered honey plant species are revealed.

Key words: honey plants, Ustyurt plateau, habitat, biodiversity, resources.

Introduction.

At present, the rational use and reproduction of natural resources is of great importance in solving the problem of food security and sustainable development of agricultural production in any state. Plants in all countries of the world are recognized as a vital part of biological diversity and global environmental sustainability. They are at the base of the trophic pyramid in all terrestrial ecosystems, on which all other animal species and humans inevitably depend [1]. It is known that the composition and productivity of honey-bearing resources depend on natural, climatic and geographical conditions [2].

The biodiversity of honey plants is the world heritage of present and future generations [1]. At the same time, economic development of territories leads to a decrease and disappearance of the species diversity of honey-bearing resources and impoverishment of the honey-bearing base [7, 9]. According to the forecast data, most of the world's plant species are already threatened with extinction [10]. The study of the biodiversity of honey plants in the desert zones of Central Asia is relevant and timely.

Material and methods.

Honey-bearing plants provide the most important products of beekeeping, and on the other hand, they receive pollination from the honey bee [3, 5]. Honey-bearing plants in the generally accepted meaning of this word are those plants from which bees take two products that are important for the development and activity of the bee family: flower nectar and flower pollen. Not all such plants have the same value: some of them give bees only nectar, others-only pollen, and still others-both together. In fact, only plants that give bees nectar can be called honey-bearing plants, plants that give one pollen are called pollen-bearing plants [4].

The object of our study was the vegetation cover, mainly of the Ustyurt plateau. The work on the study of honey-bearing resources was carried out by the stationary and route-geobotanical

method. The species composition of the honey-bearing flora was taken into account by geobotanical descriptions of the occurring plant species. The collected plants were identified by the "Plant Identifier of Karakalpakstan" (1978). The study of honey plants was carried out in all the territories of the region. The prediction of the flowering time of honey plants was carried out depending on the flowering time of each botanical species. Phenological observations were carried out using the method of A. A. Kulygin. The land areas occupied by honey plants are called honey-bearing lands [4]. In agricultural areas, the basis of the honey base is mainly cultivated honey plants, not only field [10], but also meadow-various grasses, a variety of fruit and berry crops [3, 7].

Determination of the specific raw phytomass (USF) of plant species using regression models for its assessment.

Results and discussion.

Today, the global trend of reducing the biodiversity of wild honey plants, which are the food base of honey bees and other pollinators, is of great concern. This trend is directly related to the growing problem of food security [10].

In various countries of the CIS and far abroad, economic development of territories also leads to a decrease in the species diversity of honey plants and the impoverishment of the honey base [6, 7]. The main reason for the disappearance of certain plant species is human activity: deforestation, land development, land reclamation, grazing, improper land use, alienation of land during the construction of facilities, industrial and transport emissions, as well as recreational pressure. As a result, the habitat of honey-bearing plant species is disturbed, which leads to their disappearance [8, 9].

The sustainable development of agriculture in modern conditions is based on the extensive use of the biological and ecological potential of plants and their system formations-biocenoses. An important role in the implementation of this task is played by the study and development of plant resources, which equally applies to the Southern Aral Sea region. Unique species of valuable honey-bearing, medicinal, forage and other plants grow here. Meanwhile, plant resources are not sufficiently studied, which negatively affects the development of the beekeeping industry and its productivity.

The increase in anthropogenic impact and the development of the Ustyurt plateau territory leads to a decrease in the area occupied by wild honey plants. With the widespread use of cultivated honey plants, it is important to predict their yield and nectar productivity. To do this, it is necessary to find out the ecological relationships of plants and the influence of environmental factors on them. This is especially important in those populations where, as a result of selection, some of the adaptive reactions are lost and compensated for by agrotechnical measures. That is, to achieve maximum plant productivity, a set of agrotechnical measures is used that can reduce the negative impact of environmental factors and strengthen the favorable one.

The main aspect of the vegetation of the Southern Aral Sea region is the small number of species in the flora and their dynamism. As a result, numerous ecological niches remain unfilled,

and represent the instability of the ecosystem as a whole.

The flora of Ustyurt includes about 600 species of higher vascular plants, among which the basis is made up of haze (20%), complex-flowered (14%), cereals (10%) and cruciferous (9%), which together make up more than half of the total species diversity of the flora.

In climatic terms, the Ustyurt plateau is a complex and peculiar object, on the territory of which a sharply continental climate prevails. The maximum air temperature in July reaches more than 47°C. The average monthly temperature in July and August is 30°C. Winter is cold and snowless, the average monthly temperature in January is -12.9°C, on some days it reaches more than -30°C. In winter, fogs, ice, snowstorms and short-term thaws are frequent. The maximum duration of individual cases of glaciation is 56 hours. The annual temperature range for the central part of Ustyurt is 36-38°C, the average precipitation in the south is 90 mm, in the north – 120 mm.

Weather conditions are the main factor affecting the release of nectar by plants and its collection by bees. This includes the combined effects of wind force, solar radiation, temperature, precipitation, dew, evaporation, and atmospheric pressure [3, 5, 7]. It is also established that light is a controlling factor that regulates the flight activity of bees [4, 5, 7]. It is considered proven that the same plant species in different geographical areas of the country emit nectar in different quantities and quality. In the course of evolution, plants have adapted to certain soil and climatic conditions and their nectar productivity has become different. In-depth study of such a group of useful plants as honeybees and pollen-bearing plants has significantly expanded our knowledge of the formation and structure of nectaries, the formation and release of nectar depending on environmental and other factors [2, 4, 6, 15].

Currently, the anthropogenic impact on the vegetation cover of the Ustyurt plateau caused changes in the natural vegetation. The current dynamics of plant communities is associated with anthropogenic impact. It is determined by changes in graphical conditions, under the influence of man-made factors, as well as unsystematic grazing against the background of general climate aridization. The main anthropogenic factors affecting the ecosystems of Ustyurt are unsystematic grazing and technogenic factors. They cause the formation of anthropogenic ecosystems, technogenic destruction of gypsum-bearing and salt-bearing soils, destruction of the surface of takyrs, as well as the emergence of technogenic takyrs and salt marshes.

The analysis showed that honey plants are distributed unevenly across the study region. The bulk of the species (55%) is distributed throughout the territory, 14% - only in the northern part, 20% - in the southern, 4% - in the central, 5% - in the eastern, 2% - in the western part, which is obviously due to the strong elongation of the territory from north to south (fig.1). The honey-bearing flora of the region is highly endemic. Many endemic species are rare, endangered, or recognized as a protected part of the desert ecosystems of the Southern Aral Sea region.

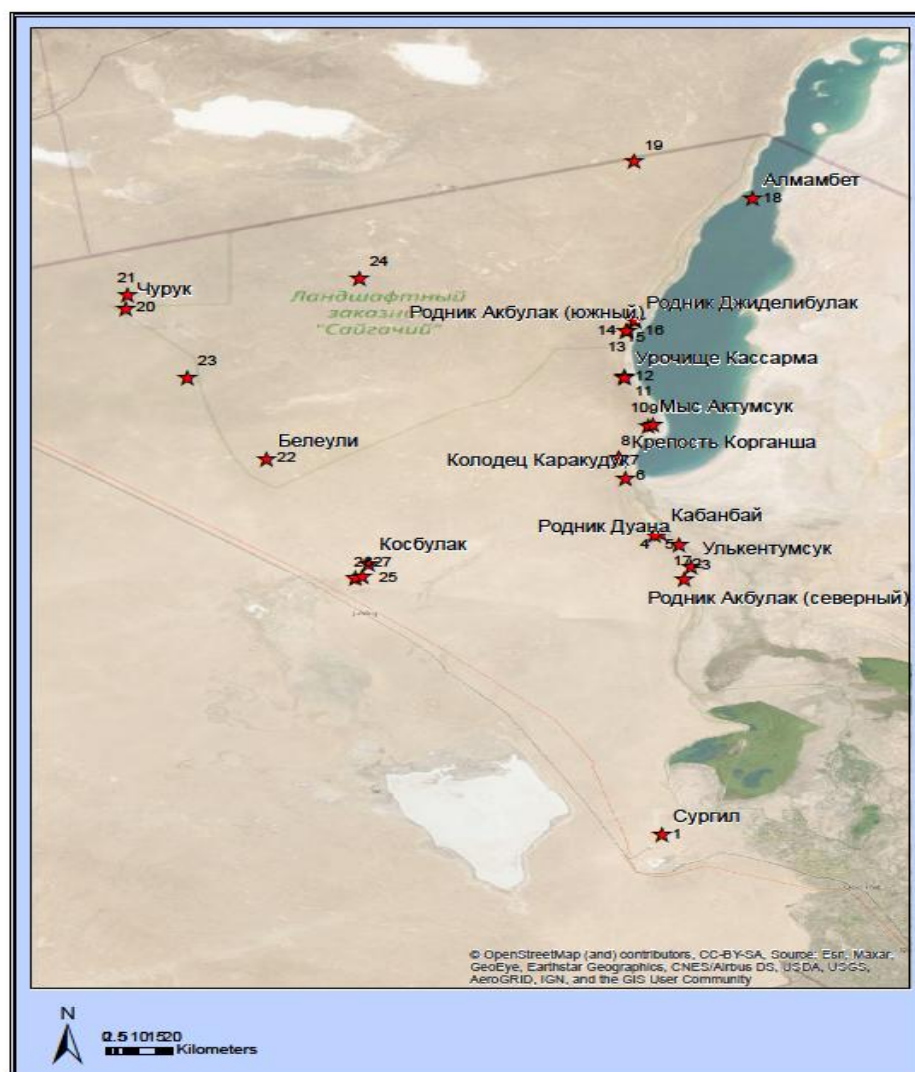


fig. 1. Map-scheme of distribution of the main types of honey plants on the Ustyurt plateau

A detailed study of honey plants in the Southern Aral Sea region has not yet been carried out fully enough. The honey-bearing flora of the studied region was not studied purposefully, but only a general fragmentary study of the vegetation was carried out. For the proper organization and use of the forage base of beekeeping, determining the size of the apiary, the ecological assessment of the area and the resources of honey plants is crucial. This assessment is carried out on the basis of data on the species composition and areas of the main honey plants, their nectar productivity and flowering time [5, 8]. According to experts, the best area for beekeeping is a place where there is all the variety of natural and artificial lands used by humans, where honey plants grow [2, 4].

Let's consider some types of honey plants growing in the Southern Aral Sea region.

Ziziphora clinopodioides is a perennial, strongly scented plant up to 40 cm tall with a thick lignified rhizome, of the family labiaceae. *Ziziphora* is widely distributed in Central Asia (Kazakhstan. Uzbekistan). The pinkish-purple flowers are collected at the top of the stem in a

dense head-shaped inflorescence. Blooms in June-July. The daily weight gain of the control hive during *Ziziphora* flowering is up to 10 kg [1, 4].

Halimodendron halodendron is a prickly shrub of the legume family, up to 2 m high. It is widely distributed in Kazakhstan and Uzbekistan. Blooms in May for 10-12 days, sometimes a second time in late summer. Honey productivity is 194 kg per 1 ha. According to experts, the daily weight gain of the control hive during the flowering of *Halimodendron halodendron* is up to 2 kg. The bee family collects about 10 kg of commercial honey from *Halimodendron halodendron* [1, 4, 9].

Alhagi camelorum fisch is a perennial plant in the legume family. It is distributed in Uzbekistan, Kyrgyzstan, Turkmenistan, Kazakhstan and the southern regions of Azerbaijan. Shrub with a height of 60 cm or more. Blooms throughout June and half of July. In the flowers, a huge amount of nectar is formed, so in the areas of distribution, *Alhagi camelorum* is the plant of the main honey collection. According to the authors, one bee family can collect up to 50 kg of honey from it [1, 13, 14].

In the conditions of the Southern Aral Sea region, the camel thorn (*Alhagi camelorum*) forms various phytocenoses. For example, yantachno-licorice, yantachno-reed, yantachno-ajrekovaya, yantachno-veynikovaya, yantachno-akbashevaya, yantachno-grebenshchikovaya, yantachno-uldrukovaya, yantachno-karaganovaya, yantachno-balykkuzovaya, yantachno-kuyandzhunovaya and others [12, 14] (fig. 2).



Ziziphora clinopodioides; *Halimodendron halodendron*; *Alhagi camelorum fisch*

fig. 2. Appearance of honey plants of the Southern Aral Sea region

(Photos from the site: <https://ok.ru/dk?cmd=logExternal&st.cmd=logExternal&st.sig>)

The collected material allowed us to establish the relationship between the USF of the studied species and different population parameters [4, 9, 10, 25, 29]. Regression models of this dependence are constructed [9]. All of them are reliable, because the calculated significance level is much less than the specified one ($P_0, 05$).

The results of the studies revealed the following types of regression dependence: exponential for *Ziziphora clinopodioides* and *Alhagi camelorum fisch* and linear dependence for *Halimodendron halodendron* (fig. 3-5).

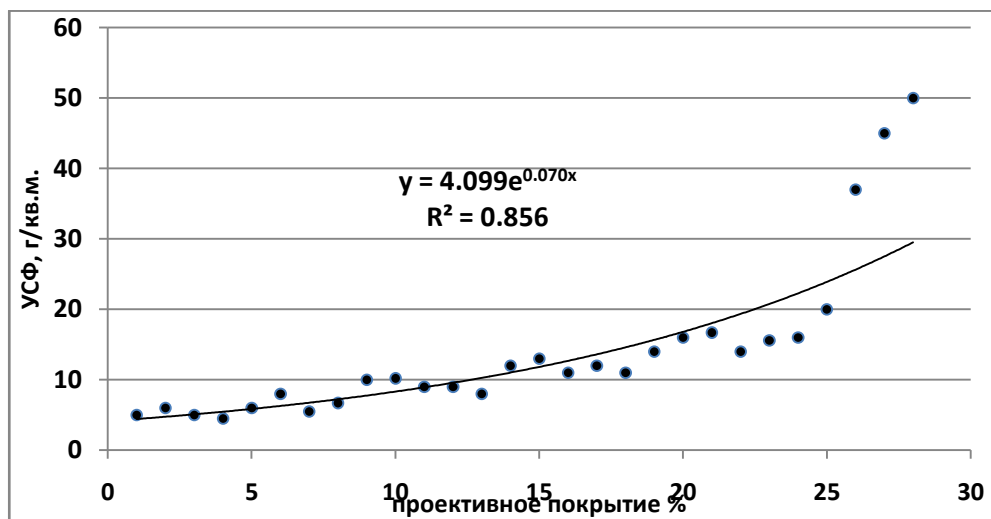


fig. 3. The dependence of the USF *Ziziphora Clinopodioides* from the studied indicators (exponential)

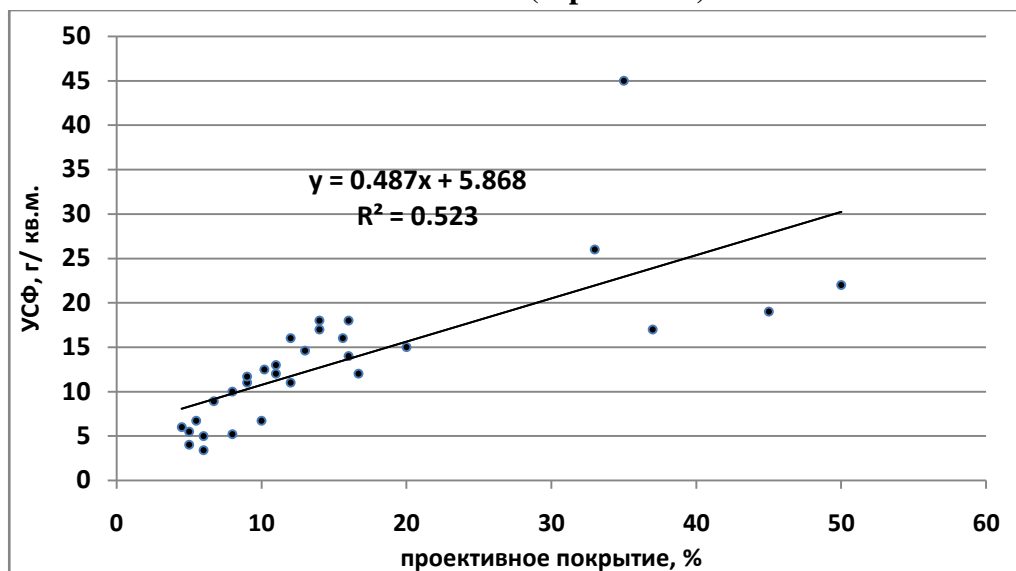


fig. 4. Dependence of USF *HALIMODENDRON HALODENDRON* from the indicators studied (linear)

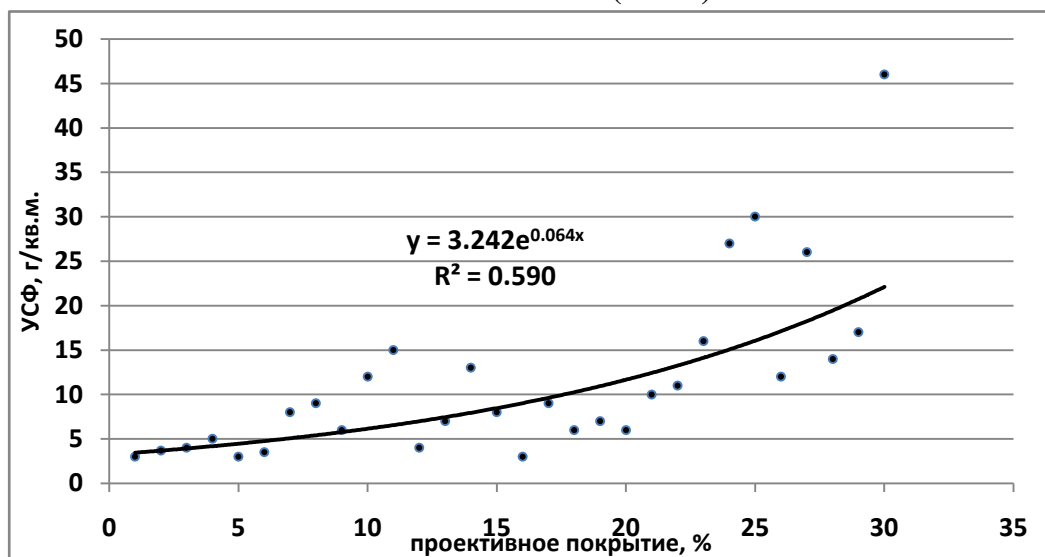


fig. 5. Dependence of USF *Alhagi camelorum* fish on the studied indicators

(exponential)

Experts have noted that large areas of land in various regions of the world have entered the stage of succession, during which the volume of the bee food supply often increases, but then the formed available food supply of bees slowly decreases and, accordingly, the potential production of honey decreases [2, 7, 8].

The use of regression equations is the scientific basis for the ecological express analysis of plant productivity without the withdrawal of medicinal raw materials by measuring the necessary population indicators (the projective coverage of the species, the number and height of shoots, the annual growth of the raw part) [4, 9].

The biological stock of phytomass of honey plants depends on the age and the area of the projective cover. As a rule, it is known that with increasing age and reducing the area of the projective cover, the productivity of honey plants decreases, which is associated with the intensity of environmental factors - the intake of light, heat and moisture for the growth and development of honey plants [15].

Conclusion. Thus, the comparative analysis showed that the obtained regression models make it possible to conduct a preliminary assessment of the productivity of populations of honey-bearing plant species based on measurements of the necessary indicators (the projective cover of the species, the number and height of shoots) in order to optimize the process of determining the resources of plant honey-bearing resources in the desert zone of the Southern Aral Sea.

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