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FEATURES OF BIOLOGY AND ECOLOGY, GROWTH AND DEVELOPMENT OF COUSINIA SPECIES IN VARIOUS ECOLOGICAL CONDITIONS OF UZBEKISTAN

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ABSTRACT

The article presents the features of biology and ecology, the growth and development of various types of Cousinia in various environmental conditions of Uzbekistan. The distribution area covers mainly foothill and semi-desert and desert zones of Uzbekistan. Cousinia species are found in deserts, low mountains, sometimes to the middle zone of mountains. In Uzbekistan, this plant is considered one of the best fodder plants; it is procured as a bait andreserve of feed.

Keywords: fodder plants, drought resistance, foothills, deserts, plant associations, productivity, palatability, chemical composition.

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1. INTRODUCTION

Abrief description of pastures in Uzbekistan. The natural conditions of the pasture region of Uzbekistan are diverse in terms of its physical-geographical and pasture-forage conditions, since they are located at different heights above sea level. Depending on the height, the territory of Uzbekistan is divided into the following regions: desert, adyrs (the adir: the desert,foothill

and piedmount of the mountainous areas), mountains and yaylau (the high mountains). Pastures located on the plains are called desert territories and occupy 78.1% of the total area. Adyrs make up 15.2%, mountains 4.5%, yaylau 2.6%.

The characteristic features of the climate are a contrasting change of seasons of the year, a low amount of atmospheric precipitation and their uneven intra-annual distribution, as well as a high intensity of solar radiation.

Desert are plains with up to 400-500 m of height above sea level, and precipitation less than 300 mm per year.

Adyrs are locatedonthe first step of the mountains, their absolute height ranges from 300 - 400 to 600-900 m above sea level.In these areas, precipitation falls from 250 mm to 400 mm per year, from November to May, mainly in the winter (up to 30%) and spring months (up to 50%). The summer heat and drought period last about 5 months.

Unsystematic use of pastures leads to their degradation, and also poses a threat on biodiversity in pastures. Overgrazing is observed in most of the pasture areas (especially around villages in the adyr zone), there are significant areas with clear signs of degradation (up to 25%). This is one of the main factors of desertification. Therefore, the preservation of the biodiversity of pastures, primarily forage plants and the increase in their natural productivity is a very urgent problem.The adyr is characterized by vegetation of *Caricetapachystilis*. In some areas, against the background of the *Carexpachystilis*, an iris formation *Iridetasongorica*, *Phlomisformation Phlomidetathapsoides* and *Psoraleadrupaceae* are formed. In addition to the above plants, there are: camel grass *Alhagipseudalhagi*, *Convolvulusdivaricatus*, *Cousiniaresinosa*, *Cousinia smirnowii*, *Irissongorica*, *Phlomisthapsoides* and others. In ephemeral synusium: *Bromustectorum*, *Bromus Danthonii*, *Poabulbosa*, *Eremopyrumorientale*, *Ceratocephalusfalcatus*, *Scabiosaolivieri*, *Hypecoumparviflorum*, *Leptaleumfillifolium*, etc.The yield of rain fed pastures is highly dependent on weather conditions, and varies sharply over the years and seasons (from 0.15-0.20 to 5 t/ha). The search for and attraction of new highly productive species of forage plants for the creation of multicomponent agrophytocenoses is an urgent problem of forage production and restoration of degraded pastures.The vegetation cover of the adyr is characterized by the absence of semi-shrubs and bushes and, consequently, no wintering grounds. Fodder reserves on adyr pastures vary greatly from year to year due to the hydrothermal conditions of individual years. This dependence on the weather has repeatedly caused natural disasters due to lack of food.

There are no grasslands in the adyrs of Uzbekistan. Only occasionally, in some years, when there is an abundance of winter-spring precipitation, in some places a relatively high grass stand (20-30 cm) grows, which is barely amenable to cutting. The procurement of reserve feed is made from coarse-stemmed shrubs, semi-shrubs and perennial grasses, which cannot fully meet the needs of animal husbandry in feed. In this regard, the need to create highly productive long-term artificial agrophytocenoses under adyrs conditions, which could be used not only as pastures, but also as hayfields, providing the procurement of reserve feed, is especially urgent.

Species of the genus *Cousinia*, which are perennial polycarpic herbaceous plants such as ephemeroidmesoxerophytes, are very promising in this respect [1]. In wet years, *Cousinia*develops so well on adyrs that it even forms hayfields.

2. PURPOSE OF THE STUDY

The purpose of the work is to study the features of biology and ecology, growth and development of various species of *Cousinia* in various ecological growing conditions. Development of scientific and practical foundations for adaptive use of agroecological resources, including optimization of the composition of flora, assessment of biological diversity

and identification of the resource potential of natural vegetation. The main purpose of the research was a comprehensive study of the bioecological characteristics and economically valuable traits of *Cousinia* species, the identification of ways of introducing their culture in the lower part of the mountainous semi-desert, as new fodder, honey and oil plants.

2.1. The research tasks included

- Carrying out phytocenotic surveys in natural habitats;
- study of the characteristics of the growth and development of underground and aboveground organs and the determination of the yield of the forage mass;
- finding out the nature of flowering, fructificationand seed productivity of Cousinia species in nature and in culture;
- identification of the features of the water regime;
- determination of feed merits, eatability and digestibility of feed mass.

3. MATERIALS AND RESEARCH METHODS

During the research, the following methods were used: Description of vegetation, taking into account its floristic composition- it was carried out according to the Drude method generally accepted in geobotany. Clarification of the area was carried out on the basis of literature data and surveys of distribution areas within the Samarkand, Jizzakh, Bukhara and Navoi regions. Age-related changes in plants according to Rabotnov's method (1964). Phenology was carried out according to the method of Beydemann (1974). The species belonging of plants was specified according to Cherepanov (I96I) and Identifier of Keys to Plants of Central Asia (vol. I-X, I968-I993).

The peculiarities of root systems were studied by the method of Taranovskaya (1957). The chemical composition was determined by the method of Ermakov et al. (1972); Lebedev, Usovich (1976); Petukhova et al. (1989). Ascorbic acid (vitamin C) was determined using the methods of Lapin et al. (1966) and Shimanov et al. (1976). The determination of the nutritional value and digestibility of the green mass of plants was carried out using the (VIJ) method. The experimental data were processed according to the Dospekhov method (1979). The species belonging of plants was specified according to Cherepanov (1981)

4. RESULTS AND DISCUSSION

For the introduction into culture, the species of the genus *Cousinia* have not been studied enough. The available information on this account characterizes only some of the known species of the genus (*Cousinia alata, C. bibinata, C. deccurrens, C. Franchetti, C. mikrocarpa, C. molis, C. polycephala, C. triflora, C. Umbrosa* and some others kinds). In this case, data are given only regarding the organic composition of the forage mass. There is no information on the vitamin and mineral composition, as well as microelements, in these species of *Cousinia* (Morozova, 1940, 1946; Larin, Agababyan et al., 1956; Rybina, Makarov, Kolokoltseva, 1983).

Cousinia umbrosa, features of growth and development in cultural conditions. On the 8-11th day of the growing season, the first two pairs of leaves of an oblong-oval shape appear at the seedlings, that is, the seedling stage is short (about 10 days). After the appearance of the third and fourth leaves, on the 25-30th day, andhaving reached their maximum size (12-18 cm long and 0.8-1.3 cm wide), they begin to dry out. At the beginning, and in the second half of June, the growth of leaves stops. By this time, the length of the leaves of the Cousinia umbrosa reaches an average of 22-25 cm, and the width is 11-13 cm.

In summer dormancy, plants leave in a juvenile age state. In the second year of life, the *Cousinia umbrosa* shows significantly better and most intensive leaf growth in plants. Plants enter the virginal stage of ontogenesis. In the third year of the growing season in the Cousinia umbrosa, the size of the leaf blade reaches 55.2 cm in length and 29.85 cm in width. At higher planting density, the growth rate of leaves is slowed down. In the third year of the growing season, after regrowth and formation of 12-15 large basal leaves, a specialized generative shoot is formed in late April or early May, plants enter the generative stage of ontogenesis.

Development and formation of the root system. According to Cherneva (1988), all species of the genus Cousinia are tap-root plants. However, according to our data, the root system of the C*ousinia umbrosa* deepens significantly (over 3 m) and belongs to the universal type. By the end of the first year of the growing season, a rather powerful root system is formed in the Cousinia umbrosa, with lateral roots of the first and second orders well developed for young plants and vertically running deep branches of the roots. The length of the root system by this period reached more than 66 cm. In the second year of life, the root system of the Cousinia umbrosa develops both vertically and horizontally.

By the end of the second year of the growing season, the root system of the *Cousinia umbrosa*reaches 189 cm. In the fructification phase, a very powerful root system of a universal type is formed. The diameter of the main root in the zone of the root collar reaches 8-10 cm during this period, the length of the root reaches 320 cm and more, which is one of the prerequisites for drought resistance of this species.

Fructification. Under natural conditions, fruit setting is observed on average in 23.52-27.93% of flowers, while the rest of the flowers fall off without forming a fruit. Under the conditions of culture, fructification setting increases to 31.43%, which is associated with a significant improvement in the conditions for plant development.

Aftermath and yield of forage mass. In different years, in the same natural areas, the yield of the fodder mass of the *Cousinia umbrosa*was different. In the years when the greatest amount of spring precipitation was observed, the maximum yield of forage mass was noted (26.1 t/ha of green and 3.1 t/ha of dry mass). In drier years, the yield of green mass does not exceed 20.2-21.9 t/ha. In the first and second years of vegetation, the yield of forage mass in the *Cousinia* is much less than in plants of the third and fourth years of life. The yield of seeds of the *Cousinia* in a culture varies depending on the weather conditions of the year, from 450 to 751 kg per 1 hectare.

The productivity of green mass in the third and subsequent years of growing season increases to 42 t/ha and, accordingly, 6 t/ha of dry mass.

The developed basic methods of cultivation of *Cousiniaumbrosa* in the adyr zone allow obtaining high yields of dry fodder (6.6 t/ha) and green (42 / ha) mass when sown in autumn (October-November). Long-term highly productive *Cousinia* hay meadow make up for the lack of forage in the lower adyrs, which contributes to the creation of a solid forage base and intensification of forage production, especially in the early spring and summer seasons.

Cousinia rezinoza is a biennial plant, grows on adyrs of the piedmont semi-desert, in places it forms very dense thickets with a forage productivity of 1.5-2.0 t/ ha. It gives fodder and hay mass in the second year of the growing season. It takes 2 years for the *Cousiniarezinoza*to fully develop. In the second year, the plant blooms, bears fructification and dies. *Cousiniarezinoza*refers to monocarpic plants. Productivity varies from year to year, strongly depends on weather conditions and on the biology of the plant itself. On the pasture, *Cousiniarezinoza*is almost not eaten by sheep, but is harvested for winter feeding, satisfactorily eaten only by camels.

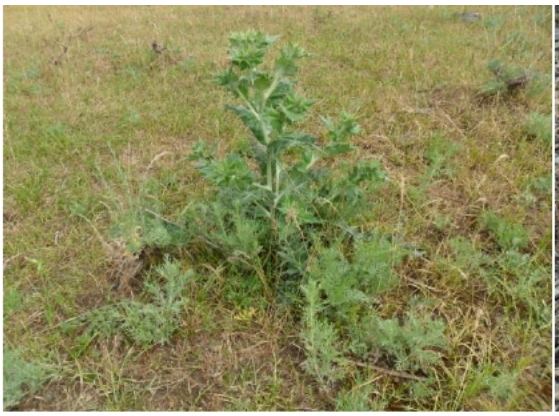

Figure 1 Cousiniarezinoza

Figure 2 Cousinia smirnowii

Cousinia dichotoma, Cousinia bipinnata. In the sandy desert, the species of *Cousinia* are often found in the shrub-ephemeral-ephemeral community where the species composition is dominated by *Haloxylonpersicum*. Within the framework of the UNDP Land project, an assessment of the geobotanical and phytocenotic aspects of the main plant communities was carried out, where it was revealed that the composition of the vegetation is represented by various shrubs, semi-shrubs and perennial herbaceous plants, such as *Calligonuma rborescens*, *Calligonumleucocladum*, *Salsolarichteri*, *Ammodendron Conollyi*, *Astragalusvillosissimus*, *Aristidapennata*, *Cousiniabipinnata*and others.The spread of the ephemeroid–*Carexphysodes*, one of the best for sands binding plants, is limited, which makes the sands mobile. [2]. Table 1 presents data on the species composition of the vegetation cover and indicators of productivity and consumption of the main species of plant communities in the desert zone.

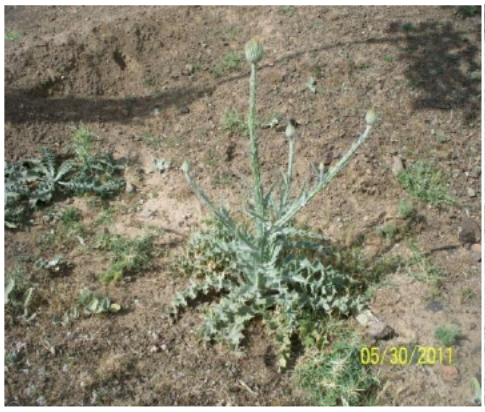

Figure 3 Cousinia dichotoma

Figure 4 Cousinia bipinnata

Despite the relatively high species diversity, the composition of plant communities in the sandy desert mainly consists of several shrub and semi-shrub edificatory species. Below in table 1, the names of the plants with their feeding values are given. [3].

Table 1 Species composition of vegetation in cenoses and indicators of palatability of fodder

№	Latin name	Life form	Productivity, kg/ha	In 100 kg of Feed Unit	palatability
1	Haloxylon persicum	Shrubs	100-150	53	good
2	Salsola richteri	Shrubs	150	86,4	good

№	Latin name	Life form	Productivity, kg/ha	In 100 kg of Feed Unit	palatability
3	Calligonum setosum	Shrubs	25-50	59	good
4	Ephedra strobilacea	Shrubs	50-80	69	good
5	Salsola arbuscula	Semi-shrubs	160	69	average
6	Astragalus villosissimus	Semi-shrubs	3-5	74	good
7	Astragalus unifoliolatus	Semi-shrubs	15-40	76	average
8	Artemisia diffusa	Semi-shrubs	250-350	61	good
9	Carex physodes	ephemeroids	100	94	good
10	Poa bulbosa	ephemeroids	250	64,6	good
11	Aristida pennata	Herbaceous plants	30-50	34-50	good
12	Ferula foetida	Herbaceous plants	20-40	63	good
13	Cousinia bipinnata	Herbaceous plants	60-70	28	poorly
14	Cousinia dichotoma	Herbaceous plants	40-50	20	poorly

As can be seen from the data in the table, the *species Cousinia dichotoma* and *Cousinia bipinnata* are poorly eaten by animals and have little food value in the sandy desert.When a wild-growing fodder plant is introduced into the culture, it is necessary to study and characterize its fodder advantages in more detail. For this, first of all, it is necessary to study the chemical composition of the plant's fodder mass, determine the amount of nutrient organic substances and their digestibility, the percentage of palatability, as well as the silage capacity, etc. Only after that it will be possible to draw a conclusion about the possibility of using the plant introduced into the culture.

Chemical composition of the Cousinia aureaand the Cousinia umbrosa. Research has been carried out on the fodder value of the *Cousinia umbrosa*for comparison with*Cousinia aurea,* (chemical composition, coefficients of digestibility, nutritional value).The chemical composition of various types of *Cousinia* varies markedly depending on the phase of its development. The highest content of crude protein (12.74-12.79% and fat (6.25-7.72%) in the *Cousinia umbrosa*was observed in the budding and flowering stage, fiber accumulated more in the fructification phase (31.67%) and flowering (31.01%), less - in the bud stage phase (28.82%). *Cousinia aurea*was distinguished by a lower content of protein, fat, fiber and higher content of NES (No nitrogen Extractive Substances). The content of calcium and phosphorus was higher in the *Cousinia umbrosa*than in the*Cousinia aurea*.The study of the vitamin composition (ascorbic acid and carotene) showed that the maximum content of vitamin C in the *Cousinia umbrosa*and *Cousinia aurea*was observed at the beginning of the growing season (258 and 331 mg/100 g, respectively), the lowest - in the seed ripening phase (108 and 74 mg / 100

g). More carotene was contained in the flowering phase (43.3 mg/ kg in the shady cousin and 40.1 mg / kg in the*Cousinia aurea*). In the flowering phase in the green mass of *Cousinia umbrosa*and*Cousiniaaurea*, the content of trace elements was: copper - 7.20 and 8.80 mg/kg, respectively; zinc - 19.7 and 20.9; iron - 90.0 and 106.0; manganese -24.0 and 24.6 mg/kg of dry matter of feed.

The chemical composition of cousinia seeds. It is known that individual members of the Asteraceae family, or Compositae, are characterized by the presence of fatty oil in the seeds. Such species of the family as Helianthus annuus and *Carthamustinctorius* have long been cultivated as valuable oil plants. The seeds of these species contain 25 to 40% of the fatty oil used for food.In the course of the research, it was of interest to study the content of oils in the seeds of various types of *Cousinia*, due to the fact that some members of the Asteraceae family in the seeds contain from 25 to 40% of the oil used for food. It was found that the seeds of the *Cousinia umbrosa*oil contained I7.8%, and the figure for*Cousinia aurea*accounted for14.4%, the iodine number of 125.5 and 123.8; saponification number - 187.0 and 186.5; acid number - 2.12 and 1.98, respectively.

The content of microelements inmain fodder plants of the pastures of Uzbekistan is currently has been well studied (Egorov and Rish, 1965). It was found that the content of copper in these plants is at the lower limit of the norm (3-4.2 mg/kg of dry plant material), therefore ruminants grazing on such pastures may experience a lack of copper, especially in the summer, when dried plants contain little copper. The content of trace elements in the studied species of cousinia has not been studied.

We studied the content of microelements in the *Cousinia tomentella*and *Cousinia schmalhausenii*(Table 2)

Table 2 The content of microelements in the green mass of the*Cousiniatomentella*and *Cousinia schmalhausenii*,grown in the "Hobdun" farm, Bulungur district, Samarkand region, in the flowering phase (in mg/kg of dry mass)

Species	Cu	Zn	Fe	Mn
Cousinia tomentella	7,9±0,5	20,4±1,5	90,7±5,6	24,7±2,9
Cousinia schmalhausenii	9,4±0,9	21,5±1,7	106,8±5,3	25,2±3,5

As shown by our studies, in the green mass of *Cousinia tomentella* and*Cousinia schmalhausenii,* the copper content is quite high (7.9 and 9.4 mg/kg, respectively), which is especially valuable, since both species vegetate until mid-summer. As for the content of manganese in the green mass of *Cousiniatomentella* and*Cousinia schmalhausenii*, it should be assessed as low (24.7 and 25.2 mg/kg, respectively), since the content of 50 to 150 mg/kg is considered normal (Egorov, Risch , 1965).

According to the literature (Egorov, Rish, 1965), the approximate norm of zinc content in areas for dairy cows is 20-50 mg/kg of dry material, and for young cattle, adult and young sheep - 30 mg/kg. The content of zinc in the main forage plants of Uzbekistan (with the exception of pastures of river floodplains) is below these indicative norms and rarely exceeds 20 mg/kg of dry material. In the green mass of *Cousiniatomentella* and*Cousinia schmalhausenii*, the zinc content is on average 20.4 and 21.5 mg/kg, respectively, is at the lower limit of the rate recommended for animal feed. The iron content is within the normal range (Table 2).

Thus, the species of *Cousiniatomentella* and*Cousiniaschmalhausenii*, according to the content of ascorbic acid and carotene in the green mass, can be classified as the best among the forage plants of natural pastures in Uzbekistan. The green mass of both species is a complete food and in terms of the content of trace elements - copper and zinc.Balance experiments carried

out by karakul sheep showed that when feeding the green mass of *Cousinia umbrosa*in the flowering phase, the digestibility coefficients of nutrients were (%): dry matter - 46.00; organic matter -54.83; protein - 64.92; fat - 71.16; fiber - 28.89, NES-. 68.28. When feeding the*Cousinia aurea*, the digestibility coefficients were as follows (%): dry matter - 49.65; organic -57.16; protein - 64.06; fat - 68.03; fiber - 33.84 and NES-70.14.

Thus, the digestibility of dry matter into organic matter in *Cousinia aurea*was higher than that of*Cousinia umbrosa*. 1 kg of the air-dry food of the *Cousinia umbrosa*contained 0.51 feed units and 74.92 g of digestible protein, and in the same amount of *Cousinia aurea*- 0.55 in 66.05 g, respectively. Exchange energy, in terms of energy feed unit, for Cousinia Umbrosa hay was 0.65, *Cousinia aurea*- 0.68, or 4.61% higher.

The balance of nitrogen when feeding animals, hay of different types of *Cousinia* was positive. The degree of nitrogen utilization was higher when the sheep eating*Cousinia aurea*hay - 20.2% of the accepted and 31.5% - of the digested one, and when eating *Cousinia umbrosa*16.3 to 25.1%, respectively.

The chemical composition of the aboveground mass of *Cousinia umbrosa*is characterized by a sufficient content of calcium and phosphorus. In terms of the content of crude protein, fat, fiber, microelements and vitamins, hay is not inferior to previously known forage plants. 1 kg of air-dry substance contains from 0.51 feed units and digestible protein 74.92 g [1]

Benefits of introducing technology: *Cousinia* species are insurance feed for animals, they form a yield of up to 5.2-6.6 t/ha. To keep one sheep in winter (90 days), about 180-200 kg of hay is needed. On the harvested hay from 1 hectare of *Cousinia's* hayfields, 25-30 heads of sheep can be kept during the winter season without the cost of purchased feed.

The creation of hayfields from the farm will increase the productivity of pastures by 5-6 times and, accordingly, increase the profitability of forage production in the republic's farms by increasing the livestock of cattle, and expanding employment opportunities for the population.

5. CONCLUSIONS

Based on the study of the ecological and biological properties and economically valuable characteristics of pasture plant species of the natural flora of Uzbekistan, ecologically significant species were selected as a starting material for introduction into culture and use in increasing the productivity of pastures. It is recommended for a significant increase in the productivity of the pastures of the adyrs of Uzbekistan, the introduction into the culture of a perennial highly productive fodder plant from the composition of the natural flora of the republic - the*Cousinia umbrosa*, which allows to create perennial hay meadow fields, giving high yields of green mass (up to 42.7 t/ha) and hay (6.6 t/ha).The*Cousinia umbrosa* recommended for cultivation can be used to obtain green mass, silage, haylage, hay, fatty oil from seeds, and also as a honey crop for beekeeping.

The introduction of cousin species used as fodder plants will make it possible to create breeding nurseries, and the results obtained can be used in animal breeding farms and karakul sheep breeding farms to restore and increase the productivity of degraded pastures and as hay meadow fields.

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