

Ecological Analysis of *Leontice* L. Species Distributed in the Navoi Region, Kyzyl-Kum Desert (Uzbekistan)

Nodirjon Bobokandov

Samarkand Agroinnovations and Research University, Samarkand, Uzbekistan

Email: nboboqandov@gmail.com

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Abstract

Leontice L. is a perennial herbaceous plant belonging to the Berberidaceae family. Our research was conducted in Navoi region. The article presents an ecological analysis of *Leontice* L. species in the Navoi region. The genus *Leontice* grows mainly in mountainous areas and some are distributed in arid climates. According to the information that 2 species have been identified in Navoi region, these species are plants with flavanoids healing properties. *Leontice* species have been used in traditional medicine since ancient times in ethnobotany. The presence of this species was discovered during the research and *Leontice* has identified numerous unique compounds, such as alkaloids, flavonoids, and phenolic acids, with potential medicinal properties such as anti-inflammatory, antitumor, and antiviral effects. According to ecological analysis, the *Leontice* genus thrives on stony, gravelly, and fine-grained mountain slopes and ridges, foothills, mountains, rocks, colorful rock outcrops, rocky slopes, and sandy, clay, and gravel deserts.

Keywords

Leontice L, Ecological, Flavonoid, Kyzyl-Kum, Ethnobotany

1. Introduction

The prudent utilization of natural resources should be the cornerstone of contemporary environmental preservation strategies. An examination of the dynamics of human impacts on the environment reveals that the “prohibitive” approach is unworkable, cruel, and unable to address pressing environmental issues. The connection between conservation policies and human activity should be based on the findings of methodical scientific investigations of the condition

of biodiversity [1].

Leontice belongs to the Berberidaceae family, currently there are more than 650 species of the family belonging to 14 families, which are divided into 4 combined families. Its representatives are grass and trees. They are all over the globe widespread in the regions. The most important characteristic of family representatives gynoecium is pseudo-monomeric and composed of 2 (3) carpels (fruit leaves) [2].

Perennial herbs have a tuberous thickened rhizome, with twice trifoliolate or pinnately dissected leaves and flowers in a racemose or paniculate inflorescence at the top of the stem [3] [4]. On earth, there are 4 species of the genus *Leontice*, all of which are ephemeroids with thickened rhizomes. The leaves are 2 times of three or pinnately cut. The ball is shingle or bulging. A node has 2 - 4 seed pods, a bubble-like fruit. Among them, (*L. ewersmannii* Bunge) is distributed in deserts, in the lower parts of hills and mountains. (*L. incerta* Pall) grows on the gravelly soil slopes of the middle and lower part of the mountains. There are also species of the group (*L. armeniaca* Boivin and *L. leontopetalum* L). The rhizomes of these species are rich in starch but poisonous [5] [6].

The largest region in Uzbekistan is called Navoi. The region is thought to have a very high plant diversity. In turn, accurate data analysis is required due to the dispersion of species and their natural reserves. The species' primary distribution regions are found in mountainous and mountainous regions. This species has been used for many years by the local population [7].

2. Object and Methods of Research

The investigation was conducted using traditional botanical research techniques. During the field research, route reconnaissance was the primary technique. The Braun-Blanquet method (1965), which uses cover classes ranging from 0 to 5%, 5% to 25%, 25% to 50%, 50% to 75%, and 95% to 100%, was used to estimate the total vegetation cover in each plot [8]. Species of the genus *Leontice* L. is distributed in Navoi region (Uzbekistan).

3. Study Area

Kyzyl-kum region is bordered by the Amudarya River in the west, the Aral Sea and the Syrdarya coast in the north, and the Zarafshan River and the Nurota Mountains in the southeast. South-Western Kyzyl-kum is bordered by Ovminzatau, Jetimtau, Kazoktog in the north, Nurota mountains in the east, Zarafshan river in the south, Amudarya in the west. The total area of the region is 11,988 km² or 4 million hectares [9] [10] (Figure 1).

With some indicators of the region's climate, including the minimum amount of precipitation (60 mm), the average maximum air temperature is 31°C, the maximum temperature rises to 46°C, the sum of the temperatures useful for plants in summer Being around 48°C, it differs sharply from other regions of Uzbekistan (Figure 2).

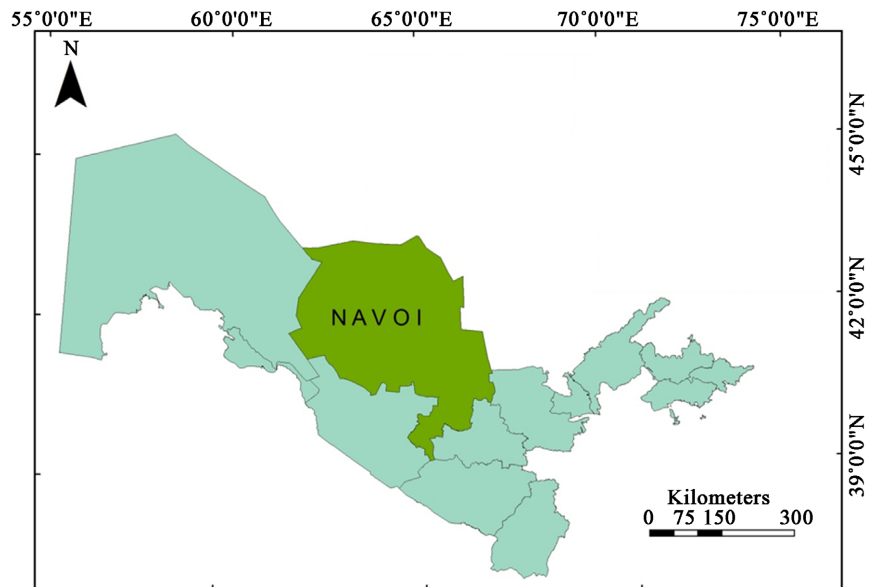


Figure 1. Physico-geographic description of the research area.

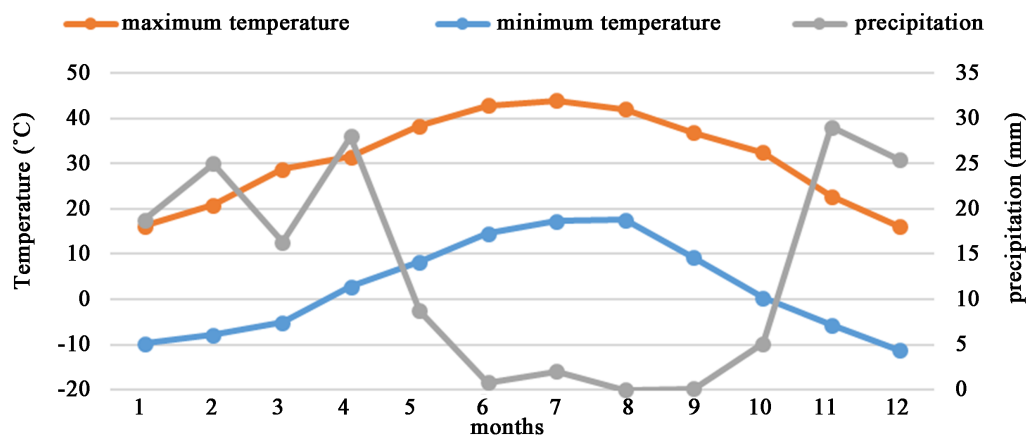


Figure 2. Ambrothermic diagram of Mashguduk weather station in Konimex

According to E.P. Korovin [11] phyo-geographical zoning, Southwest Kyzyl-kum is included in South Kyzyl-kum District, Turon Province.

Our scientific research was conducted in the center of Janubi Kyzyl-kum, Zafarabad district. Geology and geomorphology. The relief and geological structure of Kyzyl-kum have been studied by a number of scientists [12] [13].

According to Zakirov P.K, 3 main stages are distinguished in the geological and tectonic development of Kyzyl-kum:

- 1) The geosynclinal stage associated with the processes of formation of the Hersen mountain that occurred in the second half of the Paleozoic era. At this stage, Southern Tiyan-shan rises and Kyzyl-kum block is formed;
- 2) The platform stage of the Mesozoic and Cenozoic eras. Although this period is a relatively peaceful period in the geological development of Kyzyl-kum, it is characterized by the erosion of mountains;
- 3) The platform-orogenic stage, which began in the middle of the Oligocene

and is still ongoing.

As the western part of the central region of the Central Asian mountain system, the Kyzyl-kum residual mountains occupy the main place in this mountain system [14]. According to O.A. Rijkov [15], the Kyzyl-kum Relic Mountains are formed by anticlinal uplift and are a mega-anticlinal continuation of Nurota Mountain.

The average height of the remnant mountains that formed the macrorelief in Kyzyl-kum is 600 - 1000 m. The absolute height of Kuljuktau reaches 784 m above sea level. Kuljuktau and Ovminzatau extend for more than 100 km from east to west and are parallel to each other. In these mountains, shale, marble, sandstone, and conglomerates are common compared to limestone areas.

Kyzyl-kum residual mountains, including Kuljuktau, play an important role in the formation of the landscape of this area. The northern slopes of Kuljuktau are steeper than the southern slopes, the foot of the mountain merges with its lower part and forms the valley plains. The southern slopes consist of stony-cobblestone, gravel-sandy soils and sandy loams, gypsum is widespread in this area. According to I.F. Momotov [16], the total amount of gypsum in this area is 30% - 50%, and in some horizons it reaches 85%. In addition, some promising medicinal plants are being studied in the arid zones of the study areas [17] [18].

4. Result and Discussion

It is a medicinal plant, Chemical analysis of *Leontice* has identified several unique compounds, including alkaloids, flavonoids, and phenolic acids. These compounds have been shown to possess potential medicinal properties, including anti-inflammatory, antitumor, and antiviral effects.

Therefore, this plant is subjected to many anthropogenic influences *Leontice* is not commonly cultivated and is primarily harvested from the wild for medicinal use. Its natural habitat is threatened by habitat loss, grazing, and overgrazing, and it is considered to be a species of conservation concern in some areas. which in turn shows that research is important (Figure 3).

Two species of the genus are reported to exist inside the Navoi region, according to the investigations. It was discovered that a perennial life form is present in all of these species (Table 1).

L. ewersmannii is a perennial herb, tuber is ovoid, large-tubercular, 10 - 15 cm wide, located under the soil surface at a depth of 15 - 40 cm. The underground part of the stem is erect, cylindrical, the aboveground part is slightly longer than underground, 20 - 50 cm high. The lower leaves, numbering 1 - 2, seem to be basal, since they extend from the underground part of the stem and a significant part of the petiole is underground and somewhat expanded in the form of a vagina, pinnately distributed; primary segments petiolate, three dissected; middle secondary segment petiolate, tripartite, lateral sessile, deeply bifid, up to 11 cm long, up to 5 cm wide; 1 - 2 middle stems are similar to the lower ones in the nature of their dissection; sit on short petioles, widened at the base in the

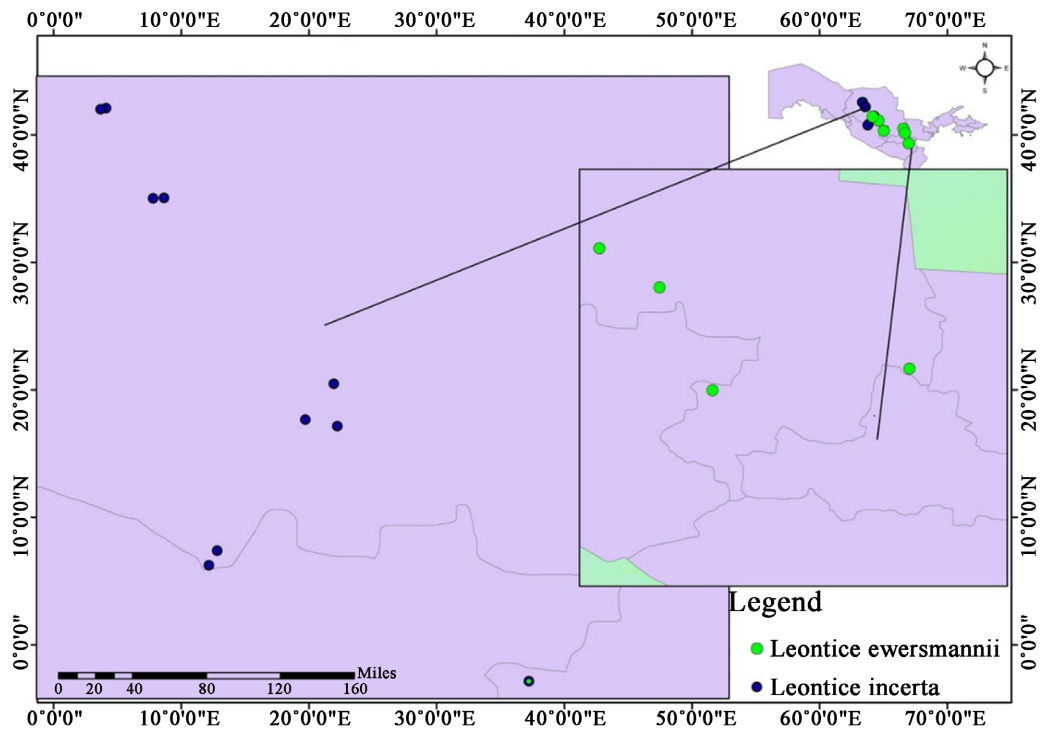


Figure 3. Population map of *Leontice* L. species distributed in Navoi region.

Table 1. Genus of *Leontice* L., distributed in Navoi region.

Leontice ewersmannii Bunge

Leontice incerta Pall.

form of a vagina, the rest of the stems, numbering 1 - 3, are moved towards the base of the brush, slightly dissected or almost whole. The inflorescence is apical, a complex multi-flowered raceme. The bracts are almost stem-embracing, elliptical at the apex, rounded, 3-7-(12) mm long. Pedicels are strong, horizontally deflected, faceted, with flowers 1.5 - 3.5 cm long. Sepals are yellow, 6 - 9 mm long, ovate-oblong. The petals are oblong, with 2 processes at the apex, almost half as long as the sepals. The ovary is almost pear-shaped, shortly narrowed towards the base, with 2 - 3 ovules; stigma is blunt. The capsule is bubble-shaped, up to 25-(30) mm wide, chopped off at the apex, bursting even before the seeds ripen. Seeds number 1 - 2, spherical, smooth, up to 5 mm wide. Blossoms and bears fruit in March - April. In sandy and clayey deserts, on loess hills in the foothills distributed (**Figure 4**).

L. incerta is a perennial herb, tuber spherical, 1.5 - 2.5 cm wide. stems are erect, unbranched, cylindrical, 10 - 15 cm high. Leaves up to 7 cm long, stem leaves usually 2, long-petiolate, 2.5 - 4 cm long, trifoliate or twice trifoliate; lobes elliptical or ovoid, 1.3 - 3.2 cm long, 6 - 20 mm wide, entire, somewhat fleshy, lateral parts sometimes dissected. Peduncles (without a raceme), not exceeding the leaves or slightly exceeding them, 2 - 3.5 cm long. brushes are sparse, about 5 - 10 colors. At the base of each flower, there is a rounded bract. Pedicels are thin,

directed obliquely upward, 8 - 12 mm long. sepals elliptical or ovate, 5 - 7 mm long. 4 - 5 times larger than the petals. the petals are kidney-shaped, vaguely toothed at the apex, and immediately narrowed at the base into a thin nail, twice as short as the limb. Pistil with a very short style and an almost sessile stigma. capsule almost spherical, 15 - 40 mm wide, vesicular swollen, indestructible seeds, 2 - 6, dark brown. Blooms and bears fruit in April-May (**Figure 5**).

Description the vascular plant communities with *Leontice* L.

The population of *Leontice* L is located in the city of Kokchatau in the southwestern Kyzyl-kum desert. The height was 370 m a.s.l., the coordinates were 40°29'817" 065°01'432". Vegetation was wasted and the total vegetation cover was 20% - 25%. The total cover of *L. incerta* is less than 1%, while the total cover of *L. ewersmannii* is around 2%. Species richness showed 19 vascular plants in the community (**Table 2**), of which four are semi-shrubs, eleven are perennials



Figure 4. General view of *L. ewersmannii* (photo by Bobokandov N).



Figure 5. General view of *L. incerta* (photo by Bobokandov N).

Table 2. Characteristics of plant communities of *Leontice* L.

№	Plant names	Populations and total	
		vegetation cover 20% - 25%	Life form
1	<i>Artemisia diffusa</i> Krach ex Poljakov	5	semi-shrubs
2	<i>Artemisia turanica</i> Kasch.	5	semi-shrubs
3	<i>Ceratocarpus utriculosus</i> Bluket ex Krylov	2	annual
4	<i>Ceratocephala testiculata</i> (Crantz) Besser	+	annual
5	<i>Convolvulus hamadae</i> (Vved.) Petrov	3	semi-shrubs
6	<i>Cousinia hamadae</i> Juz.	+	perennial
7	<i>Cousinia resinosa</i> Juz.	+	perennial
8	<i>Heliotropium dasycarpum</i> Ledeb.	+	perennial
9	<i>Lachnoloma lehmannii</i> Bunge	+	annual
10	<i>Lagochilus gypsaceus</i> Vved.	+	semi-shrubs
11	<i>Leontice incerta</i> Pall.	+	perennial
12	<i>Leontice ewersmannii</i> Bunge	2	perennial
13	<i>Merendera robusta</i> Bunge	+	perennial
14	<i>Papaver pavoninum</i> Schrenk	+	annual
15	<i>Peganum harmala</i> L.	2	perennial
16	<i>Phlomidoides eriocalyx</i> (Regel) Adylov, Kamelin & Makhm.	+	perennial
17	<i>Poa bulbosa</i> L.	+	perennial
18	<i>Polygonum polycnemoides</i> Jaub. & Spach	+	perennial
19	<i>Tulipa sogdiana</i> Bunge	+	perennial

and four are annuals. This vegetation cover is changing due to global warming and anthropogenic pressures.

5. Conclusion

The genus *Leontice* grows mainly in mountainous areas and some are distributed in arid climates. According to the information that 2 species have been identified in Navoi region, these species are plants with flavanoids healing properties. *Leontice* species have been used in traditional medicine since ancient times in ethnobotany. Ethnobotany is the study of a region's plants and their practical uses through the traditional knowledge of a local culture and people [19]. The presence of this species was discovered during the research and *Leontice* has identified numerous unique compounds, such as alkaloids, flavonoids, and phenolic acids, with potential medicinal properties such as anti-inflammatory, antitumor, and antiviral effects [5]. According to ecological analysis, the *Leon-*

tice genus thrives on stony, gravelly, and fine-grained mountain slopes and ridges, foothills, mountains, rocks, colorful rock outcrops, rocky slopes, and sandy, clay, and gravel deserts.

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Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

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