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Biogeochemistry Properties of Calcisols and *Capparis Spinosa L.*

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Annotation.

The article identifies the chemical composition of the drug *Capparis spinosa L*., which grows in light gray soils, on various organs of the plant, and compares these results with the results of studies conducted in foreign countries. The dynamics of the amount of chemical elements in the plant is shown in the diagrams.

Similarly, the amount of macro-trace elements in the genetic strata of our three soils is given. It is found that the Ca element is more abundant in all genetic layers of the soil than he average amount of elements in the earth's crust (Vinogradov, 1962), the Ni, Br elements and the accumulation in the upper layers of the soil.

Keywords and phrases: *C.spinosa*, species, morphogenetic, Calcisols, macro and microelements, medicinal property.

Introduction. The flora of Uzbekistan is extremely rich and rationally and efficiently used and preserving biodiversity for future generations is one of the most important challenges we face. Since the first years of independence, special attention has been paid to the development of natural medicines based on the study, reproduction, protection and processing of medicinal plants of local flora.

In particular, projects are underway to study the medicinal properties of plants, their rational use and to expand the scope of cultivation. Of such importance in our environment, one of the most naturally occurring medicinal plants is the thorn bush *(Capparis spinosa L).*

Medicinal plants have been used since ancient times as therapeutic agents for the management of health and treatment of diseases because they possess health-promoting effects and contain bioactive components [1]. According to the World Health Organization (WHO) [2], 80% of the world's populations rely mainly on traditional medicine. In China, 30–50% of the overall medicinal consumption is estimated from the preparations of traditional medicine [3]. Approximately 90% of the population in Germany reported that they have used natural remedies for certain health purposes [2]. Therefore, there is increasing use and popularity of traditional medicine in both the developing and industrialized countries, demonstrating that the global market for traditional medicine continues to be strong. The international market for herbal medicines has hit over $60 billion yearly and it continues to increase gradually. Therefore, medicinal plants such as Capparis spinosa (C. spinosa) continue to play a major role in healthcare systems [4].

C.spinosa is one of the most important economical species in the Capparidaceae family which has a wide range of diversity (i.e., about 40–50 genera and 700–900 species). Capparidaceae has been known to be closely related to the family of the Brassicaceae (Cruciferae) that is rich in glucosinolates and flavonoids [5]. C.spinosa is also known as Caper, wild watermelon (in China) [6], Cappero (in Italy), Alaf-e-Mar (in Persian) [7] and Alcapparo (in Spain) [8].

From a geographical point of view, *C.spinosa* is naturally distributed in the Mediterranean, southern Europe, the Caucasus, Crimea, Central Asia, including Azerbaijan, Turkmenistan, Kazakhstan, Uzbekistan, Pakistan and India [9]. This plant is cultured in France, Spain, Italy, Algeria, Cyprus, Greece and North America. The plant is named after the Dashti-Kavir Desert in Iran. *C.spinosa* is the most common type of plant in the area.

The natural distribution of *C.spinosa* in Uzbekistan is diversed. Specifically, they can be found on rocky pebbles, sometimes on fields, on roadsides, on ditches, on hills, on railway tracks, on dry ditches and canals [10]. When examining the biological and environmental features of any plant, it is necessary to first examine its natural state.

The properties and characteristics of the soils of the formed loesses and loess sands, proluvial and alluvial-proluvial deposits, as well as alluvial-deluvial deposits on the river terraces of Uzbekistan, where the vegetation of C.spinosa L. were studied by scientists G.Yuldashev, M.T.Isagaliev, A.T.Turdaliev, K.A.Askarov Sh.Ya.Eshpulatov, Kh.A.Abdukhakimova and M.V.Obidov [11, 12, 13, 14, 15, 16] and botanical properties, biochemical composition, agronomic methods of cultivation of this plant, which are common in them, M.T.Isagaliev, M.V.Obidov [10], Fu Kh.P., Aisa Kh.A., Abdurahim M., Yili A. et al. [17] N.T. Eshonkulova [18] and others.

The analysis shows that the arid climatic zone is not studied in relation to soil properties and the composition and biogeo-chemical properties of the medicinal *C.spinosa* distributed in the Calcisols.

Object and methods of research. Capparis spinosa L. is a native of the Fergana Valley in the area of Calcisols formed on alluvial proluvial, loess and middle loam rocks. Morpho-biological features of the studied Capparis spinosa L. species were used in the "Atlas of high morphology of high plants". The main method of research was the use of morphogenetics, methods of pedogeochemical methods of M.A. Glazovskaya and A.I.Perelman. The soil, vegetation element analysis was performed by neutron-activation method.

Results of research. There are 8100 species of plants in Central Asia, including 4,500 in Uzbekistan (4,448 by Flora). Of these 4,500 species, 577 species are medicinal plants [19]. Capparis spinosa L. is a perennial medicinal shrub species that grows in our environment. In field and laboratory conditions, the length of the stem is 70-180 cm, depending on the growth conditions.

At the top part of the young stems is covered with small hairs, but the hairs fall off as a branch grows during the growing season. The stem is green in color, with twisted thorns on the underside of the leaf band. In one bush, the number of main stems is 6-10 and the lateral

branches are 3-6 and 10-15 cm long. The diameter of the stem is 7-12 mm. The leaves on the stems vary in size, width, and length. Leaves are usually rounded, oval or elliptic in length, 2-7 cm long, green, hairless or scattered at the bottom, and are arranged in the main stem and lateral branches through the short leaf stem.

Flowers are 5–8 cm large, smelly, with a single leafy armpit, 4 petals, bent, oval, green, covered with small hairs on the outside. Flowerpots are 4, but 2 are clogged up to half, white, paternal pollen is of various lengths (6-9 cm), dust-bent, brown (red after flowering). The bouquets are 4-6 cm long. In the study area, the *C.spinosa* blossom from April to May, depending on the amount of rainfall.

The fruit is a multi-seed berry. The color is green, with long white lines. Inverted oval shape, elongated, like a nut or rounded multicellular, with long band. The exterior is of a smooth surface with a dark red inside. The fruit is like a watermelon. When the fruits ripen, the fruit peel turns to the outside. The fruits are 3-5 cm long and 1.3-2.7 cm wide. The fruit has more than 310 seeds (average 235); the seeds are 2.8-3.3 mm long, like a kidney and brown. The fruits ripen in July-August.

According to the data, the nutritional value of 100 g of dry marinated *C.spinosa* is as follows: carbohydrates-4.89 g, proteins-2.36 g, fat-0.86 g, folic acid-23 mcg, rutin-0.32 mg, quartzine-0.43. mg, sugar-10 mg, glycoside-25 mg, vitamins: B_1-0,018 mg, B_2-0,139 mg, A-138 mg, E-0.88 mg, K-24.6 mg, PP-0.652 mg, B_6- 0.023 mg, B_5-0.027 mg, C-4.3 mg, B_4-6.5 mg has been reported [20].

Traditional food uses: The flower buds (capers) and the fruit (caper berries) of *C.spinosa* due to having high nutritional status have been traditionally consumed as a seasoning or garnish. Capers are a common ingredient in mediterranean cuisine, especially, italian, cypriot and maltese. Moreover, in ancient Greece the caper had been used as a carminative. The fruit is used to garnish pizza and also added to salads, sauces and jams [21, 22]. Both the caper buds and the fruit are often pickled in salt or in a salt and vinegar solution resulting in development of a pungent flavor resembling mustard oil (glucocapparin). During this, an enzymatic reaction leads to the formation of rutin and the presence of this flavonoid compound can be seen as crystallized white spots on the surfaces of caper buds. Capers are considered as a unique ingredient in Italian cuisine, especially in sicilian and southern italian cooking. These are usually utilized in salads, pasta sauces and meat dishes [21]. On commercial basis capers are graded and sold based upon their size, with the smallest size being the most marketable. The pickled fruit can be served as a Greek mezze and snack in Menorca. Dried caper leaves are also used as a substitute for an enzyme, rennet, which is mostly employed during preparation of high-quality cheese [21, 22]. In the current perspectives of malnutrition, especially in under-developed and developing countries**,** *C. spinosa* can be explored as a nutritious plant to serve rural communities.

According to folk medicine, *C.spinosa* plant is a polyparmogen in its medicinal properties. Its role in medicine is multifaceted. In particular, its tincture of rootstock is used in the treatment of urinary tract, paralysis, neurosis, liver disease and jaundice. Flowers and Leaves - In the treatment of white spots and skin sores on the body, inflammation of the

lymph nodes, salivary gland, pancreas; from the fruit - for the treatment of pain, gastrointestinal, epilepsy, gastrointestinal, asthma and bull disease in gums and teeth; The seeds are used as natural medicines for treatment of diseases of the gastrointestinal tract, helminthiasis (trematodes, cestodes, nematodes, active forms of lamblia). The use of *C.spinosa* plant products increases the resistance of the human body to environmental conditions and enhances immune system activity [23]. Abu Ali Ibn Sina has treated gout root diseases, such as gout, joints, and radiculitis with *C.spinosa*.

From this point of view, today the world pharmaceutical industry is widely developing the manufacture of drugs on the basis of these recommendations.

In 1955, for the first time in medicine, by the Himalayan Drak Company developed and tested the drug Liv-52 for the treatment of liver diseases and is now widely used in medicine. The main part of products or 65% of the drug consists of *C.spinosa* products [24, 20].

Capparis spinosa is a potential source of some basic dietary components for human nutrition. For example, the fruit of this species is reported to contain moisture (79%), ash (1.6%), protein (5.8%), fat (1.6%), crude fiber (5.4%) and important minerals such as calcium (871 ppm), magnesium (636 ppm), potassium (542 ppm), sodium (226 ppm), iron (13 ppm) and phosphorous (21 ppm) [20]. But the concentration of these nutrients is affected with regard to the nature of cultivar, time of cultivation-harvest and size of the fruit. Considering the classification of the studied elements in terms of their biological role [25], they are among the essential biogenic and essential elements for life, and are grouped into macro and micronutrients by their quantity.

The investigated reserves of Calcisols are formed on loess, deluvial, proluvial layers and are distributed on the flat, flat planes on the Fergana hills by morphogenetic properties. Light gray color, moderately mechanical and light sand, small sand (0.1-0.05) prevails. The plants are mainly ephemeroids and grow on the soil surface, occur in various sizes of rocks and gravel, the boulders are deposited at the bottom, the carbonates change to 5.2–11.4% in the soil section, in the form of spots, molds, white pores, gypsum cones stronger than 26 cm, HCl boils strongly from the top to the acid.

According to laboratory analyzes, the amount of some chemical elements in the light gray soils grown by medicinal Capparis spinosa was as follows. (tabl. 1).

Table 1.

The amount of elements in light Calcisols growing Medicinal Capparis spinosa L.

Section number	Shear depth, cm	Elements (μg/g),										
		Ca	K	Na	Fe	Mn	Zn	Co	Mo	Ni	Ba	Br
1 M/O	0-10	142000	11100	7000	13300	370	55.8	4.71	<0.1	134	483	3.4
	10-30	52000	14500	7100	16100	430	37.1	7.35	1.6	152	570	9.5
	30-56	136000	15100	9400	18100	520	59.8	7.45	0.55	13.0	556	2.5
	56-120	105000	14500	6800	20500	420	61.1	8.58	1.1	59.0	442	1.9
He average amount of elements in the earth's crust *		29600	25000	25000	46500	1000	83	18	1.1	58	650	2.1

* - I.P.Vinogradov (1962).

It can be seen from the data in the table that the amount of macro- and micronutrients varies according to the genetic layers of the soil. It can be seen that the element Ca is 2-4 times more abundant in all layers of soil than Vinogradov Clark. The elements Ni and Br are also accumulated in the upper layers of the soil. Excess of clarin content in the soil layers of Ni and Br elements may reveal harmful properties for living organisms in these soils. It also leads to an excess of these elements in medicinal plants. From this point of view, it is expedient to monitor the amount of chemical elements in the soil and to select the type of plant to be planted according to the results of monitoring.

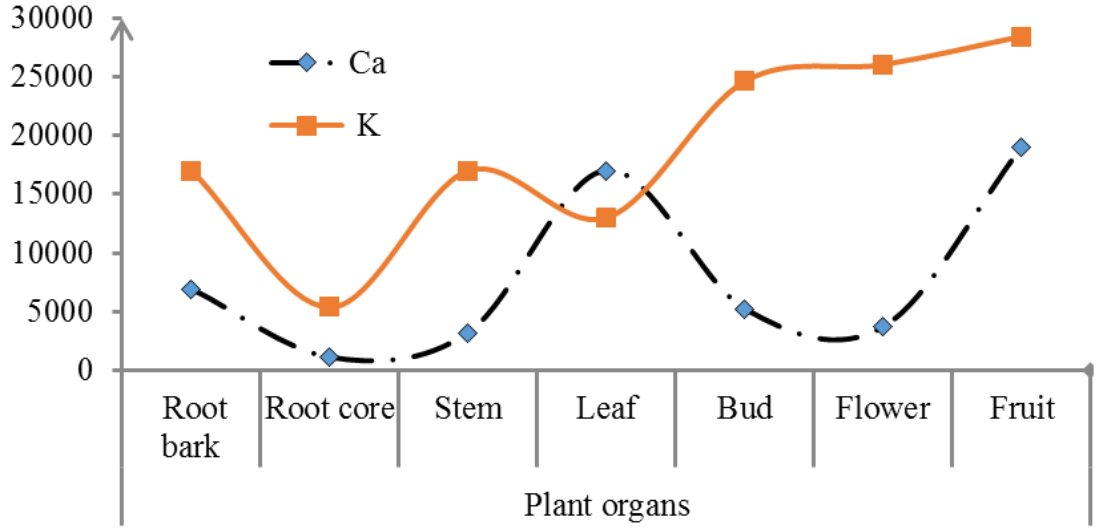
The amount of elemental composition *C.spinosa* changes depending on the properties and properties of the soil, in particular the content of the elements. These changes can also be seen in the table below (tabl. 2, picture 1-2).

Table 2.

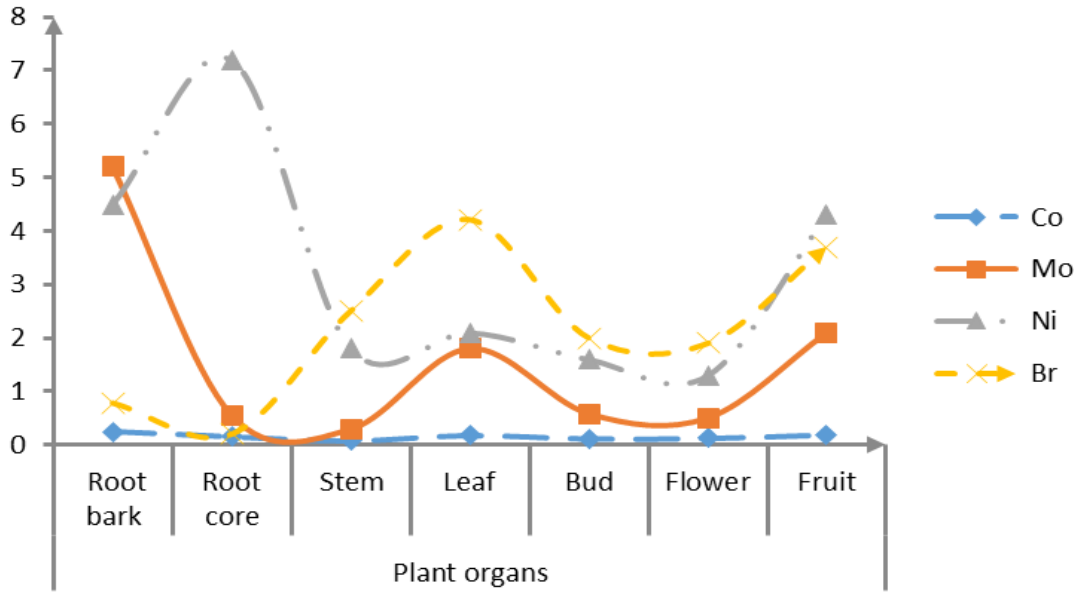
The amount of macro- and microelements in the plant Capparis spinosa L. (μg/g**), (n=7)**

№	Elements	Plant organs						
		Root bark	Root core	Stem	Leaf	Bud	Flower	Fruit
1	Ca	6900	1100	3200	17000	5200	3700	19000
2	K	17000	5400	17000	13000	24600	26000	28400
3	Na	1300	1200	75	84	135	130	151
4	Fe	330	82.5	75	155	100	125	231
5	Mn	32	9.0	16	100	26	24	34
6	Zn	27	5.1	14	30	33	30	34.1
7	Co	0.25	0.16	0.086	0.18	0.12	0.13	0.19
8	Mo	5.2	0.55	0.29	1.8	0.58	0.50	2.1
9	Ni	4.5	7.2	1.8	2.1	1.6	1.3	4.3
10	Ba	39.0	4.3	3.5	5.2	2.2	3.5	4.1
11	Br	0.79	0.21	2.5	4.2	2.0	1.9	3.7

According to Table 2, different amounts of chemical elements were accumulated in different organs of C. spinosa. For example, Ca is present in 6900 μg/g in the rhizome, 1100 μg/g in the root, 3200 μg/g in the stem, 17000 μg/g in the leaf, 5200 μg/g in the bud, 3700 μg/g in the flower and 19000 μg/g in the fruit. In general, the amount of elements studied in plant organs: K-13000-28400 μg/g, Ca-1100-19000 μg/g, Na-75-1300 μg/g, Fe-75-330 μg/g, Mn-9.0 -100 μg/g, Zn-5.1–34.1 μg/g, and the minimum amount of Co-0.086–0.25 μg/g oscillates in the range.



Picture 1. Diagram of the amount of chemical elements in plant organs (µg/g)



Picture 2. Diagram of the amount of chemical elements in plant organs (µg/g)

In conclusion, it is important to study the soil properties and properties, particularly the median limit of chemical elements in the soil, and to study the permissible concentrations of elements and a number of microelements in medicinal plants. High concentrations of chemical elements in the soil lead to the accumulation of this element in some organs of the growing plant.

The development of quantitative provision of nutrients in *C.spinosa* and other medicinal plants further increases the productivity and medicinal properties of medicinal plants.

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