RESULTS OF THE STUDY ON MACRO AND MICRO ELEMENTS OF WORMWOOD PANICULATE (ARTEMISIA SCOPARIA WALDST)

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Abstract. *The essential oil of the Artemisia scoparia Waldst is contained in the drug Artemizole and is used to treat urinary stones. In traditional Tibetan medicine, the part of Artemisia scoparia Waldst above soil has been used to treat pneumonia, neurological diseases and hepatitis.*
The content of macro, micro and ultra micro-elements of wormwood paniculate collected during flowering in Buyant soum of Khovd aimag was determined by X-ray fluorescence quantitative analysis at the Central Geological Laboratory.
The samples were relatively high in potassium (1.29%), calcium (0.54%), phosphorus (0.204%), magnesium (0.11%), silicon (0.23%), sodium (0.03%), and aluminum (0.05%). In Artemisia scoparia Waldst sample, elements such as copper, zinc, strontium, barium, tin, chromium, cabalt, and nickel were found to be 5-28 mg/kg, and some rare earth elements such as cerium, lanthanum, and germanium were found to be 3-30 mkg/kg. The content of copper, chromium, cobalt, tin, lead, and zinc in wormwood paniculate samples did not exceed the standard volume [6].
Keywords: *Strontium, calcium, rubidium, copper.*

Introduction.

Essential oil of *Artemisia scoparia Waldst* is contained in the drug artemizole and is used to treat urinary stones [10, 17].

In traditional Tibetan medicine, the part of *Artemisia scoparia Waldst* above soil has been used to treat pneumonia, neurological diseases and hepatitis. In traditional Russian medicine, the *Artemisia scoparia Waldst* is used in the treatment of respiratory diseases, rheumatism and diuresis. In Siberia, the gramineous part of the ***Artemisia scoparia Waldst*** is used to treat epilepsy [1, 5].

In Chinese medicine, the *Artemisia scoparia Waldst* is used to help urination, reduce fever and increase appetite.

In Indian medicine, the part of the ***Artemisia scoparia Waldst*** above soil is used to reduce swelling and to whiten. The essential oil of ***Artemisia scoparia Waldst*** is antibacterial and has properties to heal urination and spasm [5].

As the essential oil contains 40-70% of capillaries, it has antibacterial properties. The essential oil is used as colorants in beverages, as well as in the cosmetics and food industries. Danisev, G.A., Golubeva, K.I., et al. found that the essential oil of *Artemisia scoparia Waldst* could be used in cosmetic industry [5, 12].

The of *Artemisia scoparia Waldst* is medicinal herb used as a main component of artemizole in the treatment of fever, pulmonary tuberculosis, biliary, urinary and helminthiasis diseases, and for the treatment of kidney and bladder stones [13].

The of *Artemisia scoparia Waldst* paniculate is pasture plant that sheep, goats and camels eat when it is dry [11].

In this study, the results determining the content of micro and ultra micro-elements in of ***Artemisia scoparia Waldst*** are discussed.

Distribution of the of ***Artemisia scoparia Waldst***. When the distribution of ***Artemisia scoparia Waldst*** is considered by vegetation geographical region of Mongolia, it is divided into forest-steppe circle of Khangai and Mongol Daguur mountain, meadow-steppe circle of Khyangan mountain, Middle Khalkha and Eastern Mongolia steppe circle, Mongol-Altai mountain-steppe circle, desert-steppe circle of Great Lakes Depression, desert-steppe circle of Valley of Many Lakes, desert-steppe

circle of East Gobi, desert-steppe circle of Gobi-Altai mountain, desert-steppe circle of Dzungarian Gobi, Inner Gobi desert circle of Altai, and desert circle of Alashaan Gobi. It grows in mountain gravel slopes, downhills, ridges, bankside marl saline meadows, sand, gravel, straw hollows, and around dwellings in deserts, semi-deserts and sandy steppes [3, 14].

Morphological features. It is an annual or biennial plant which has a single-stem, sometimes 2-5 stems, and branches above the middle. Leaves around the roots are 1-4.5 cm long and 0.5-1.5 cm wide, and blades 2-7 mm long, 0.3-2 mm wide, linear or lanceolate. The lower part of the stem has a leaf handle, the others are sessile. Leaf blades 1-4 cm long, up to 2 cm wide, double or triple hairy, its petals wiry-linear. Baskets broadly oval, egglike, 1.2–2 mm long, 1–1.5 mm wide with 1–3 mm long hanging stalks, forming sparse and sessile inflorescences. Basket scarves, petals, and flower seats are all bare [3].

Literature review /Previous studies/. In the ground section, the resin is 4.35-5.57%, 1.08-1.37% in the roots and 7.91% in the flowers and all organs are nutritious (citric, apple, dock flower, vinegar, thyroid and propionic acid). It has 3.61-4.74% dehydrating substances from pyrogal group in the herbaceous part and 2-2.5% in the roots.

Essential oil (0.96%) is accumulated in the leaves and flowers, especially during flowering period. It also contains flavonoid, rutin-1.03%, quercetin, kaempferol, luteolin, ramnocitrin, eupalitin, cirsimaritin, phenolic carbon caffeine and chlorogenic acids in leaves, stems and flowers [11].

Artemisia scoparia Waldst contains coumarin, scoparon-0.25%, isocoumarin, capillary, resin, tannins and essential oil- 0.71-0.96%. Essential oil has been found to contain α-pinene, β-pinene, and myrcene [5].

Topsoil part of *Artemisia scoparia Waldst* harvested from Mongolia contains flavnoids, coumarins and 0.2-0.8% of essential oil [14]. Samples of *Artemisia scoparia Waldst* during flowering contain 7.7% of water, 28.8-31.2% of fiber, 7.3-7.9% of protein, 5.8-6.3% of fat and 5.6-6.0% of ash [4].

Artemisia scoparia Waldst is high in essential oil and sesquiterpene lactone [24].

Traditional usage. When in Chinese and Tibetan hospitals, it is used for biliary excretion, digestion, fever reduction, arthritis, pulmonary tuberculosis, pneumonia, bronchitis, laryngitis, pharyngitis, sore throat, neurasthenia, fever, anemia, and rehabilitation, Siberians use it for fainting, epilepsy, and people in the Far East use it for the treatment of coughs, lung diseases, as well as parasites and mites [11].

Essential oil of *Artemisia scoparia Waldst* is an ingredient of the drug artemizol, which relaxes the smooth muscles and increases the solubility of oxalate and lime-phosphate salts in the urine [2].

In India, it is used to treat diarrhea and to relieve ear infections, and given to patients at Nangiad and Tibetan hospitals (alone or on prescription) for biliary excretion. In Nangiad hospitals, the extract is used to relieve fever, expel bile, improve urination and digestion, heal respiratory diseases, relieve headaches, and deworming [7].

Artemisia scoparia Waldst is used to treat respiratory diseases, rheumatism, urine and biliary excretion. Moreover the water-based extracts of wormwood paniculate have been used to treat burns and epilepsy [24].

Mongolian and Tibetan hospitals use the herbal extract to improve yellow eyes, digestive system diseases and digestion [26].

Essential oil of *Artemisia scoparia Waldst* has antibacterial and anti-inflammatory properties [27].

In Chinese, Tibetan and Indian medicine, the of *Artemisia scoparia Waldst* is included in antimicrobial, diuretic and anti-febrile drugs to treat colds, sputum and respiratory diseases. Essential oil of *Artemisia scoparia Waldst* contains artemizole, which has muscle relaxant effect and increases the amount of calcium oxalate and calcium phosphate excreted through the urine [29]. *Artemisia scoparia Waldst* extract, scoropan, lowers cholesterol and triglycerides in blood [30].

Research materials and methodology.

Artemisia scoparia Waldst samples were collected from the territory of Buyant soum of Khovd aimag (N 880 47/648 //, E 55037/219 //) during flowering period, in July 2020 and were used for analysis. Research sample collection site and plant distribution are shown in Fig. 1 and 2.

Fig. 1. Buyant soum, Khovd aimag

Fig. 2. Distribution of the of Artemisia scoparia Waldst

The content of macro, micro and ultra-microelements in plants was determined by X-ray fluorescence quantitative analysis method at the Central Geological Laboratory.

Research process and results. Determination of macro and micro element content of *Artemisia scoparia Waldst*. Determination of the macro-element composition of the plant ash.

The plant was burnt at 450°C to obtain ash. The chemical composition of the macro-elements in the ash is shown in Table 1.

Table 1. Chemical composition of plant macro-elements (%)

Kind of sample	Si	Ti	AI	∑ Fe	Ca	Mg	Na	K	Mn	P
/Artemisia scoparia Waldst/ /2020.07/	0.23	<0.005	0.05	0.03	0.54	0.11	0.03	1.29	0.003	0.204

Samples of *Artemisia scoparia Waldst* contain elements such as potassium (1.29%), calcium (0.54%), phosphorus (0.204%), magnesium (0.11%), and silicon (0.23%) at relatively high level.

Table 2 shows the results of comparison of the macro-element content of *Artemisia scoparia Waldst* with the results of other researchers.

Table 2. Macro-element composition of the plant (%)

Kind sample	Si	Ti	AI	∑ Fe	Ca	Mg	Na	K	Mn	P
(Artemisia scoparia Waldst/) /2020.07/	0.23	<0.005	0.05	0.03	0.54	0.11	0.03	1.29	0.003	0.204
(Artemisia scoparia Waldst) [25]				0.02	0.38	0.76	0.092	4.26	0.089	
(Artemisia scoparia Waldst) [24]				0.188	1.6	0.528	0.151	1.78	0.0246	

The content of iron and manganese in *Artemisia scoparia Waldst* samples is consistent with the results of other researchers [25, 24].

Determination of microelement content of the plant. Table 3 shows the content of microelements in the plant.

Table 3. Micro-element composition of the plant (mg/kg)

Kind sample	As	V	Cu	Zn	Cr	Co	Mo	Ni	Sn	Sr	F	Ba	Bi	Pb
(Artemisia scoparia Waldst) /2020.07/	<5	<15	7	19	<5	<5	<5	<5	<30	28	<0.05	15	<5	<5

The chromium and zinc content of the plant samples shall be within the standard range.

The results of comparing the micro-element content of *Artemisia scoparia Waldst* with the results of other researchers are shown in Table 4.

Table 4. Comparison of microelements of ***Artemisia*** type plants (mg/kg)

Kind sample	As	V	Cu	Zn	Cr	Co	Mo	Ni	Sn	Sr	F	Ba	Bi	Pb
/Artemisia scoparia Waldst/ /2020.07/	<5	<15	7	19	<5	<5	<5	<5	<30	28	<0.05	15	<5	<5
/Artemisia rutifolia Steph.Ex/[18]	6	67	93	345	84	16	6	40	<30	928	<0.05	2213	13	
Artemisia albicerata [19]			58.9	182				38.2						11.4
(Artemisia annua L) [20]	<20		250±30	270± 20						20± 10				50± 10
(Artemisia sieversiana Willd) [22]	10.9			607.17	10.2	4.0				401				
(Artemisia dracunculus L) [23]			6.65±0.04	76.6±0.01										
(Artemisia frigida Willd) [21]			11.22± 0.25	26.83± 0.57				0.58± 0.01						0.10± 0.002
(Artemisia frigida Willd) [21]			7.22± 0.03	27.69± 0.49				2.85± 0.06						2.28± 0.06
(*Artemisia jacutica* Drob) [21]			20.87± 0.20	24.86± 0.44										5.20± 0.59
(Artemisia scoparia waldst. Et kit.) [24]	1.0		2.2	3.3	4.34	0.073		16		4.74		5.09		
(Artemisia scoparia waldst. Et kit.) [28]	0,0005	0.19	7.48	16,3	1.31	0.13	0.38	0,2	0.015	26.6	-	5.07	0.005	0.22

Zinc content of *Artemisia scoparia waldst. Et kit.*, *Artemisia rutifolia Steph. Ex spreng*, *Artemisia annua L*, *Artemisia dracunculus L*, *Artemisia frigida Wild* and *Artemisia albicerata* does not exceed the standard value [6]. Arsenic content of the sample of *Artemisia scoparia Waldst. Et kit* is consistent with the results of the researchers [24, 28]. The content of tin, nickel, chromium, lead, molybdenum, cobalt and fluoride in the samples of *Artemisia scoparia waldst. Et kit.*) is consistent with the results of the researchers [18, 28, 24].

Determination of the content of ultra-microelements in the plants.

Table 5 and 6 show the content of ultra-microelements of the plants.

Table 5. Ultra microelement composition of the plant (mg/kg)

Kind of sample	Ce	Cs	Ga	Ge	Hf	La	Nb	Nd	Pr
(*Artemisia scoparia Waldst)* /2020.07/	<30	<30	<3	<3	<15	<30	<3	<50	<30

Table 6. Ultra microelement composition of the plant (mg/kg)

Kind of sample	Rb	Sb	Sc	Sm	Ta	Th	U	W	Y	Zr
(*Artemisia scoparia Waldst)* /2020.07/	8	<40	<10	<30	<10	<5	<5	<8	<3	<3

The elements such as cerium, cesium, lanthanum, neodymium, antimony and samarium are contained relatively high in the samples of *Artemisia scoparia Waldst. Et kit*. The results of comparing the ultra-microelement content of *Artemisia scoparia Waldst. Et kit* with the results of other researchers are shown in Table 7 and 8.

Table 7. Comparison of ultra-microelements of wormwood type plants (mg/kg)

Kind of sample	Ce	Cs	Ga	Ge	Hf	La	Nb	Nd	Pr
(*Artemisia scoparia Waldst)* /2020.07/	<30	<30	<3	<3	<15	<30	<3	<50	<30
Artemisia rutifolia Steph.Ex [18]	37	<30	<3	<3	<15	30	<5	<50	<30
Artemisia scoparia waldst. Et kit. [24]	0.35	0.037			0.027	0.26		0.105	
Artemisia scoparia waldst. Et kit. [28]	0.042	0.068	0.0025	0.057	0.023	0.03	0.01	0.033	0.074

The content of germanium [24, 28], cesium, hafnium, neodymium, praseodymium and lanthanum in *Artemisia scoparia Waldst* samples is consistent with the results of some researchers [18, 24, 28].

Table 8. Comparison of ultra-microelements of *Artemisia* type plants (mg/kg)

Kind of sample	Rb	Sb	Sc	Sm	Ta	Th	U	W	Y	Zr
Artemisia scoparia Waldst/ /2020.07/	8	<40	<10	<30	<10	<5	<5	<8	<3	<3
Artemisia rutifolia Steph.Ex [18]	89	<40	<10	<30	<10	5	<5	<8	13	69
Artemisia annua L [20]	50±10									
Artemisia sieversiana Willd [22]		10.49								
Artemisia scoparia waldst. Et kit) [21]	1.2									
Artemisia scoparia waldst. Et kit [24]	1.2	0.018	0.064	0.0238	0.004	0.068	0.024			
Artemisia scoparia waldst. Et kit. [28]	1.5	0.012		0.068	0.073	0.089	0.035	0.081	0.023	0.12

The antimony content of wormwood paniculate samples [18, 22, 24], samarium, scandium, tantalum, uranium and tungsten content [18, 24], and thorium content [24] are consistent with the results of some researchers.

Conclusions.

1. Samples of *Artemisia scoparia Waldst* paniculate are relatively high in the elements such as potassium (1.29%), calcium (0.54%), phosphorus (0.204%), magnesium (0.11%), and silicon (0.23%).
2. The content of chromium, copper and zinc in the *Artemisia scoparia Waldst/* sample is within the standard range.
3. The content of tin, nickel, chromium, lead, molybdenum, cobalt and fluoride in the samples of Artemisia scoparia waldst. Et kit. is consistent with the results of the researchers [18, 28, 24].
4. Samples of *Artemisia scoparia Waldst* also contain elements such as barium, zinc, and strontium.

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