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THE HEAVY METALS IN ALHAGI PSEUDALHAGI, ARTEMISIA TERRAE-ALBAE, CERATOCARPUS ARENARIUS OF MANGYSTAU REGION

The article presents the results of a study of heavy metals concentration(Pb, Cd, Zn, Cu, Mn, Co, Ni) in the following samples of dominant plants: Alhagi pseudalhagi, Artemisia terrae-albae, Ceratocarpus arenarius and soils collected in the Mangistau region in 3 points: № 1 point (Aktau, the farm «Bereke»), number 2 point (Fort-Shevchenko, agriculture ' Asem-Almaz «) and number 3 (of Zhanaozen, the farm «Nurken»). The determination of heavy metals was carried out by atomic absorption spectrometry. The procedure for performing measurements of the mass fraction of petroleum products in soil samples was carried out on a Fluorat-02 liquid analyzer. It was found, the studied plants in the studied points have different accumulative abilities: Artemisia terrae-albae revealed the best accumulative ability to store heavy metals when as Ceratocarpus arenarius differs in that, in comparison with other plants that grow together with them under the same environmental conditions, they accumulate the least heavy metals. In all areas studied the content of heavy metals in soil samples it is within the acceptable level. However, there is a general pattern of a slight excess of the permissible level of concentration in the range of 1.09 – 1.72 to the maximum permissible concentrations (MPC) for metals such as zinc, cobalt, which may be related features physiographic zones and geological factors.

Key words: Mangistau region, heavy metals, atomic absorption spectrometry, the dominant species, accumulative capacity.

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Маңғыстау облысының Alhagi pseudalhagi, Artemisia terrae-albae, Ceratocarpus arenarius өсімдіктер құрамындағы ауыр металдардың мөлшері

Бұл мақалада Маңғыстау облысының аумағында жиналған Alhagi pseudalhagi, Artemisia terrae-albae, Ceratocarpus arenarius және топырақ үлгілерінің құрамындағы ауыр металдардың (Pb, Cd, Zn, Cu, Mn, Co, Ni) зерттеу нәтижелері ұсынылған. Басым өсімдіктер мен топырақ үлгілері 3 нүктеден жиналды: №1 нүкте (Ақтау қаласы, «Береке» шаруашылығы), №2 нүкте (Форт-

Шевченко қаласы, «Әсем-Алмаз» шаруашылығы) және №3 нүкте (Жаңаөзен қаласы, «Нүркен» шаруашылығы). Ауыр металдар атом–абсорбциалық спектрометрия әдісі арқылы анықталды. Топырақ үлгілеріндегі мұнай өнімдерінің жаппай үлесін өлшеуді жүргізу тәртібі «Флюорат-02» сұйық анализаторында жүргізілді. Өсімдіктердің ауыр металдарды құрамдарына жинақтау қасиеттері әртүрлі болып келеді. Зерттелген өсімдіктер арасында Artemisia terrae-albae ең үздік жинақтаушы қасиеттерімен ерекшеленетіні анықталды. Ал Ceratocarpus arenarius басқа да өсімдіктер түрлерімен бір экологиялық жағдайларда өсетіндігіне қарамастан, құрамында ауыр металдарды аз мөлшерде жинайтындығымен ерекшеленеді. Барлық зерттеу жүргізілген нүктелерден алынған топырақ үлгілерінде ауыр металдардың мөлшері рұқсат етілген деңгейдің аясында екені анықталды. Бірақ, физико-географиялық аймақтары мен геологиялық факторлар ерекшеліктеріне байланысты болуына мүмкін, мырыш, кобальт металдары рұқсат етілген 1,09 – 1,72 ауқымындағы шекті-рауалы концентрациясы (ШРК) деңгейінен шамалы асатыны анықталды.

Түйін сөздер: Маңғыстау облысы, ауыр металдар, атомдық-абсорбциялық спектрометрия, өсімдіктің басым түрі, жинақтаушы қасиеттері.

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Содержание тяжелых металлов в *Alhagi pseudalhagi, Artemisia terrae-albae, Ceratocarpus arenarius* Мангистауской области

В данной статье представлены результаты исследования содержания тяжелых металлов (Pb, Cd, Zn, Cu,Mn, Co, Ni) в следующих образцах доминантных растений: Alhagi pseudalhagi, Artemisia terrae-albae, Ceratocarpus arenarius, а также почвы, собранных на территории Мангистауской области в 3 пунктах: № 1 Точка (хозяйство «Береке», г. Актау), № 2 Точка (хозяйство «Асем-Алмаз», г. Форт-Шевченко) и № 3 (хозяйство «Нуркен», г. Жанаозен).

Определение тяжелых металлов проведено методом атомно-абсорбционной спектрометрии. Методика выполнения измерений массовой доли нефтепродуктов в пробах почвы проводилась на анализаторе жидкости «Флюорат – 02».

Было выявлено, что изученные растения в исследуемых точках обладают различной аккумулятивной способностью: Artemisia terrae-albae обладает наибольшей способностью накапливать тяжелые металлы, тогда как Ceratocarpus arenarius отличается тем, что посравнению с другими растениями, произраставшими вместе с ними в одинаковых экологических условиях, накапливает меньше всего тяжелых металлов.

Содержание тяжелых металлов в образцах почвы на территории изученных пунктов находилось в пределах допустимого уровня. Однако, отмечалось незначительное превышение допустимого уровня содержания в пределах от 1,09 – до 1,72 предельно допустимой концентрации (ПДК) по таким металлам, как цинк, кобальт, что может быть связано с особенностями физико-географической зоны и геологических факторов.

Ключевые слова: тяжелые металлы, атомно-абсорбционная спектрометрия, доминантные виды растений, аккумулятивные способности, Мангистауская область.

Introduction

Environmental problems in the Caspian region, including the Mangistau region, are now directly related to the rapid development of industry, energy and transport communications, the active chemicalization of agriculture, intensive mining of minerals, as well as the active activities of the mining, oil and gas processing industries. All of them adversely affects on the environment, air, soil composition, surface and groundwater bodies. In recent years, one of the most dangerous pollutants are heavy metals.

Different metals and their compounds have a direct impact on the soil and plants. The accumulation of heavy metals adversely affects the fertility of the soil, its microbiological activity, the growth and development of plants, as well as the quality of crop production. At a normal concentration of heavy metals in the soil, plants are able to regulate their intake through the root system. However, at higher concentrations, protective and regulatory mechanisms are not able to prevent their entry into vegetative organs. The nature of distribution of heavy metals in plant biomass has the following features: most of them accumulate in roots, root crops, tubers, somewhat less in overground green organs and even less in fruits (Sytar 2013:985-999, Prasad 2013:304, Gratão 2005: 53-64, Nagajyoti 2010:199–216, Yruela 2005: 154-163). Heavy metals play an important role in the life of plants. For example, when there is a shortage of manganese, a slowdown in the development of the root system and growth of the plant are observed, yields are reduced. The content of Ni and Co is relatively stable for plants. Plumbum is a natural component of soil, atmospheric air and water. Due to the wide prevalence of plumbum in the environment, it is to some extent contained in all types of food products. The impact of plumbum on orgagnism today remains a serious problem. (Filova 1989:214, Avtsyn 1991:124-127, Himelblau 2000:205-210, Dietz 1999:73-97, Rosenfeld 2017:279-287, Rosenfeld 2017:373-383).

The characteristic features of territory of the Mangistau region are the poverty of the flora and the unique structure of the vegetation cover. The flora of this region refers to typical desert floras. The composition of plant communities and their distribution in space are determined by habitat conditions. The main factors determining the distribution of vegetation are the conditions of moistening, salinity and mechanical composition of soils and soils, as well as geomorphological conditions (Dimeeva 2014:33).

The most part of the study area is occupied by complex communities with the dominance of (*Artemisia terrae-albae* Krasch., *Artemisia gurganica (*Krasch.) Filat., *Artemisia lessingiana* Bess.) the ash-lays (*Anabasis salsa* (C.A. Mey.) Benth. ex Volkens, *Anabasis aphylla* L.). Sagebrush communities are characterized by alkaline and solonchakous varieties of brown desert soils. Biyurgunovy phytocenoses are confined to solonets desert. Among these communities, annuals predominate (*Lepidium perfoliatum* L., *Alyssum desertorum* Stapf., *Tetracme quadricomis* (Steph.) Bunge, *Descurainia Sophia* (L.) Webb ex Prantl, *Eremopyrum triticeum* (Gaertn.) Nevski, *Ceratocephala falcata* (Crantz) Bess.). Most of the representatives of the family *Brassicaceae*.

Also in these communities there are perennials such as *Cousinia onopordioides* Ledeb, *Rheum tataricum* L. fil., *Gypsophilla diffuza* Fisch et Mey., *Tanacetum achilleifolium* (Bieb.) Sch. Bip., *Prangos odontalgica* (Pall.) Herrnst. & Heyn. Communities dominated by perennial halophytes are formed in solonchaks of common (*Halocnemum strobilaceum* (Pall.) Bieb., *Anabasis salsa* (C.A. Mey.) Benth. ex Volkens, *Limonium suffruticosum* (L.) O. Kuntze., *Artemisia monogyna* Poljak.,). For these communities, ephemeral annuals are the characteristic components (*Eremopyrum orientale* (L.) Jaub. & Spach, *Lepidium perfoliatum* L., *Eremopyrum triticeum* (Gaertn.) Nevski). (Aralbaj 2006a:44).

In the study area, xerophytes predominate in the composition of vegetation, which are related to the life forms of semi-shrubs, half-shrubs, shrubs, herbaceous annuals and perennials with short (ephemerals and ephemeroids) and a long vegetation period.

Thus, the aim of work is to assess the ecological status of the Mangistau region using the example of dominant terrestrial plant species at the monitoring points of the Atyrau region and the collection of representatives of terrestrial plant species as test objects for analyzing the content of oil products and associated heavy metals.

Materials and methods

Monitoring studies were carried out to determine the content of heavy metals in soil and plant samples from 2015 to 2017 (Inelova 2015: 292-297, Inelova 2016:44-53).

Before the beginning of the work, a route was laid, along which further sampling of plants and soil cover was conducted to determine the content of heavy metals in them.

In determining the species of plants for collection, geobotanical descriptions of communities were initially made at three points:

1) Point (Aktau city, «Bereke» farm).

2) Point (Fort-Shevchenko city, «Assem-Almaz» farm).

3) Point (Zhanaozen city, farm «Nurken»). (Fig.1).

According to the geobotanical method, the laying of sites was carried out in tenfold repetition. Initially, dominant and fodder species were identified, which later served as objects of research for fodder and dominant plants – *Alhagi pseudalhagi, Artemisia terrae-albae, Ceratocarpus arenarius.*

Alhagi pseudalhagi (M. B.) Desv. -semishrub 50-100 cm high; stems branched, smooth, furrowed, glabrous, rarely with sparse hairs, branches usually depart at an acute angle, upward directed, densely leafy; lower spines strong, 10-15 mm long, 1 mm thick, upper thin, 30-35 mm long, 0.5-0.7 mm thick, upward directed; leaves ovate, oblong or lanceolate, on top with short denticle, on both sides scatteredly pubescent, lower usually shorter than thorns, flowers 3-8 of which sit on spines; pedicels loosely adpressed or pubescent, about 1.5-2 mm long; calyx about 3-4 mm long, corolla pink, red or purple, flag 7-9 mm, 5-6 mm wide, slightly arched at apex, narrowed at the base in a wide short nail, wings oblong, about 7-8 mm 2 mm wide, at the apex ovate, slightly curved, at the base with a broad eyelid, the nail 2 mm long, the boat about 8-9 mm, its plate along the lower margin arcately curved, from above obliquely cut, at the end obtuse, slightly narrowed, at the base with a broad ankle, nails 3 mm long; ovary linear, with a short column, glabrous; beans are clear, naked, 4-7 seeds, curved or straight; seeds are small, smooth, kidney-shaped. Blossoms V-VI, fructifies VIII (Fig.2).

It grows in desert clayey steppes, solonetsous depressions and on the outskirts of hummocky sands, less often as a weed on irrigated lands.

Economic importance. Fodder, melliferous, weed (Goloskokov 1956:633).

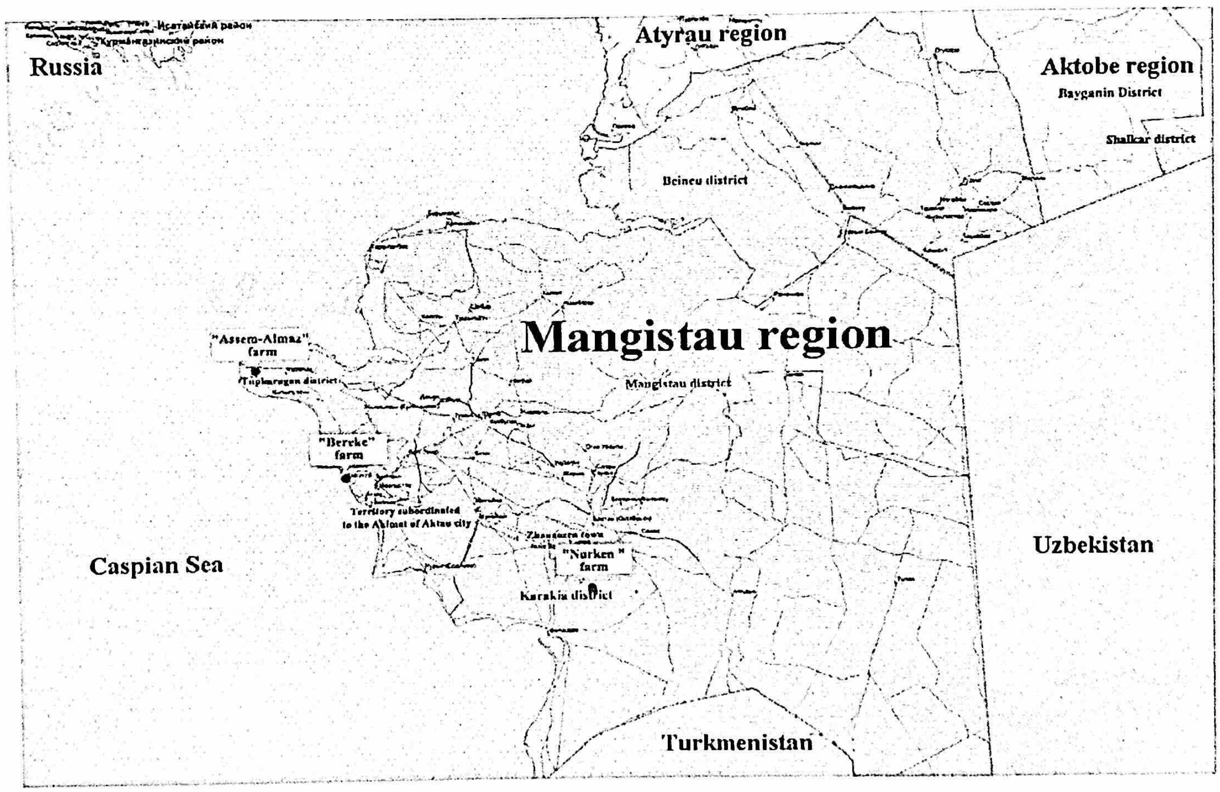

Figure 1 – Sampling points

Artemisia terrae-albae Krasch.- perennial. The whole plant is grayish from thick spider webs. The root is thick, woody, multi-headed; truncated, wooden, quite densely leaved barren shoots, together with numerous fertile stems form dense and wide turf; the resulting stems at the base are ascending or erect, 8-15 or (8) 15-30 cm high, thin, sinuous or thick, at the base of the tree, up to 45 cm high, branching at the top; leaves lower cauline, in shape ovoid, 1-2 cm long. and up to 1 cm wide, on both sides grayish-green from dense cobweb pubescence, simple or twice pinnatized; baskets broad or oblong ovate, 2-3 or 4 pinched, collected in a wide, loose panicle with lateral branchlets, 3-4-rowed, tessellate-convex, white-toothed from dense, cobweb hairs, external ovate, small, shorter than internal, inner oblong They are ovate, edged along the margin; flowers are bisexual, in number 3-5, corolla tubular, yellow or purple. Blooms VIII-X (Fig.3).

It grows in a desert zone. Occurs in all desert areas of Kazakhstan (Pavlov 1960:220-221).

Ceratocarpus arenarius L .- the plant is greyish or reddish from stellate hairs, the stem is 5-30 cm high, from the base densely branched, with strongly spaced, forked branched branches forming an almost spherical bush, the leaves are stiff, regular, at the base of the branches are opposite or 3 in the whorl , 1-4 cm long. and 0,5-2 mm wide, filiform, linear, less often lanceolate-linear, narrowed to the base, pointed at the apex, all-edged, with edges turned upside down, with 1 vein; perianth of anthers flowers back-oblong-ovate, with obtuse lobes and sparse, falling, stellate hairs, fruits together with fused bracts oblong-back-wedge-shaped. 5-7 mm long. and 2.5-4 mm wide .. laterally with longitudinal vein, at the top with 2. almost horizontally spaced, subulate horns. Fruits at the base of the stem short horny or almost hornless, densely hairy-hairy. Blossoms V-VII. (Fig.4).

Economic importance. Fodder for all types of livestock (Pavlov 1966:120-121).

In the «Bereke» farm in Aktau, a collection of plants was produced in a sagebrush –forb community. Excessive grazing led to a decrease in the projective coverage. On the territory of this community projective coverage is – 60%. Some fodder species are replaced by weeds (cocklebur – *Xanthium strumaruim*) and poisonous (brunz – *Sophóra alopecuroídes*, adraspan – *Peganum harmala*), which indicates a change in the grass stand. For analysis, the dominant *Artemisia terrae-albae* from the family *Asteraceae* and a species of fodder value – *Alhagi pseudalhagi.*

Recently, there has been a decline in the species composition of the natural vegetation cover, which is represented mainly by weed species: cocklebur (*Xanthium strumaruim*), adraspan (*Peganum harmala*), brunz (*Sophóra alopecuroídes*). These areas of severe disturbances in phytocoenosis are local and do not cover large areas.

In the «Asem-Almaz» farm in Fort-Shevchenko, the collection of plants and soils was also produced in a sagebrush-forb community. In addition to the dominant *Artemisia terrae-albae*, the forage plants *Alhagi pseudalhagi, Ceratocarpus arenarius* were collected for analysis.

In the first community, the dominant was collected as test objects for analysis, which is also a forage plant *Alhagi pseudalhagi* (MV) Desv. – from the family *Fabaceae* and the accompanying food plant – *Ceratocarpus arenarius* L. from the family *Chenopodiaceae*. In the second community the dominant – fodder plant *Artemisia terrae-albae* Krasch – is collected. from the family *Asteraceae*.

To determine the content of heavy metals in the samples of plants studied, the atomic absorption spectrometry method was used. The determination of heavy metals was carried out on an atomic absorption spectrometer «AAS 1N» (CarlZeiss, Germany) in tenfold repetition. Only the aboveground mass of plants (leaf, flower and stem) (Illin 2001:216, Slavin 1993:351, Wang 2017: 337-345.

Sampling of plants. The plants are selected, dig them out with a root, washed with running water, then distilled, and dried in a drying oven at a temperature of 105 ° C. Then the sample is ground, weighs 3 parallel samples of 1 gram each on analytical scales.

The course of analysis. Plant weights are placed in a heat-resistant beaker on a 100 – 150 ml. add 15 to 20 ml. concentrated perchloric acid and evaporated on a hot plate to wet salts. In case of not completely opening the sample, add 5-10 ml. concentrated perchloric acid, 2 – 3 ml. concentrated nitric acid and continue to evaporate to wet salts. The resulting mineral is brought to 15 ml. 5% solution of HCl (hydrochloric acid), washing this solution with a heat-resistant beaker and transfer it into a test tube. The concentration of heavy metals is determined in the solution obtained. The content of heavy metals in the samples is determined by a graduated graph based on standard solution (Vazhenin 1974:123-134).

Soil sampling. Point sampling is selected with a knife or spatula from the inflows or soil drill at a depth of 0-20 cm and 20-40 cm horizon in 5 multiple repetitions. The soils were then dried to an air-dry state at room temperature. Cleared it of various inclusions. The soil is ground in a mortar with a pestle and sieved through a sieve with a hole diameter of 1 mm.

To perform the analysis on an atomic absorption spectrometer, 1 gram of soil was weighed in 5 replicates on analytical scales. The weights were placed in heat-resistant cups, 15 ml of perchloric acid and 5 ml of nitric acid were added, heated to boiling, ensuring complete opening of the sample (Zhuravleva 1974:285).

Discussions and results

As a result of analysis of the species composition of plants, compiled on the basis of their own and published data, Safronova I.N. (1991, 1996), the State Plant Cadastre of the Mangistau region (2006), etc. (2014) (Aralbaj 2006a:44, Safronova 1991:55, Safronova 1996:221, Kosareva 1995:8, Aralbaj 2006b:301.) in the Mangistau region 676 species from 301 genera and 69 families were identified, with the dominance of the families *Chenopodiaceae* (smell, 13.5 % of the total number of species), *Asteraceae* (Compositae, 11.8%), *Brassicaceae* (Cruciferous, 9.5%), *Poaceae* (Cereals, 8.5%) and *Fabaceac* (Legumes, 7.5%). The largest genera include *Astragalus, Artemisia* and *Salsola*.

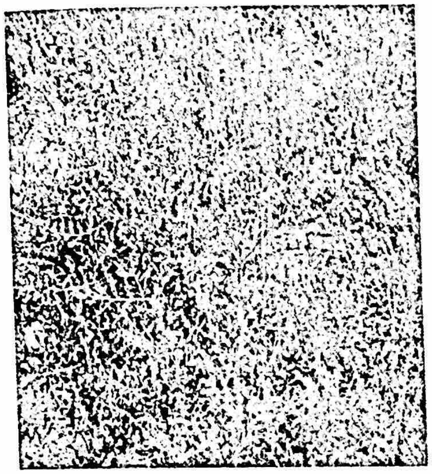

Figure 2 – *Alhagi pseudalhagi*

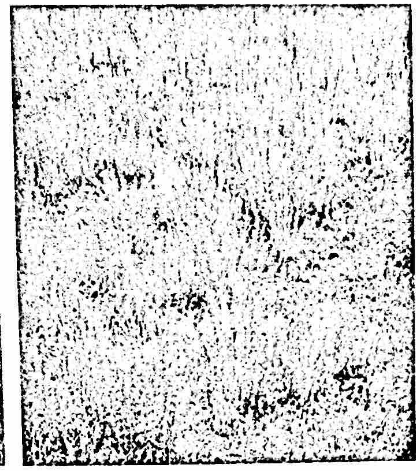

Figure 3 – *Artemisia terrae-albae*

Figure 4 – *Ceratocarpus arenarius*

Samples of soils for the determination of heavy metals were taken from the studied territories in the investigated points. The results of soil samples obtained are shown in Table 1.

Table 1 shows that in soil samples taken from the territory of the Bereke farm in Aktau, the cadmium content (0.96 MPC), manganese (0.65 MPC), nickel (0.05 MPC), copper (0, 08 MPC) and lead (0.53 MPC) is within the permissible limits. However, there was a slight excess of MPC for some chemical elements, such as zinc (1.46 MPC) and cobalt (1.09 MPC).

In samples of soils selected from territory of the Asem-Almaz farm in Fort-Shevchenko, the content of heavy metals such as cadmium (0.64 MPC, manganese (0.92 MPC), nickel (0.06 MPC), copper (0.12 MPC) and lead (0.67 MPC) is within the permissible limits, but exceeds the permissible level of zinc (1.72 MPC) and cobalt (1.55 MPC).

Samples of soils were selected from the territory of the Nurken farm in Zhanaozen, in which the lead content (0.62 MPC), copper (0.11 MPC), nickel (0.06 MPC) and manganese (0.63 MPC) were also sampled was within the acceptable limits. But the concentration of some of the elements under study has exceeded the MPC in insignificant limits: cadmium (1.44 MPC), zinc (1.6 MPC), cobalt (1.27 MPC).

Table 1 – Average content of heavy metals in soil samples of the studied points

Points of collection	Controlled substances, mcg / kg						
	Mn	Co	Ni	Cu	Zn	Cd	Pb
Farm.Bereke,Aktau city	455,20±22,00	5,33±0,60	4,19±1,20	2,64±0,33	34,59±3,70	0,50±0,01	16,69±1,04
Farm. Asem-Almaz, Fort-Shevchenko city	650,00±36,00	7,69±0,73	5,59±1,29	3,89±0,63	40,20±4,90	0,29±0,25	15,39±1,87
Farm. Nurken, town of Zhanaozen	439,00±24,00	6,40±0,58	5,59±1,45	3,76±0,29	37,19±5,20	0,73±0,04	20,11±2,14

Thus, the content of heavy metals in soil samples is within the permissible level in all studied points. But in general, there is an insignificant excess of the permissible concentration level in the range from 1.09 – to 1.72 MPC for metals such as zinc, cobalt.

Studies were carried out to determine the content of heavy metals in samples of plants selected in 3 locations: Aktau, Bereke farm, Fort-Shevchenko, Asem-Almaz farm, Zhanaozen, Nurken farm).

The results of the Bereke farm study are presented in Table 2. Based on the obtained data, it is evident that in all studied dominant plants the content of Co, Cd, Ni, Cu, and Mn is within the maximum permissible concentrations (excluding *Artemisia terrae-albae*).

The content of most heavy metals in all samples of dominant terrestrial plants is within the permissible values: cadmium 0.28-0.68 MPC, copper 0.29-0.65 MPC, nickel 0.13-0.49 MPC except *Artemisia terrae-albae* – 1.06 MPC), cobalt – 0.14-0.37 MPC, manganese – 0.28-0.93 MPC (excluding *Artemisia terrae-albae* – 1.06 MPC). But at the same time, heavy metals such as lead and zinc exceed the permissible level in all studied plant samples: lead – 1.12 – 1.71 MPC and zinc – 1.02 – 1.33 MPC. It should be noted that in the study area, in these environmental conditions, *Artemisia terrae-albae* accumulates the largest amount of Pb, Mn, Ni, Co, compared with other dominant plants, *Ceratocarpus arenarius* – cadmium and copper, *Alhagi pseudalhagi- zinc*.

In all samples of the dominant terrestrial plants of the Nurken farm in Zhanaozen, the content of heavy metals is contained in permissible concentrations of MPC: Cd is in the range 0.24-0.52 MPC, Cu 0.24-0.99 MPC, Ni-0, 13 – 0,67 MPC, Co – 0,07 – 0,23 MPC, Mn- 0,10 – 0,97 MPC. However, the content of Pb and Zn exceeded the permissible level of MPC and amounted to: Pb – 1.17 – 1.58 MPC, Zn- 0.9 – 1.12 MPC (Table 2).

On the basis of the results presented in Table 2, it can be seen that in the samples of dominant species collected from the territory of the Asem-Almaz farm in Fort-Shevchenko, the content of most of the heavy metals studied also does not exceed the MPC.

The cadmium content is in the range of 0.20-0.64 MPC, copper 0.19-0.71 MPC, nickel 0.13-0.42 MPC, cobalt 0.08-0.46 MPC, manganese – 0.28 – 0.81 MPC (excluding *Artemisia terrae-albae* – 1.46 MPC). But the lead content exceeds the maximum permissible concentration in all types of plants in the study area (1.17 – 1.87 MPC). The zinc content exceeds the MPC in the samples of plants *Alhagi pseudalhagi* (1.26 MPC), *Artemisia terrae-albae* (1.56 MPC).

Compared with other dominant plants under these environmental conditions, *Artemisia terrae-albae* accumulates more lead, cadmium, zinc, copper, nickel, manganese, *Alhagi pseudalhagi*-nickel, cobalt.

Thus, based on the results of the analysis, it was found that the content of most heavy metals in plants in the investigated areas is within the permissible concentrations (MPC).

On the territory of the Bereke farm, the greatest amount of Pb, Ni is found in the plants *Artemisia terrae-albae* (6.86 mg / kg and 90.20 mg / kg, respectively), Zn-*Alhagi pseudalhagi* (66.40 mg / kg). (table 2).

The highest content of heavy metals Zn and Mn on the territory of the Asem-Almaz farm is observed in *Artemisia terrae-albae* (78.0 mg / kg and 365.2 mg / kg) (Table 2).

The greatest amount of Zn is determined in the plant *Artemisia terrae-albae* (6.32 mg / kg) of the Nurken farm (Table 2).

Due to the fact that unfavorable natural and climatic conditions are characteristic for the study area, the vegetation cover of the studied region is characterized by weak resistance to anthropogenic influences. One of the most common problems of terrestrial ecosystems used as pastures is overgrazing, which most often leads to degradation of the vegetation cover, the appearance of weed species. Small, local areas of severe disturbances in phytocenoses, as in other researchers (Dimeeva 2012:10-15, Prasad 1999b:414, Bhargava 2012:103-120, Priscila 2005:481-494), were observed around villages, wells and construction sites.

Anthropogenic pressure in the Mangistau region now has a direct impact on plant, animal and soil cover, as well as water resources. The main reasons for the accumulation of heavy metals in the region under investigation are anthropogenic pollution of water by sewage, air emissions from industrial plants and transboundary transport of toxicants by water. As a result of numerous studies on various biological objects (from microorganisms to mammals), mutagenic and carcinogenic properties of heavy metals have been identified. Various heavy metals in living organisms act as accumulative poisons. For these conditions, it is necessary to develop monitoring and forecasting the situation in order to further improve it.

Based on the research results that were launched in 2016, the following conclusions can be drawn: the first time a collection of dominant and fodder species (*Ceratocarpus arenarius, Alhagi pseudalhagi, Artemisia terrae-albae*) was conducted at three monitoring points (farms: Bereke, Asem-Almaz , «Nurken») of Mangistau region as test objects for analysis of heavy metals content. As a result of the work carried out, it was revealed that the content of such heavy metals as Pb, Cd, Zn, Cu, Ni, Co and Mn in plants is within the maximum permissible concentrations (MPCs) or insignificantly exceeds the permissible level in plants. Among the studied plants, *Artemisia terrae -albae* contains the largest amount of lead, zinc, nickel and manganese, which is due to the predominance of these elements in the soil, compared to other sites, and also indicates its higher accumulative capacity compared to the other and the studied plants. The lowest content of heavy metals was observed in the fodder form of *Ceratocarpus arenarius*.

Table 2 – Average content of heavy metals in plant samples taken from the territory of farms «Bereke», «Asem-Almaz», «Nurken»

Types of plants	Controlled substances, mcg /kg						
	Mn	Co	Ni	Cu	Zn	Cd	Pb
farm. Bereke, city Aktau							
Ceratocarpus arenarius	228,2±15	0,1±0,03	41,79±4,90	6,49±0,56	60,01±6,18	0,35±0,03	4,50±0,87
Alhagi pseudalhagi	120,3±7,3	1,40±0,07	14,98±1,91	3,04±0,27	67,36±6,98	0,19±0,98	5,60±1,28
Artemeisia terrae-alba	291,7±20	1,79±0,16	89,31±14,28	5,97±0,68	52,18±5,00	0,19±0,04	6,90±1,22
farm. Asem-Almaz, city Fort-Shevchenko							
Ceratocarpus arenarius	198,9±18,6	1,65±0,97	14,97±1,93	3,64±0,27	50,01±5,28	0,33 ±0,10	4,96±0,20
Alhagi pseudalhagi	190,1±17,0	2,26 ±0,20	40,08±2,54	3,01±0,53	64,19±5,96	0,30±0,01	6,86±2,76
Artemisia terrae-albae	370,1±18	0,70±0,12	31,94±3,01	7,20±0,71	77,99±10,01	0,33±0,02	6,94±0,68
farm. Nurken, town of Zhanaozen							
Ceratocarpus arenarius	131±8,2	0,51±0,10	21,02±2,02	4,11±0,40	45,12±4,34	0,33±0,01	5,63±1,34
Alhagi pseudalhagi	27,4±0,98	0,29±1,82	16,95±2,30	2,50±0,40	55,37±6,00	0,09±0,20	6,20±0,65
Artemisia terrae-albae	240±13	1,01±0,01	21,03±1,87	10,04±0,71	51,01±5,98	0,30±0,10	6,28±1,25

The main danger of heavy metals is not direct exposure and obvious poisoning, but that they have the ability to gradually concentrate in plants, animal and human organisms. Not all heavy metals have toxicity, because this group includes Cu, Zn, Co, Mn, Fe, that is, microelements (Weinert 1998:348, Thakur 2016:124-128, Memon 2001:44–48, Prasad 1999a:51-72.).

Thus, at present, due to the intensive growth and development of industry, transport, industrialization and chemicalization of agriculture, the acceleration of scientific and technical progress is substantially increasing and continues to increase the flow of heavy metals into the environment. Pollution of objects in the living environment, as well as animal and vegetable feedstocks, salts, heavy metals, taking into account their high toxicity, the ability to accumulate in the human body, have a negative impact even in small concentrations, can have a number of serious negative consequences for human health, called environmentally-related diseases. This indicates the need for further research in the area and environmental monitoring of heavy metals in the soil.

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