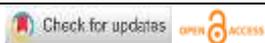


## The Impact of Certain Chemical Elements In Soils on Human Health In The Example of Urgut District

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DOI : <https://doi.org/10.61796/jgrpd.v2i2.1284>



### Sections Info

#### Article history:

Submitted: January 18, 2025  
Final Revised: January 30, 2025  
Accepted: February 10, 2025  
Published: February 28, 2025

#### Keywords:

Radioactive elements  
Chemical composition of soil  
Human health  
Environment  
Chemical elements

### ABSTRACT

**Objective:** This study aims to analyze the presence and concentration of specific radioactive and chemical elements in the soils of the Urgut district and assess their potential impact on human health. **Method:** A field and laboratory approach was employed, involving soil sample collection from key locations followed by spectral analysis, mass spectrometry, and X-ray fluorescence to determine the levels of dysprosium, erbium, neodymium, and strontium. **Results:** The findings reveal that concentrations of these elements vary across different geographical areas, with strontium showing particularly high levels in certain regions, potentially posing health risks through soil exposure and food chain contamination. Dysprosium and erbium were found at relatively uniform but concerning levels across foothill and plain areas. **Novelty:** This research contributes a novel perspective by linking geochemical soil characteristics directly with public health implications in a specific and underexplored region, offering critical insights for regional ecological assessments and the development of localized health safety interventions.

## INTRODUCTION

Several scientists have conducted scientific research on the geographical study of mountainous regions. In this regard, the works of natural geographers of Uzbekistan, such as AAAbulqosimov, LAAlibekov, LN Babushkin, BABakhritdinov, Kh.Vakhobov, P.Gulomov, NDDolimov, Sh.S.Zokirov, M.Qoriev, NAKogay, N.Korzhenevsky, M.Mamatkulov, AMNigmatov, S.Nishonov, O.Yu.Poslavskaya, AARafikov, and others, are of particular importance [1].

Of Urgut district, which is considered the object of research, consists of mountainous, foothill and plain areas. The famous economic geographer T. Jumayev divided the mountainous districts into groups This district is called a high-mountain district [1, 2]. This is because the district is located on the slopes of the Chakilikalon and Koratepa mountains, which are a continuation of the Zarafshan mountain ranges, at an average altitude of 1000 m. The eastern, southern and western parts are low-altitude plains is located, and there are several valleys. The mountain slopes consist of shale and limestone rocks. The hills are composed of porous and loose sedimentary rocks. The valleys of the streams in the hills are wide [3]. There are caves (Kiev tri, etc.) in places formed from limestone rocks. Chaqilkalon, Koratepa belong to the class of medium-altitude mountains. These mountains were formed during the Hercynian fold, and although their heights differ from each other, they are similar to each other in terms of

geological history [4]. The geological structure of the mountains is dominated by shales, in this respect these mountains differ somewhat from the Koratepa Mountains. The absolute height of the mountain ranges ranges from 2350 m, sometimes up to 2590 m, only in the western part of the mountain range the watershed line drops to 1700 m. [5]. The district includes the Chakilkalon-Qoratepa mountains and their hilly, foothill plain and flat landscapes. The relief of the region is strongly dissected, the foothill areas are undulating, strongly dissected by dry and constantly flowing streams, the slope of the land surface is 1-5°, and the slope on the flats is 1-12°. The altitude of the region above sea level is 700-1000 m. The soil is mainly dark and typical gray soil [6].

## RESEARCH METHOD

A comprehensive approach involving both field and laboratory methods was used to determine the concentration of radioactive elements in the soil of Urgut district. Initially, soil samples were collected from six key locations—Jartepa (Chobot), Saygus, Qorabuloq, Omonquton, Beshkapa, and Muminobod—based on the district's natural-geographical zoning (mountain, foothill, and plain areas). At each location, samples were taken from the soil layer at a depth of 20–25 cm using standard procedures.

The collected samples were analyzed at the Analytical Laboratory of the Samarkand Regional Geology State Enterprise. To determine the concentration of radioactive elements, spectral analysis, mass spectrometry, and X-ray fluorescence analysis methods were employed. Based on the analysis results, the quantities of elements identified in each area—Dy (dysprosium), Er (erbium), Nd (neodymium), and Sr (strontium)—were calculated and expressed in percentages and mg/kg.

As part of the methodological approach, international scientific studies previously conducted on the effects of radioactive elements found in soil on human health [7, 8, 9, 10] were reviewed. In this study, observation, statistical comparison, and geochemical characterization methods were employed as the main research tools. The soils of the Urgut district are mainly located in the foothills and mountain ranges, and their composition and fertility depend on natural and geographical conditions. The territory of the district consists of mountains, valleys and plains, and the soil zonation corresponds to this. Soil pollution with heavy metals is caused by various metals, in particular Cu, Ni, Cd, Zn, Cr, Pb [6]. Radioactive elements have toxic effects on soil biota by interfering with basic biological processes and reducing the number and activity of soil microorganisms [11, 12].

## RESULTS AND DISCUSSION

During the study, the following results were observed when analyzing the soils of the Urgut district (Table 1).

**Table 1.** Radioactive elements detected in the soils of the Urgut district, results (composition) %

Radioactive elements	Jartepa (Chobot)	Saygus	Karabulak	Omonquton	Beshkapa	Muminabad
Dy*	0.0003	0.0002	0.0003	0.0002	0.0003	0.0003
Husband*	0.0002	0.0001	0.0002	0.0001	0.0002	0.0002
Nd*	0.0021	0.0015	0.0017	0.0015	0.0022	0.0018
Sr.	0.0154	0.0235	0.0157	0.0123	0.0141	0.0201

**Note:** The table was compiled by the author based on the analyzes of the Analytical Laboratory Complex of the Samarkand Regional Geology Department (2024).

During the study, radioactive minerals were detected in soil samples. Among them, dysprosium is one of the most abundant lanthanide elements in nature, twice as abundant as tin. We know that dysprosium is never found as a free element, but it is present in many minerals. It should also be noted that dysprosium has no biological role. Soluble dysprosium salts are mildly toxic when ingested, while insoluble salts are nontoxic. Toxicity tests in mice have shown that doses of 500 grams or more are required to endanger human life [13, 14, 15]. The table above shows that in the soils of the studied areas, this radioactive element was homogeneous in the foothills and plains of Jartepa, Karabulak, Beshkapa and Muminabad, i.e., 0.0003% of the soil, or 0.03 mg/kg. In the mountainous areas, in Saigus and Amonkutan, this indicator was lower, 0.0002%, or 0.02 mg/kg [1].

Another element to be identified is the element strontium. During the research, it was found that radioactive strontium almost always has a negative effect on the human body. Accumulating in the bones, it irradiates bone tissue and bone marrow, which increases the risk of malignant bone tumors, and when ingested in large quantities, it can cause radiation sickness. As can be seen from the table above, the highest concentration of strontium was found in Saigus. It amounted to 0.0235% of the soil of the region or 0.2 g / kg. In Muminabad it was 0.0201%, in the vicinity of Jartepa, Karabulak, Beshkapa 0.0154%. The least detected area was in Omonkutan, in the soil of the region it was 0.0123%.

## CONCLUSION

**Fundamental Finding :** This study confirmed that the soils of the Urgut district contain measurable concentrations of radioactive elements, notably dysprosium, erbium, neodymium, and strontium, which pose potential health risks to the local population through environmental and agricultural pathways. **Implication :** The results highlight the urgent need for environmental monitoring programs and public health initiatives that address soil contamination and food safety in the region. **Limitation :** The study was

limited to elemental concentration analysis without conducting a full toxicological assessment on agricultural products or a direct epidemiological study on affected populations, which constrains the ability to draw causal links between soil contamination and health outcomes. **Future Research** : Further studies should integrate comprehensive soil-plant-human transfer models, involve broader geographic sampling, and incorporate biological testing to strengthen the understanding of the environmental and health implications of soil-borne radioactive elements in Urgut and similar districts.

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