

Calculation of the Concentration of Uranium Absorption for both Roots, Stems and Leaves of the Alkalbutus Plant using Fluorometry Technique

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Abstract

The research aims at measuring and calculating the low concentrations of uranium in plants samples of the roots, stems and leaves of the Alkalbutus trees in sites contaminated with uranium samples in Al-Tuwaitha site . It was prepared out of standard solutions of these samples after incineration to conduct measurement using fluorometry device . The result indicates that the uranium concentrations in the roots absorption was higher than the concentrations in the plant stems and this in turn higher than in the leaves.

Key words: *uranium , fluorometry device , uranium in plant.*

Introduction

Uranium occupies second place after plutonium in the elements that atomic mass, which is found in nature and has the highest lead density of about 19%, but slightly less than gold. Uranium naturally exists in soil, rock and water at low concentrations of a little parts per million . The commercial extraction from container minerals such as Aluraninte [1]. Uranium 235 is the only fissile counterpart to be found in nature (it can be induced to fission by low- energy heat neutrons, making it able to ensure continuity of the nuclear chain). Uranium 238 is fissionable by fast neutrons, which means that it can be converted to 239 fissionable plutonium in nuclear reactors. Another fissile counterpart, uranium 233 , can be produced from natural thorium, which is also important in nuclear technology. That is what generates heat in nuclear power reactors, and also produces fissile material for nuclear weapons. Uranium (U^{238}) is used in the manufacture of rocket - propelled grenades and in shielding vehicles (covered with armored plates) [2]. Uranium is also transported from the plants to the human body. The amount of uranium transported from humans by drinking water is neglected compared to other sources. Its

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concentration in fresh water ranges from 0.01 to 100 ppb. It follows the nature of the water - touching rocks and their uranium content. Uranium in sea water is equal to 3.3 ppb [3].

Normally, the amount of uranium in the air is very small, but people living near facilities that manufacture or test nuclear weapons or near facilities that either process or process uranium metals or enrich them for reactor fuel and others can be exposed to increase doses of uranium and its daughters as well as The existing homes and structures are located above uranium sites (either natural or man-made as remnants of industry) [4].

One of the pathways neglected in radionuclides risk assessments, which has subsequently been shown to be important in many cases, is the food chain pathway. After Chernobyl accident, all pathways are being investigated, the ingestion pathway to men must be included therefore, the chemical characteristics of the radioactive material become important. Initially, following an atmospheric release to the environment, various radionuclides will be deposited onto plants by wet or dry deposition depending on meteorological conditions, and the point of deposition will depend on a number of factors, including wind speed and radioactive half life. At the point of deposition the chemical form of a particular radionuclide could be very different from that at the time of release, but the processes involved in uptake of the radionuclide into the crop and hence the subsequent ingestion by man will involve foliar absorption, root uptake, resuspension and translocation, all dependent on the chemical properties of the particular radionuclide [5].

Fluorine is a kind of absorption of atomic energy, which leads to the effects of electrons from the stable state to the excited state then lose its energy by sending a photon back to the stable state characterized by heavy elements The group of Alktnat Serious Actinides that each element has its own fluoridation energy, The excited minutes can lose their acquired energy by emitting a photon of the same energy, the absorption caused by this reaction is called resonance fluorescence (Resonance Fluorescence), which is the basis of the technique of atomic fluorescence. The molecule can return to a steady state with non-radiant relaxation and the energy of the absorbed radiation becomes heat or the molecule returns directly from S_1 to S_0 . This is called normal fluorescence, which is less than the absorbed radiation frequency. The normal fluorescence emission is within a short period up to 10^{-10} seconds [6,7].

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The Aim of research as a result of calculating the concentration of uranium transmission for plant from the soil containing the uranium. Calculate the absorption ratio for each part of the plant (root, stalk, leaves).

Materials and Methods of Work

Devices and Chemicals

- ١ - Fluorometric device to measure the concentration of uranium type Algade.
- ٢- Binder drying oven type Binder USA
- ٣ - Fusion Furnace type Muffle Furnace / Fin Tech Model SEF-٣٠١ with a temperature of ١٠٠٠ °C
٤. Grinding machine for grinding of samples.
٥. Large eyelid for incineration.
٦. Nitric acid of ٦٩% of Himeda production.
٧. perchloric acid. of Himeda production

Preparation and creation of samples

The samples of contaminated plants were taken from the Fuel Fabrication Facility site. Eucalyptus roots, Leaves and stalks were taken. It is an evergreen plant. It is found in al-Tuwaitha site. The samples are washed with distilled water to get rid of the suspended soil. The samples are then placed in a ٦٠ °C drying oven for about three days to be prepared for grinding.

The samples by an electric grinding and then took ٦ grams of the weight of the ground sample and put it into the smelting eyelid for incineration and put it in the melting furnace. Samples are gradually incinerated as follows:[^٨]

٢٥ - ٢٠٠ °C rate of rise of four degrees per minute and set at ٢٠٠ °C for five hours. Then from . ٢٠٠-٦٠٠ °C gradual rise within two hours, and then keep the model at ٦٠٠ °C for five hours.

Preparation of the Samples for the purpose of measurement using fluorometry technique

It weighs ١ gm of the incinerator and is placed in a ١٠٠ ml beaker Then add ٣٠ ml of the nitro- perchloric mixture and then cover with a watch glass. It is heated to boiling point for two hours, raising a watch glass and evaporating the solution to dryness and then cooling and adding ١٥-١٠ ml of non-ionic water to dissolve the formed salt After dry form (soluble nitrate salt) [^٩].

The mixture is filtered and washed with hot nitric acid at a concentration of ٥%. It is then filtered and transferred to a ٥٠ ml bottle of volume dilution.

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The concentration of uranium in liquid Samples is calculated by using the following code [١٠].

$$U_{ppm} = E * K * (A-B) / (D-A)$$

E = concentration of the standard solution in ppm

A = The read of sample

K = dilution factor

B = The plank reading

D = The reading of sample + the read standard solution

The dilution factor K was ٥٠ times

Results and discussion

Three samples were taken from the site of the Italian fuel reactor (Fuel Fabrication Facility) The first sample is the leaves of the Eucalyptus and the second sample is the stalk of the Eucalyptus . the third sample is the roots of the Eucalyptus and was examined with a fluorometric device after washing, drying and incineration and then converted to the case Liquid to be examined and calculate the concentration of uranium according to the equation.

$$U_{ppm} = \frac{1}{5} \times K \times \frac{(A-B)}{(D-A)}$$

$$U_{ppm} = 1 \times ٥٠ \times \frac{(١٢٨-٨٧,٣)}{(١٤٩٤-١٢٨)}$$

$U_{ppm} = ١,٤٨٩ ppm$ Concentration of uranium in the leaves of Eucalyptus

$$U_{ppm} = 1 \times ٥٠ \times \frac{(٧٧٤,٥ - ١٥٠,٦)}{(٤٠٦٤ - ٧٧٤,٥)}$$

$U_{ppm} = ٩,٤٨٣ ppm$ Concentration of uranium in the roots of Eucalyptus

$$U_{ppm} = 1 \times ٥٠ \times \frac{(١٦٩,٥-٨٧,٣)}{(١٥٥٣-١٦٩,٥)}$$

$U_{ppm} = ٢,٩٧٠ ppm$ Concentration of uranium in the stalks of Eucalyptus plant

Note that the concentration of uranium in the roots of the plant was higher than in the stalks so that the transfer of uranium through the soil solution by the ion exchange process with the root solution is transferred from the soil solution to the root solution, concentrating the most in root part when in the leaves of the Eucalyptus plant were less concentrated than the roots because of the high weight of uranium. In the leaves of the Eucalyptus, the concentrations were lower than in the stalks and roots. The

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transfer of uranium to the plant depends on several factors, depending on the type of plant and soil type, and also varies from plant to plant[١١].

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Refferance

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حساب تركيز امتصاص اليورانيوم لكل من جذور وسيقان وأوراق نبات الكالبتوس باستخدام تقنية الفلورومتري

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مديرية المختبرات المركزية / وزارة العلوم والتكنولوجيا

الخلاصة

يهدف البحث قياس وحساب تراكيز اليورانيوم الواطئة في عينات النباتات المتمثلة بجذور وسيقان واوراق اشجار الكالبتوس الموجودة في المواقع الملوثة باليورانيوم في منطقة التويثة، حيث تم تحضير محاليل قياسية من هذه النماذج بعد الترميد لاجراء القياس لها باستخدام جهاز الفلورومتري، حيث كانت النتائج تشير الى تراكيز اليورانيوم نتيجة امتصاصه من قبل الجذور كانت اعلى من تركيزه في سيقان النبات وهذا بدوره اعلى مما في الاوراق. الكلمات المفتاحية : اليورانيوم , الفلورومتري , اليورانيوم في النبات .