Natural Radioactivity Concentration in Traditional Thai Herbal Medicine

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Abstract

The aim of this study is to create a database of radioactivity concentration and annual effective dose of the naturally occurring radionuclides: 226Ra, 232Th, 210Po in Thai medicinal herb plants. 99 types of popular Thai medicinal herb plants (total of 212 samples) such as Curcuma comosa Roxb., mucuna, white kwasu krua, brabed grass, black galingale, lingzhi mushroom, Ginkgo biloba, Jiaogulan, plu kawo, turmeric, ginger, safflower, moringa, getu kaws and garlic were randomly collected from drug stores and herbal fair. The activity concentration of 226Ra, 232Th and 210Po in all herb samples was determined by gamma-ray spectrometry while that of 210Po was determined by alpha spectrometry. The activity concentration was found to range from <0.20 to 40.93 Bq kg⁻¹ for 226Ra, from <0.10 to 39.62 Bq kg⁻¹ for 232Th and from 4.83 to 2761.33 Bq kg⁻¹ for 210Po. The highest activity concentration of 226Ra, 232Th and 210Po were found in the white kwasu krua, Jiaogulan, plu kawo and ginkgo, respectively. The average total annual effective dose due to ingestion of these herb plants was assessed to range from 0.0001 to 0.0327 mSv y⁻¹, with highest dose found in Jiaogulan.

Introduction

Herbal or medicinal plant products, in various forms, have been used to treat illnesses for many hundreds of years on all continents and within cultures across the world. It is estimated that about 25% of all modern medicines are derived directly or indirectly from medicinal herbs. Also, about 80% of the world population (especially in developing countries) uses herbal medicine plant as the primary source of health care [1]. Natural radionuclides are found in every constituent of the environment; air, water, soil, food and in humans. According to the International Food Safety Authorities Network [2] plants used as food commonly have ⁸⁷⁶Kr, ¹⁴⁸⁹Th and ¹³⁷Cs. According to the International Food Safety Authorities Network [2] plants used as food commonly have ⁸⁷⁶Kr, ¹⁴⁸⁹Th and ¹³⁷Cs. They are the primary pathway of natural radionuclides entering into the human body through the food chain. The assessment of radioactive contamination of medicinal plants not only contributes to determining the quality of the plant material, but it also provides useful information on the safety level of their consumption by humans.

Results & Discussion

The results of activity concentrations of ²²⁶Ra, ²³²Th ⁴⁰K and ²¹⁰Po found in the medicinal plant samples are shown in Figure 1 and Table 1.

![Figure 1. Activity concentrations of ²²⁶Ra ²³²Th ⁴⁰K and ²¹⁰Po in the medicinal plant samples](image1)

Table 1. Comparison of the activity concentration of ²²⁶Ra, ²³²Th ⁴⁰K and ²¹⁰Po in the medicinal plants from this study with those from other countries

<table>
<thead>
<tr>
<th>Country</th>
<th>Activity concentration (Bq kg⁻¹)</th>
<th>²²⁶Ra</th>
<th>²³²Th</th>
<th>⁴⁰K</th>
<th>²¹⁰Po</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thailand</td>
<td>average</td>
<td>1.1</td>
<td>0.8</td>
<td>0.6</td>
<td>0.1</td>
</tr>
<tr>
<td>China</td>
<td>range</td>
<td>0.1</td>
<td>0.8</td>
<td>0.6</td>
<td>0.1</td>
</tr>
<tr>
<td>Brazil</td>
<td>range</td>
<td>0.1</td>
<td>0.8</td>
<td>0.6</td>
<td>0.1</td>
</tr>
<tr>
<td>Italy</td>
<td>range</td>
<td>0.1</td>
<td>0.8</td>
<td>0.6</td>
<td>0.1</td>
</tr>
<tr>
<td>Nigeria</td>
<td>range</td>
<td>0.1</td>
<td>0.8</td>
<td>0.6</td>
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<tr>
<td>Serbia</td>
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<tr>
<td>Malaysia</td>
<td>range</td>
<td>0.1</td>
<td>0.8</td>
<td>0.6</td>
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</tr>
</tbody>
</table>

The total of 214 Thai medicinal herb plants samples used extensively for treating various diseases or complementary medicine were collected from drugstores in Thailand. Most of them have license patented products from Food and Drug Administration Ministry of Public Health. The herb samples are white kwasu krua, curcuma barbed grass, mucuna, jiaogulan, turmeric, ginger, comosa Rosh, moringa, black galingale, safflower, gotu kola, ginkgo biloba, plu kawo, garlic, lingzhi mushroom. The method for sample preparation and measurement technique show in the diagram.

Materials & Methods

The aim of this study is to create a database of radioactivity concentration and annual effective dose of the naturally occurring radionuclides: ²²⁶Ra, ²³²Th, ²³⁴U in Thai medicinal herb plants. 99 types of popular Thai medicinal herb plants (total of 212 samples) such as Curcuma comosa Roshb., mucuna, white kwasu krua, brabed grass, black galingale, lingzhi mushroom, Ginkgo biloba, Jiaogulan, plu kawo, turmeric, ginger, safflower, moringa, getu kaws and garlic were randomly collected from drug stores and herbal fair. The activity concentration of ²²⁶Ra, ²³²Th and ²¹⁰Po in all herb samples was determined by gamma-ray spectrometry while that of ²¹⁰Po was determined by alpha spectrometry. The activity concentration was found to range from <0.20 to 40.93 Bq kg⁻¹ for ²²⁶Ra, from <0.10 to 39.62 Bq kg⁻¹ for ²³²Th and from 4.83 to 2761.33 Bq kg⁻¹ for ²¹⁰Po. The highest activity concentration of ²²⁶Ra, ²³²Th and ²¹⁰Po were found in the white kwasu krua, Jiaogulan, plu kawo and ginkgo, respectively. The average total annual effective dose due to ingestion of these herbal plants was assessed to range from 0.0001 to 0.0327 mSv y⁻¹, with highest dose found in Jiaogulan.

Conclusions

Most of corresponding annual average effective dose determined in this study due to the ingestion of natural radionuclides in Thai medicinal herb plants is far below the average radiation dose of 0.3 mSv received per person worldwide[4]. In this research result presents insignificant annual committed effective dose due to the use of those Thai medicinal herb plants into fast Medicine. Therefore, the radiological hazard associated with intake of the natural radionuclides in the medicinal plants is insignificant. Hence, the Thai medicinal herb plants samples from this research are considered safe in terms of the radiological hazard.

Acknowledgement

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References


Diagram shows Sample preparation and measurement technique

Figure 2. The variation of the average annual committed effective dose from natural radionuclides (²²⁶Ra, ²³²Th, ²³⁴U and ²¹⁰Po) in the Thai medicinal herb plants samples.