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NOTE

Determination of Rare Earth Elements in Lotus Seed from Rare Earth Mining Area by ICP-MS Simultaneously

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To investigate the effects of private dug rare earth elements without planning on environment and food safety from rare earth mining area, contents of rare earth elements in lotus seed from rare-earth mining area was detected by ICP-MS (inductively coupled plasma source mass spectrometry). The results showed that the content of rare earth elements in lotus seed was at a low level which was not higher than that from reference area, so we should overly concern about harm of rare earth in rare earth mining area.

Key Words: Rare earth elements, Lotus seeds, ICP-MS, Rare earth mining area.

Rare earth elements are important strategic resources for many industries, such as aviation industry, semiconductor industry. China is the first reserves and producing country of rare earth elements. In recent years, due to the increasing price private dug without planning becomes more and more serious, which will result in waste and environmental pollution of rare earth elements[1,2] and seriously threaten the health of local people because many researches proved that exposure to rare earth elements is harmful to human health, especially to young children.

Wu *et al.*[3] showed that leukemia be related to environmental pollution with rare earth elements around the residential areas. Yu *et al.*[4] reported that contents of rare earth elements in orange-growing soils around rare-earth mining area were obviously higher than those in soils far away rare-earth mining area. And large amount of rare earth elements in orange-growing soils were in oxidative and reducible states, which reached 61.6 and 31.9 % of total amount, respectively. Peng *et al.*[5] determined contents of five kinds of rare earth elements of the hair root samples collected from 71 young children aged 0-3 years and 62 of their mothers living in a rare earth mining area. The mean hair content of rare earth elements was the highest in the young children and their mother living in the place nearest to the rare earth element mining area, next was in those nearer to the rare earth element mining area and the lowest was in those in the control area. And the average hair level of five kinds of rare earth elements in the young children was two times high as their mothers'. The hair level of rare earth elements in young children and their mothers decreased with the increase of the distance from their home to rare earth mining area. Young children living in the area with rare earth elements mining may be the high exposure population and their hair level of rare earth elements was significantly higher than that in their mothers. Wang *et al.*[6] showed that the medians of the contents of 15 rare earth elements in the samples from the mining area were all significantly higher than those from the reference area. The distribution patterns of all samples had the characteristics of accumulation of low rare earth elements and deficit in high rare earth elements. The degree of low rare earth elements accumulation in samples from the mining area averaged 3 times higher than that from the reference area.

To investigate the effects of private dug rare earth elements without planning on environment and food safety from rare earth mining area, contents of rare earth elements in lotus seed from rare-earth mining area was detected by ICP-MS in this paper.

The soil and lotus seeds are obtained from south of Jiangxi province. The ICP-MS instrument was the PQ Excell instrument (PE-Sciex DRC, PE Company, USA).

The samples were prepared as reported method[7,8]. Instrument parameters to detect the content of rare earth lotus seed were as described in the literature[7,9,10].

The results showed that contents of rare earth elements La, Ce, Pr, Nd, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm and Yb in

lotus seeds range from 0.10 ng/g to 51.14 ng/g, which is not higher than that from reference area which was from 0.28 ng/g to 70.00 ng/g (Table-1).

TABLE 1
CONTENTS OF RARE EARTH ELEMENTS IN *Camellia oleifera* SEEDS FROM RARE EARTH MINING AREA

Elements	*Camellia oleifera* seeds from mining area	Amount (ng/g) [Ref. 7]
La	28.49	34.90
Ce	51.14	70.00
Pr	6.93	7.10
Nd	24.67	25.60
Sm	3.56	4.70
Eu	2.24	1.30
Gd	3.62	21.20
Tb	0.48	0.65
Dy	1.99	2.80
Ho	0.30	0.53
Er	0.90	1.37
Tm	0.10	0.28
Yb	0.72	4.70

Many researches proved that the rare earth elements are harmful to animal and human health[11] and previous studies proved that contents of rare earth elements in plants are relative to their contents in soil[11,12].

In this study, the lotus seeds were detected from rare earth elements mining area and the results showed that lotus seeds contained rare earth elements. However, the level of the rare earth is not higher than those found in non-mining area[11,13].

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REFERENCES

1. J.-Z. Cheng and L.-P. Che, *Chin. Rare Earths*, **31**, 65, 85 (2010)
2. C.L. Yuan, *Sichuan Rare Earth*, **1**, 6 (2009).
3. L. Wu, Y.P. Zhou and H.J. Zhong, *Chin. J. Epidemiol.*, **24**, 879 (2003).
4. J. Yu, Z.-Y. Huang and T. Chen, *Food Sci.*, **30**, 309 (2009).
5. Peng Ruiling, Pan Xiaochuan and Xie Qing, *Chin. J. Prev. Med.*, **37**, 20 (2003).
6. N.-F. Wang, X.Y. Wang, H. Liu and J.Y. Wang, *Modern Instruments*, **01**, 33 (2007).
7. Y.Q. Lu, L.W. Zhou, X.M. Li and H.X. Li, *Chem. Anal. Meterage*, **16**, 33 (2007).
8. M.-L. Li, L.S. Wang, X.L. Peng, G.-L. Yang, X.-W. Huang and Z.-Q. Long, *Metallurg. Anal.*, **30**, 47 (2010).
9. C.-Z. Jiao, Z.-L Wei, Z.H. Tian, G.Qi Qu and Y.-K. Rui, *Spectrosc. Spec. Anal.*, **28**, 1931 (2008).
10. Z. Hongxing, X. Fang and R. Yukui, *Asian J. Chem.*, **22**, 4777 (2010).
11. L. Miao, R.S. Xu, Y.L. Ma, Z.Y. Zhu, J. Wang, R. Cai and Y. Chen, *Ecol. Environ.*, **17**, 350 (2008).
12. N.Y. Zhang and G.P. Fan, *Stud. Trace Elem. Health*, **26**, 51 (2009).
13. D.J. Cai and Y.-K. Rui, *J. Verbrauch. Lebensmitt*., DOI 10.1007/s00003-010-0650-7.