Asian Journal of Chemistry; Vol. 25, No. 4 (2013), 2315-2316

ASIAN JOURNAL OF CHEMISTRY

http://dx.doi.org/10.14233/ajchem.2013.12855

NOTE

Determination of Beneficial Elements, Heavy Metals and Rare Earth Elements in Northeastern Rice Brand of China by ICP-MS

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(*Received*: 13 October 2011; *Accepted*: 26 October 2012) AJC-12338

Food safety and quality have become an important focus about food issues with continuous improvement of living standards in China. Ca, Mn, Fe, Zn, Cu, Cr, As, Se, Mo, Cd, La, Ce, Pr, Nd in rice from Lishu xounty of Jilin province were determined by inductively coupled plasma mass spectroscopy with microwave digestion. The results showed that the northeastern rice contains more beneficial elements and lower heavy metals, which showed that northeastern rice is more high-quality rice in terms of trace elements.

Key Words: Rice, ICP-MS, Trace elements.

Rice is one of the three major food crops, usually rice is divided into southern and northern rice in China. Northeastern rice is one of the famous brands in China, which mainly grown in northeast China has good taste and rich nutrition[1,2]. With continuous improvement of living standards in China, food safety and quality have become an important focus about food issues, especially the daily food including rice. Trace elements, as part of food safety and nutrition, naturally become the focus of our research.

There are several methods to study trace elements including spectrophotometry, atomic absorption and atomic fluorescence spectrometry, X-ray fluorescence spectrometry, plasma emission spectroscopy, ICP-MS *etc.*[3,4]. ICP-MS, as the latest method, has advantages of high sensitivity, high accuracy, low detection limit and multi-element determination. In this paper, beneficial elements Ca, Mn, Fe, Zn, Cu; heavy metals Cr, As, Se, Mo, Cd; rare earth La, Ce, Pr, Nd in rice from Lishu xounty of Jilin province were determined by inductively coupled plasma mass spectroscopy with microwave digestion.

Two cultivars Nongkedao 512 and Jigeng 88 were sampled at Xihe village of Lishu county, Jilin province, northeast of China. The method were referred to previous methods[5-7].

Contents of beneficial elements: The results showed that the Jigeng 88 cultivar contained 84.5 μg/g Ca, 50.90 μg/g Mn, 7.48 μg/g Fe, 15.06 μg/g Zn, 3.08 μg/g Cu respectively and Nongkedao 512 cultivar 85.87 μg/g Ca, 41.91 μg/g Mn, 7.63 μg/g Fe, 13.49 μg/g Zn, 2.66 μg/g Cu respectively, which are much higher than the national average[8], but there is no significant difference between both cultivars (Table-1).

TABLE-1
CONTENTS OF BENEFICIAL ELEMENTS IN NORTHEASTERN RICE (μg/g)

Elements	Jigeng 88	Nongkedao 512
Ca	84.5	85.87
Mn	50.90	41.91
Fe	7.48	7.63
Zn	15.06	13.49
Cu	3.08	2.66

Contents of heavy metals: Table-2 showed that the Cr, As, Se, Mo, Cd contents of Jigeng 88 cultivar and Nongkedao 512 are 5.35, 84.22, 55.50, 196.33, 121.93, 1.75 ng/g and 1.81, 119.79, 53.60, 380.03, 35.61, 8.59 ng/g respectively. Although there are much difference between both cultivars, contents of all heavy metals in both cultivars were lower than the China's and Janpanese's average values except Cd[8].

Contents of rare earth: Rare earth element content in soil is very little, so usually there are little in grain. In this study we determined four kinds of rare earth elements La, Ce, Pr, Nd, whose contents in Jigeng 88 and Nongkedao 512 are 0.24, 0.50, 0.05, 0.29 ng/g and 0.56, 1.34, 0.01, 0.30 ng/g

respectively (Table-3), which are all lower than previous research[9].

TABLE-2
CONTENTS OF HEAVY METALS IN NORTHEASTERN RICE (ng/g)

Elements	Jigeng 88	Nongkedao 512
Cr	5.35	1.81
As	84.22	119.79
Se	55.50	53.60
Mo	196.33	380.03
Cd	121.93	35.61
Pb	1.75	8.59

TABLE-3
CONTENTS OF RARE EARTH IN NORTHEASTERN RICE (ng/g)

Elements	Jigeng 88	Nongkedao 512
La	0.24	0.56
Ce	0.50	1.34
Pr	0.05	0.01
Nd	0.29	0.30

In summary, northeastern rice grown at Xihe village of Jilin province contains more beneficial elements and lower heavy metals, which showed that northeastern rice is more high-quality rice in terms of trace elements.

ACKNOWLEDGEMENTS

The research was supported by National "863" Program Grant (No. SS2012AA101006-05) from the Ministry of Science and Technology of the People's Republic of China and Technology Plan of Beijing Education Committee (KM201110020006).

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