



NOTE

Determination of Trace Elements and Rare Earth Elements in Gannan Navel Orange Fruit by ICP-MS

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Gannan navel orange is a famous brand in China, but mineral element content in Gannan navel orange is not systematically studied. In present work, eight trace elements in Gannan navel orange from Jiangxi province were determined by ICP-MS. The results showed that Navel orange fruits contained many kinds of mineral elements, especially Mn, Fe and B, which should be the causes that Gannan navel orange is delicious and has a good taste.

Key Words: Trace elements, Rare earth elements, Gannan navel orange (*Citrus science Osbeck*), ICP-MS.

Navel orange, belongs to the Rutaceae, citrus, orange species, is mainly distributed in United States, Brazil, Spain, Japan, Australia, Morocco, South Africa and China. Navel orange is also known as the Orange King, which has many advantages such as high quality, seedless, juicy and bright color, is widely cultivated in the world. Navel orange is beneficial to the human body, known as "Good fruit therapy", which can soften and protect the blood vessels, promote blood circulation, lower cholesterol and blood lipids¹.

South of Jiangxi province produce a large number of navel orange, known as the "navel orange home", where the navel orange products are sold all over the world, the navel orange from South of Jiangxi province are usually called "Gannan navel orange". Although the Gannan navel orange is delicious, mineral element content in Gannan navel orange is not systematically studied²⁻⁴.

ICP-MS is a good method to determine trace elements and rare earth elements, and have been applied to determine the content of elements of soil⁵, plant tissue⁶⁻⁸, animal meat⁹, edible oil¹⁰ and other food¹¹. In this paper, eight trace elements in Gannan navel orange from Jiangxi province were determined by ICP-MS with microwave digestion.

Sample preparation and instruments: The navel orange fruits were bought from supermarket. Weigh 0.5 g fruit grinded into 10 mL of 70 % nitric acid, digested with the microwave digestion instrument. After cooling, the supernatant was filtered for detecting.

Detecting methods: Test methods used the standard curve method. Diluting multi-element standard solution into concentrations of 0, 10, 20, 50, 100 and 200 $\mu\text{g L}^{-1}$ with 1 % HNO_3 as the standard series of working fluid to determine the contents of Mn, Fe, Mo, B, La, Dy, Eu and Pr.

Navel orange fruits contains many kinds of mineral elements, especially Mn (1250.84 ng/g), Fe (21721.84 ng/g) and B (3138.02 ng/g), but little Mo (5.80 ng/g). There are usually less rare earth elements in soil, so contents of La, Dy, Eu and Pr were much lower than the above elements Table-1.

TABLE-1
CONCENTRATIONS OF TRACE ELEMENTS
IN NAVEL ORANGE FRUITS (ng g^{-1} , n = 4)

Elements	Content	Elements	Content
Mn	1250.84	La	55.16
Fe	21721.84	Dy	2.00
Mo	5.80	Eu	2.34
B	3138.02	Pr	12.14

Gannan navel orange, as a famous brand, contains much Mn, Fe and B, which should be the causes why Gannan navel orange is delicious and has a good taste.

REFERENCES

- <http://baike.baidu.com/view/230961.htm>
- X.M. Guo, J.M. Wang, S.F. Min, Z.H. Zhang, L.C. Cui and B.L. Zhong, *Acta Agric. Boreali-occidental Sinica*, **20**, 127 (2011).
- <http://baike.baidu.com/view/341493.htm>

4. K.-J. Wang, X.-C. Wu, J.-L. Zhong and X.-Z. Luo, *Food Sci.*, **32**, 24 (2011).
5. Y.-K. Rui, X.-B. Kong and J. Qin, *Spectrosc. Spectral Anal.*, **27**, 1201 (2007).
6. Y.-K. Rui and G.Q. Qu, *Spectrosc. Spectral Anal.*, **29**, 819 (2009).
7. A.B. Yilmaz and L. Yilmaz, *Food Chem.*, 1664 (2007).
8. Y.-K. Rui, Y.-L. Hao and F.-S. Zhang, *Spectrosc. Spectral Anal.*, **27**, 2111 (2007).
9. V.F. Marijic and B. Raspor, *Toxicol. Lett.*, **168**, 292 (2007).
10. Y.K. Rui, H.X. Zhang, J. Guo, K.L. Huang, B.Z. Zhu and Y.B. Luo, *Agro Food Ind. Hi-Tech.*, **17**, 35 (2006).
11. Y.-K. Rui, F.-S. Zhang and J.-B. Shen, *Phyton-Int. J. Exp. Botany*, **78**, 101 (2009).