



NOTE

Determination of Nutritional Value and Safety of Selenium-Enriched Watermelon by ICP-MS

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Trace elements and heavy metals are important for human nutrition and food safety, the changes of trace elements and heavy metals contents in watermelon were determined after the application of selenium fertilizer by ICP-MS. The results showed that selenium content in watermelon increased significantly after spraying selenium-enriched foliage fertilizer, which reached the requirement of selenium-enriched products; especially contents of Li, Mg, Sr, Mn, Mo increased significantly. Content of heavy metals Cu, As, Cd, Pb, Cr in watermelon decreased significantly after spraying selenium-enriched foliage fertilizer compared with control. So application of selenium fertilizer can improve the nutrition of beneficial trace elements and the edible safety of watermelon in heavy metals.

Keywords: Watermelon, Selenium, Trace elements, Heavy metals, ICP-MS.

Selenium, one of the trace elements in the human body and animal is closely related to human health. Selenium can improve the immune function of the human body, plays an important role in cancer prevention, anticancer, lifting of heavy metal poisoning. The 72 % areas of China belong to selenium deficiency area, low soil selenium content results in low selenium content of agricultural products, which affect human health¹.

Because most of the land in China belongs to the selenium deficiency area, so the application of selenium-enriched fertilizer to produce food selenium-enriched has important significance to guarantee people's health. Previous studies only focused on the selenium content of selenium-enriched agricultural products after application of selenium fertilizer², while ignoring the other nutrients and harmful ingredients changes. This paper studies the change of trace elements and heavy metals in watermelon after the application of selenium fertilizer, which will provide more basis for agricultural health functional food (selenium-enriched food).

Previous studies have generally determined the content of trace elements in the watermelon per dry weight³, but the watermelon are eaten fresh, so the dry weight content has no reference value for people. This paper is to solve this problem, the determination of the content of trace elements content are fresh weight of watermelon.

Watermelon were collected from Panggezhuang town of Daxing district the selenium-riched watermelon were sprayed selenium fertilizer at seedling, flowering period and three weeks before picking period respectively the control were sprayed water. All content refers to content per gram fresh weight and both treatments were detected four repetitions.

Samples was incised, homogenated, determined after beating by ICP-MS.

The results showed that the descending order of macroelements and trace elements content in watermelon is K, Mg, Ca, Fe, Na, Zn, Mn, Sr, Mo, Li, Se, the first eight elements reached micrograms level per gram, last three elements were nanogram level per gram. Selenium content of watermelon increased obviously after spraying selenium-enriched foliage fertilizer, which reached the requirement of selenium-enriched products; especially contents of Li, Mg, Sr, Mn, Mo increased significantly, but other elements have no significant difference (Table-1). The effect of Ca and Mo are coincident, Fe and Sr are opposite with previous research on *Ganoderma lucidum*⁴.

The data showed that the watermelon contained little heavy metal, which proved that Panggezhuang watermelon is safe for heavy metal. Content of heavy metals Cu, As, Cd, Pb, Cr in watermelon decreased significantly after spraying selenium-enriched foliage fertilizer compared with control

(Table-2). This result is similar to the results of research on arsenic in rice after spraying selenium fertilizer⁵, but the Cu is opposite⁴.

TABLE-1
CHANGES OF CONTENT OF TRACE ELEMENTS IN
WATERMELON AFTER SPRAYING SELENIUM FERTILIZER

Elements	Control	Selenium-riched watermelon
Li	4.04 ng/g	15.84 ng/g
Na	2.07 µg/g	1.25 µg/g
Mg	161.87 µg/g	179.50 µg/g
K	2161.23 µg/g	1599.86
Ca	57.28 µg/g	50.06 µg/g
Fe	2.20 µg/g	2.24 µg/g
Zn	0.43 µg/g	0.35 µg/g
Sr	0.19 µg/g	0.26 µg/g
Mn	0.29 µg/g	0.48 µg/g
Se	0	11.66 ng/g
Mo	21.82 ng/g	29.15 ng/g

TABLE-2
CHANGES OF HEAVY METALS IN WATERMELON
AFTER SPRAYING SELENIUM FERTILIZER

Elements	Control	Selenium-riched watermelon
Cu	0.26 µg/g	0.21 µg/g
As	10.85 ng/g	4.08 ng/g
Cd	0.43 ng/g	0.32 ng/g
Pb	1.76 ng/g	1.60 ng/g
Cr	23.18 ng/g	14.45 ng/g

Conclusions

- Application of selenium fertilizer can improve the nutrition of beneficial trace elements in watermelon.
- Application of selenium fertilizer can improve the edible safety of watermelon in heavy metals.

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