



NOTE

Simultaneous Determining the Total Elements in Purple Pepper Fruit by ICP-MS

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Purple pepper (*Capsicum annuum L.*) is a rare pepper germplasm resources, but trace elements and heavy metals in the purple pepper was not reported. Five macroelements, six trace elements, four rare earth elements and eleven heavy metals were determined in purple pepper. The results showed that descending order of macroelements is $P > Ca > Mg > Na > Al$; three kinds of trace elements Fe, Zn and Mn were much higher than other three elements Mo, Li and Co; rare earth elements were very low in in fruits of purple pepper; only Cu (277.80 ng/g) and Ti (130.79 ng/g) were higher than 100 ng/g, all the heavy metals were meet to the National hygiene standards.

Keywords: Purple pepper, Trace elements, Heavy metals, Rare earth elements, ICP-MS.

Purple pepper (*Capsicum annuum L.*) is a rare pepper germplasm resources, the purple trait is caused by anthocyanins pigment in it¹. The current research about purple pepper were mostly focused on the tolerance to high temperature, drought resistance, disease resistance, anthocyanins quality breeding and fruit setting rate and major photosynthetic characteristics²⁻⁷. But other nutrients in the purple pepper was not reported, especially trace elements and heavy metals.

This paper determined the total elements of purple pepper fruit by ICP-MS, including macroelements, trace elements, rare earth elements and heavy metals, which will provide the basis for the edible value and sustainable development of purple green.

The fruits of purple pepper (Fig. 1) were collected from Nandi Lvdu vegetable base of Nanshao town, Changping district of Beijing city, where all the vegetables were organic vegetables, chemical fertilizer and toxic pesticide were prohibited.

Method: Parameters of inductively coupled plasma: power, 1250 W; rate of flow of cooling gas (Ar), 15.0 L/min; rate of flow of supplemental gas (Ar), 1.80 L/min; rate of flow of carried gas (Ar), 0.90 L/min. Parameters of mass spectrometry: vacuum of analysis room, 5.95×10^{-6} torr; impulse voltage, 1150 V.

Parameters of detecting: resolution (10 % peak height): 0.8 amu (Nor), 0.6 amu (H); retention period, 100 min times of replication, 6; times of circulation, 8; mode of analysis, scanning of mass, period of analysis, 72 s; rate of sample, 1 mL/min.



Fig. 1. Fruits of purple pepper

Macronutrient: The contents of five kinds of macroelements were high in fruits of purple pepper, which were showed in Table-1. Descending order of macroelements is $P > Ca > Mg > Na > Al$.

Trace and beneficial elements: Six kinds of trace elements were determined in fruits of purple pepper, the results were showed in Table-2. Three kinds of trace elements Fe (1471.70 ng/g), Zn (451.32 ng/g) and Mn (355.88 ng/g) were much higher than other three elements Mo (15.86 ng/g), Li (6.16 ng/g) and Co (4.19 ng/g).

Rare earth elements: Rare earth elements were very low in in fruits of purple pepper, only four kinds of rare earth elements were determined precisely. The results were showed in Table-3. All the four rare earth elements were lower than

TABLE-1
CONTENTS OF MACROELEMENTS IN PURPLE PEPPER

Elements	Contents (ng/g)
Na	8173.66
Mg	51857.44
Al	75.83
P	88022.00
Ca	60030.95

TABLE-2
CONTENTS OF TRACE ELEMENTS IN PURPLE PEPPER

Elements	Contents (ng/g)
Li	6.16
Mn	355.88
Fe	1471.70
Co	4.19
Zn	451.32
Mo	15.86

TABLE-3
CONTENTS OF RARE EARTH ELEMENTS IN PURPLE PEPPER

Elements	Contents (ng/g)
La	0.09
Ce	0.17
Pr	0.02
Nd	0.07

0.2 ng/g, descending order of four rare earth elements is Ce > La > Nd > Pr, which is relative to the corresponding content in earth crust.

Heavy metals: Heavy metal is one of important index to evaluate the food safety, eleven kinds of heavy metals were determined in fruits of purple pepper, all the heavy metals were meet to the National hygiene standards. Mercury was lower than the limit of detection; Ag, Sn, Sb and Tl were lower than 0.1 ng/g; only Cu (277.80 ng/g) and Ti (130.79 ng/g) were higher than 100 ng/g (Table-4).

TABLE-4
CONTENTS OF HAVY METALS IN PURPLE PEPPER

Elements	Contents (ng/g)
Ti	130.79
Cr	12.33
Ni	20.75
Cu	277.80
Ag	0.04
Cd	1.59
Sn	0.09
Sb	0.07
Hg	0.00
Tl	0.04
Pb	1.76

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