COMPOSITION OF MINERALS AND TRACE ELEMENTS CONTENTS OF RAW UNCLEAN AND RAW CLEAN EDIBLE BIRDNEST (EBN) ANALYZED USING ICP-MS

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INTRODUCTION

Edible bird's nest (EBN) as the most expensive animal product in the world has been reported to contain essential amino acids, sialic acid and minerals beneficial to human health (Kathan and Weeks, 1969; Marcone, 2005; Norhayati *et. al.*, 2010). In tracing the geographical origin of food, the evaluation of trace element content has been selected as a one of the most relevant method to investigate geographical origin due to the well-known fact that the content of selected minerals and trace elements in foods clearly reflects the soil type and the environmental growing conditions (Gonzalvez *et.al.*, 2009). In the case of edible bird's nest, the contents of minerals and trace elements might be closely related to the surroundings where the nest was found and the insects eaten by the swiflets. As a premium quality medicinal food product, the authentication of EBN are important to preserve the quality of EBN as the industry brings in millions of profit to the country annually due to exportation of high quality EBN especially the ones collected naturally in the cave of rural area of Malaysia. By having a specific method to trace the origin of EBN, it will prevent false claim on the origin country of EBN and hence preserve Malaysia as one of the exporter of premium high quality EBN. Inductively Coupled Plasma – Mass Spectrometry (ICP-MS) is a widely known instrument in quantitative analysis of minerals and trace elements in various kinds of samples with relatively high sensitivity and very low limit of quantification (LOQ). Having the capability of multi-element and isotopic analysis, ICP-MS is a very applicable and powerful analytical tool to be used in this study. The aim of this study is to analyze EBN using ICP-MS to investigate the presence of minerals, trace elements and the possibility of elemental marker in EBN.

MATERIALS AND METHOD

Raw Clean & Raw Unclean EBN

MICROWAVE DIGESTION OF SAMPLES[a]

Sample is ground to small particles before 500 ± 10 mg of samples were weighed into the microwave digestion vessel

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6 ml nitric acid, HNO_3 Suprapur® 65% and 2 ml hydrogen peroxide, H_2O_2 30% were mixed to the sample

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The vessel were assembled and arranged in the Milestone Ethos SK-10 microwave digestion system

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Samples were digested for 45 minutes at temperature 180°C

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Digested sample were collected and marked up to 50 ml with ultrapure water and ready for ICP-MS analysis

Milestone Ethos SK-10 Microwave Digestion System

NexION 300x ICP-MS

ELEMENTAL ANALYSIS USING ICP-MS[b]

Nexion 300X ICP-MS system was employed for sample's analysis using kinetic energy discrimination (KED) mode for low mass elements and standard mode for elements of higher mass, with online addition of internal standards. Corrections by equation were applied automatically by the software to counteract any interference during sample analysis.

[a] Milestone Ethos SK-10 Application Book (rev. 5-2011)

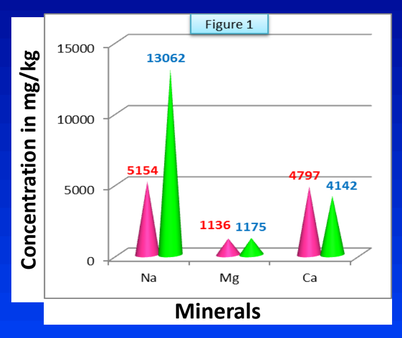
[b] EPA Method 200.8

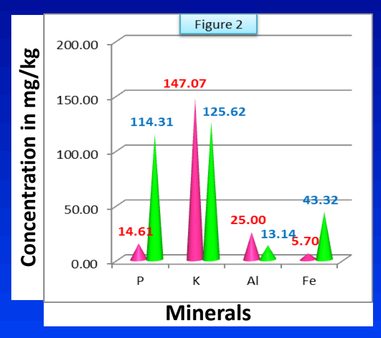
RESULTS AND DISCUSSION

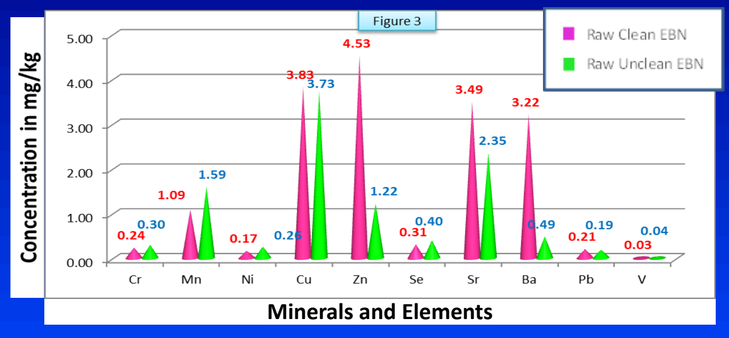
Table 1 : The range of minerals and trace elements concentrations (mg/kg) in Raw Clean and Raw Unclean EBN

ELEMENTS	RAW CLEAN EBN	RAW UNCLEAN EBN
Sodium, Na	2638-6708	7702-19804
Magnesium, Mg	883-1528	45.49-1711
Calcium, Ca	1231-8598	221-12070
Phosphorus, P	0.36-67.85	0.39-776
Potassium, K	36.42-352	17.98-652
Zink, Zn	0.54-22.59	0.02-9.34
Iron, Fe	1.58-19.41	1.83-689
Copper, Cu	1.86-5.45	0.44-7.68
Manganese, Mn	0.23-5.93	0.18-17.72
Nickel, Ni	0.10-0.34	0.05-6.58
Chromium, Cr	0.09-0.58	0.05-4.80
Strontium, Sr	2.18-5.49	0.79-7.15
Lead, Pb	0.05-0.81	0.02-2.73
Selenium, Se	0.14-0.44	0.16-0.63
Aluminium, Al	3.15-125	0.08-183
Barium, Ba	1.68-7.45	0.08-2.10
Vanadium, V	0.01-0.06	0.01-0.10

Figure 1-3 : Mean concentration (mg/kg) of minerals and elements in Raw Clean & Raw Unclean EBN







Samples of EBN were received from 6 states namely Terengganu, Perak, Johor, Kelantan, Melaka and Pulau Pinang. From the 23 raw clean EBN and 97 raw unclean EBN analyzed, the result shows that :

- From 28 elements analyzed, 17 elements (Na, Mg, K, P, Ca, Zn, Cu, Fe, Mn, Ni, Cr, Sr, Pb, Se, Al, Ba, V) shows concentration more than 0.01 mg/kg.
- Analysis of 6 heavy metals (As, Sn, Sb, Cd, Hg, Pb) in EBN as described in Food Act 1983 showed concentration less than the permitted level for all metals except lead (Pb) which is known to exist naturally in the environment.
- Raw unclean EBN generally showed higher amount of most minerals than raw clean EBN. This might be due to its unprocessed state as washing during processing of EBN can result in loss of minerals.

CONCLUSION

As a conclusion, it was found that both raw clean and raw unclean EBN contains high amount of minerals essential to human health as reported by previous studies. Besides being the source of nutrients, the contents of minerals and elements in EBN could also contribute to other findings such as the source and origin of the nest, in which further statistical analysis need to be applied for this purpose.

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