

**ANALYSIS OF METAL CONTENT IN BLACK PEPPER
POWDER AVAILABLE IN THE SRI LANKAN MARKET**

By

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DECLARATION

The work in this thesis was carried out by me as a project under the supervision of Prof. Arthur Bamunuaarachchi, Dr. (Mrs.) Indira Wickramasinghe and Mr. R.M.G.B. Rajanayake and a report on this has not been submitted in whole or in part to any University or any other institution for another degree.

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We Prof. A. Bamunuarachchi, Dr. Indira Wickramasinghe and Mr. R.M.G.B. Rajanayake jointly here by certify that the above statement in the preceding page made by the candidate is true and this thesis is suitable for submission to the university for the purpose of evaluation.



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ABBREVIATIONS

AAS- Atomic Absorption Spectroscopy

FAAS-Flame Atomic Absorption Spectroscopy

GFAAS-Graphite Furnace Absorption Spectroscopy

WHO- World Health Organization

XRF- X- Ray Fluorescence spectroscopy

ppm- part per million

ppb- parts per billion

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Dedication

*To my beloved husband Hareendra, Son Ashan and daughter Dinuli, for
the time you had to suffer and stay without me because of my studies. I*

owe this one to you.

ANALYSIS OF METAL CONTENT IN BLACK PEPPER POWDER AVAILABLE IN SRI LANKAN MARKET.

By Prashani. T. Sandanayake.

ABSTRACT

Black pepper (*Piper nigrum L.*), is a highly valued spice crop which is originated in India and subsequently spread to other countries. As far as the export market is concerned pepper is one of the major items exported by Sri Lanka. In recent years, there has been a growing interest in monitoring heavy metal contamination of spices. Pepper has been reported to contain significant quantities of some metals which cause detrimental effects on human health.

In this study concentrations of some heavy metals (Sodium, Potassium, Calcium, Magnesium, Zinc, Copper, Iron, Manganese, Lead, and Cadmium) in five common brands and unbranded Black pepper samples which are available in the local market in Sri Lanka were determined. Whole black pepper samples were analyzed as a control to study the possible metal contaminations during the process of powdering Metal analysis was carried out by Atomic absorption spectroscopy and X-ray Fluorescence Spectroscopy. Lead and Cadmium were analyzed using Graphite Furnace whereas the other metals were analyzed by Flame Atomic Absorption spectrometry and X-ray fluorescence spectrometry. Wet digestion method was used for digestion of samples for Atomic Absorption spectrophotometry

The Study shows differences in metal concentrations of their mean values such as K>Ca>Mg> Na> Fe>Mn> Cu>Zn>Cd>Pb. The results obtained from Atomic Absorption Spectrophotometry analysis the range of metals on a dry weight basis were;

Potassium 16604.3- 20428.7mg/kg, Calcium 1783.2683.2 mg/kg, Sodium 107.9 mg/kg, Magnesium 1747.9- 2194.6 mg/kg, Zinc 9.4-12.8 mg/kg, Copper 9.5-14.5 mg/kg, Ferrous 44.1-224.7mg/kg, Manganese 33.6-60.4mg/kg lead 155.8- 344.9µg/kg, Cadmium 212.6-363.8 µg/kg respectively. The study revealed that there is compliance between the two methods. In all values only the values for Cadmium was significantly above the WHO maximum permissible limit (MPL), while the others were below the MPL inferring that the agricultural practices might be affecting cadmium contamination in pepper. The study highlighted possibility of wear and tear of machineries causing high Iron content in powdered pepper. According to the present study generally processed pepper contains more metal contents than whole pepper except for sodium, calcium and manganese ions.