

# The Determination of Heavy Metal in Herb Used in Dusit Community to Develop a Sustainable Quality of Life

Chinnawat Satsananan

**Abstract**—This research aimed to find amount of heavy metal in herb used in Dusit community and compare of heavy metal in each part by quantity in herb and standard determination in Thai herb books to develop a sustainable quality of life, the result of study in 14 herbs do not find sample of heavy metal., by quantity of heavy contamination of 4 kinds: Cd, Co, Fe and Pb have lower than standard of 2 organizations: Thai herb standard, and World Health Organization, from the test 14 herbs have Fe in every part of herbs and all 14 kinds has Fe that is necessary for our health.

**Keywords**—Herbs Plants, Heavy Metal, Dusit District.

## I. INTRODUCTION

HERBS in Thai intellectual has been plants long time ago and are promoted by many variety of plants and herbs to be valuable resources of country and can be used widely controlled by physician treatment disease of human and animals. It is one choice to be famous at present time, because herb can heal many diseases, easily found and cheaper price which we can plant as requested, one choice we should know that herb is useful and also being disadvantage. We have to realize when we use in the wrong way, in other way, if heavy metal contaminated in herbs it will harm to consumers, now we have economic growth rapidly especially in industrial factory to environment by land, sea and air besides using insecticide to destroy plants of minerals mining, Agricultural industry of wastewater of community, wasted materials from paper factory and readymade factory also affecting to environment to human to affect indirect and direct ways. The sources of heavy metal maybe come from herbs during planting, maintaining, or harvesting period.

Therefore, quantity of heavy metal in herbs, before we consume, is necessary and important to people quality of life today especially who live in Dusit area to be sustainable quality of life.

## II. LITERATURE REVIEW

By center of Medical scientific center 1[8], Trang province in 2010 studied the risk evaluation from contaminated heavy metal in herb raw materials planted in Trang provincial area. The result of investigating heavy metal, lead, cadmium and arsenic in herb both fresh powder and capsules of 7-10 products, total 30 samples compare with standard of Thai

C. Satsananan is with the Faculty of Science and Technology, Suan Sunandha Rajabhat University, Bangkok, Thailand 10300 (e-mail: chinnawat.sa@ssru.ac.th, ajanmai@yahoo.com).

Herbal Pharmacopoeia determined heavy metal contaminated of 3 kinds arsenic not more than 10.0 mg/kg, 0.3 mg/kg and 4.0 mg/kg, respectively. Herbs of 2 products, rootstock A and B has cadmium quantity more than amount 0.41 and 0.48 mg/kg besides comparison the process of production in herbs both fresh, powder and capsule, the quantity has no significant difference [5] but however, in study of 2 kind of plants that has high cadmium contamination and also in rootstock A has lead averaged 9.9mg/kg so we should test heavy metal contamination in the raw materials before producing herb products. If the consumer receives poison from cadmium it will harm to kidney and being cancer after [7]. Lead is dangerous to brain, nerves and spinal cord, low blood, lose of memory which harm to kidney and die and if there are arsenic contamination which harm to food digestion and blood vessels system, central nerves system and spinal cord, causing red blood broken and growth of liver which are risk to death, lung and kidney cancer. Therefore it is necessary to test heavy metal in raw materials before producing herb products [1], [2].

Contamination in heavy metal are arsenic, lead and cadmium have no other methods can reduce quantity in herb plant, to plant should realize environment of the area because cadmium has generally in nature because there are minerals of zinc and used in metal industry including arsenic substance in general nature which are used in many industries [3], [4]. Therefore, to avoid heavy metal contamination, most producers must have the system to select raw materials that has quality and process of production avoiding utensil and tools that mix with heavy metal for consumer's safety.

### A. Objectives

1. To find intense of heavy metal compared with herbs used in Dusit community.
2. To compare quantity of heavy metal with herb and standard in Thai herbs book.
3. To develop people's quality of life in Dusit district who related with herbs to be sustainable.

## III. MATERIALS AND METHODS

### A. Equipment

Atomic Absorption Spectrophotometer, the company GBC model AVANTA (Australia)

- filler paper No. 1 (Whatman)
- Furnace model Nabertherm (Germany)
- Crucible
- Micropipet

- grassware basic in operation room

**B. Chemicals Substance**

- Cd(aq) 1000 ppm [Spectracer UK Ltd]
- Co(aq) 1000 ppm [Merck K GaA]
- Fe(aq)1000 ppm [Spectracer UK Ltd]
- Pb(aq) 1000 ppm [Spectracer UK Ltd]
- Conc. HNO<sub>3</sub> (68-70%) [BAKER ANALYZED]
- 0.01 M HNO<sub>3</sub>

**C. Sources of Herb Plant**

Community in Dusit district

**D. Preparation of Standard Solution**

This research prepared standard solution of heavy metal of 4 kinds: Cd, Co, Fe, and Pb to have concentration as follow:

- 0.2, 0.6, 0.8, 1.5, 1.8 ppm for Cd
- 1.0, 3.0, 5.0, 10.0, 15.0 ppm for Co
- 1.0, 3.0, 5.0, 10.0, 15.0 ppm for Fe
- 2.0, 5.0, 10.0, 15.0, 20.0 ppm for Pb

**E. Sample Preparation**

The research used sampling group of 14 herbs which are Plai, marum, aloe vera, turmeric, Chinese keys, ginger, lemongrass, borapet, yanag leaf, pandan, buabok leaf, partumpung, and kae using many part of herbs which are root, trunk and leaf together with powder products to analyse heavy metal quantity having a test as follow [6]:

- set sample of herb to clean and cut into small pieces
- set sample cut weigh 1g (to get fresh weight) put in crucible
- use sample of herb or products weighed to burn at temperature 450°C for 4 hours and weigh again (to gain ash weight)
- use ash from burning to crush by Conc.HNO<sub>3</sub> volume 1ml (leave it 24 hours for clear solution)
- use solution adjusted with volume by 0.01 M HNO<sub>3</sub> volume 10ml
- usesolution to fill (if solution is clear, do not fill pour into bottle and keep sample)
- use solution to measure by AAS

**IV. RESULT AND DISCUSSION**

The result of heavy metal quantity of herb of 14 kinds

**A. Result of Heavy Metal Quantity Cd in Part of 14 Herbs**

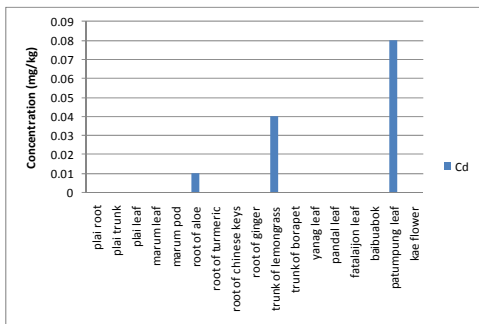


Fig. 1 Quantity of Cd in part of 14 herbs

From Fig. 1 will see that patumpung has highest Cd 0.08 mg/kg, secondly was lemongrass trunk 0.04 mg/kg and aloe 0.01 mg/kg, respectively.

**B. Result of Heavy Metal Quantity Co in Part of 14 Herbs**

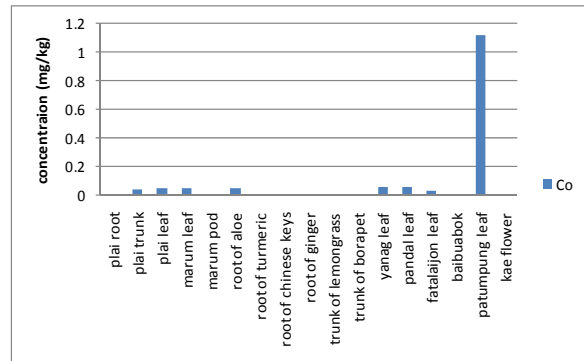


Fig. 2 Co contamination of part of 14 herbs

In Fig. 2 patumpung leaf has highest Co at 1.12 mg/kg, secondly are yanag leaf and pandal leaf 0.06 mg/kg, plai leaf marum and aloe was 0.05 mg/kg, respectively.

**C. Result of Heavy Metal Quantity Fe in Part of 14 Herbs**

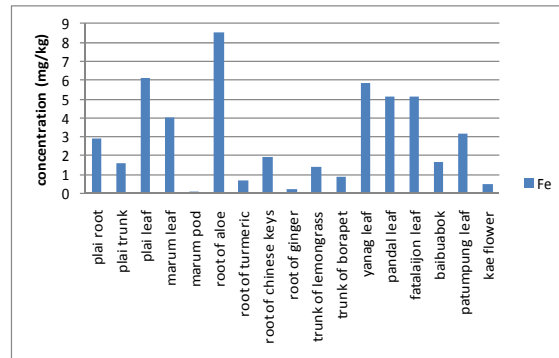


Fig. 3 Fe contamination in 14 herbs

Aloe has highest Fe at 8.51 mg/kg secondly plai leaf 6.08 mg/kg and yanag leaf 5.83 mg/kg, respectively which in part of 14 herbs to be studied have Fe in 14 herbs.

**D. Result of Heavy Metal of Pb in Total Part of 14 Herbs**

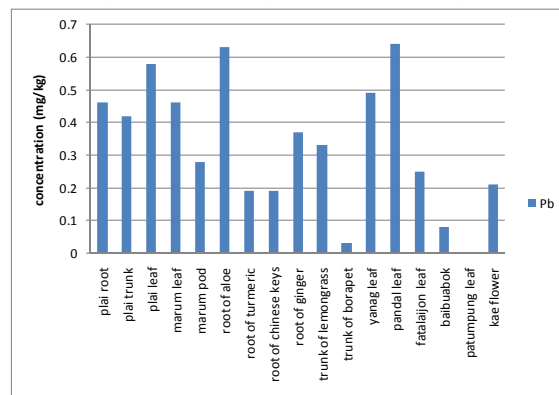


Fig. 4 Contaminated quantity Pb in part of 14 herbs

As shown above pandan leaf has highest Pb 0.64 mg/kg secondly is root of aloe 0.63 mg/kg and plai leaf 0.58 mg/kg, respectively. Fig. 4 has shown that Pb was found in parts of herbs in 14 kinds of herb studied.

*E. Result of Heavy Metal Quantity of 4 Kinds Compared with Standard Value*

TABLE I  
SHOWING HEAVY METAL QUANTITY STUDIED (MG/KG) COMPARING WITH STANDARD VALUE

| Herbs Plant          | Cd        | Co        | Fe        | Pb        |
|----------------------|-----------|-----------|-----------|-----------|
| plai root            | N.D.      | N.D.      | 2.92±0.47 | 0.46±0.48 |
| plai trunk           | N.D.      | 0.04±0.02 | 1.60±0.18 | 0.42±0.15 |
| plai leaf            | 0         | 0.05±0.01 | 6.08±0.79 | 0.58±0.30 |
| marum leaf           | 0         | 0.05±0.01 | 4.00±0.33 | 0.46±0.24 |
| marum pod            | N.D.      | N.D.      | 0.13±0.16 | 0.28±0.25 |
| root of aloe         | 0.01      | 0.05±0.01 | 8.51±0.69 | 0.63±0.33 |
| root of turmeric     | N.D.      | N.D.      | 0.70±0.42 | 0.19±0.34 |
| root of chinese keys | N.D.      | N.D.      | 1.96±0.19 | 0.19±0.23 |
| root of ginger       | N.D.      | N.D.      | 0.20±2.64 | 0.37±0.31 |
| trunk of lemongrass  | 0.04      | 0         | 1.42±0.48 | 0.33±0.08 |
| trunk of borapet     | N.D.      | N.D.      | 0.90±0.30 | 0.03±0.10 |
| Yanagleaf            | 0         | 0.06±0.02 | 5.83±0.13 | 0.49±0.10 |
| pandanleaf           | 0         | 0.06±0.02 | 5.16±0.15 | 0.64±0.21 |
| fatalaijonleaf       | 0         | 0.03±0.02 | 5.10±0.52 | 0.25±0.05 |
| Baibuabok            | N.D.      | N.D.      | 1.69±0.12 | 0.08±0.11 |
| Patumpung leaf       | 0.08      | 1.12±0.02 | 3.14±1.46 | N.D.      |
| Kae flower           | N.D.      | N.D.      | 0.48±0.10 | 0.21±0.09 |
| standard value       |           |           |           |           |
| herb standard*       | 0.3 mg/kg | -         | -         | 10 mg/kg  |
| WHO                  | 0.3 mg/kg | -         | -         | 10 mg/kg  |

\*herb standard in the book of Thai herb of nantanaSitichai (medicine and drugs materials office)  
WHO (World Health Organization)  
N.D. (not detected)

From Table I, quantity of heavy metal has contaminated value in 4 kinds: Cd, Co, Fe and Pb of each 14 kinds, compared with standard value of 2 organizations: herb standard\* and WHO, has lower than standard value of both organizations, so the products have no heavy metal contamination so it is saved from consumption.

## V. CONCLUSION

The result from the analysis of all 14 kinds of herb it was found that in patumpung leaf has the highest quantity of Cd and Co, aloe root has highest Fe and pandan leaf has highest Pb, heavy metal contamination of 4 kinds: Cd, Co, Fe and Pb in lower than standard of 2 organizations: Thai herb standard and WHO, which 14herbs are safety from harm of heavy metal in consuming it. But however, taking herb each time should study in details of such herb before taking it. For the benefit of our body and the test result from 14 herbs has Fe in every part of herb. All 14 kinds of herb have Fe necessary use for health. This research was applied to develop a sustainable quality of life of people in Dusit community.

## ACKNOWLEDGMENT

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