# CHAPTER 4

# CONCLUSION AND RECOMMENDATION

Lead is widely distributed throughout the environment. The extremely harmful effects of lead contamination result from man induced activities that redistribute and concentrate lead in the environment. The effect of lead intoxication may range from simply upsetting to disabling and even fatal. Lead is a health hazard to children, to the workers, and to the people who consume lead through food. There are many techniques used for the trace quantitative determination of lead. The high sensitivity of anodic stripping voltammetry and the simple equipment used make this technique very suitable for determining certain toxic elements, in particular lead.

When the technique was used to determine lead in various vegetables, it resulted in a simple and precise technique as well as the time consumed for this analysis was quite short (ca. 35 minutes/trial), excluding dissolution of lead from vegetable samples.

The vegetable samples were collected from four gardens which are located in Tambon Taling Chan, Prachathipat, Bangbautong and Saun Laung. The vegetable species analyzed are Chinese kale, Chinese kale (young), Chinese radish, Chinese white cabbage, coriander, cucumber , celery , leaf mustard, lettuce, Chinese cabbage, multiplier onion, Chinese convolvulus, water convolvulus and yard long bean. The vegetable samples were clean with tap water as preparing for cooking and were ashed by modifying the standard method in AOAC (65). Lead contents found in each vegetable species grown in the four gardens studied were concluded as shown in Table 15. The maximum values of lead contents in vegetables grown in four gardens were found in the same species, such as celery is the species which the maximum content of lead was found in the fresh vegetable, Chinese cabbage is the species which the maximum content of lead was found in the vegetable ash, and yard long bean is the species which no lead was found in both the fresh vegetable and its ash. Besides the species of vegetables, the stage of maturity of vegetables and the environment around the gardens were proved to have some influences on lead contents in the vegetables analyzed. Moreover, the climatic or seasonal conditions during the vegetable growth period, and types of soils, fertilizers, herbicides, fungicides and insecticides used in each garden should have some effects on lead contents in vegetables.

The relative impact of these variable can be greatly modified by man through the use of appropriate fertilizers and soil amendents, herbicides and fungicides, and irrigation and different husbandry practices. In addition, the inherent capacity of particular plant species to absorb and retain trace elements from the soil can be changed by cross-breeding and selection.

Table 15 Ranges of lead contents found in each vegetable species grown in the four garden studied.

| Name | Range of lead content found | | Range of the ratio of the weight of the ash to the fresh vegetable mg/kg |
|---|---|---|---|
| | µg/g of vegetable ash | µg/kg of fresh vegetable | |
| Chinese kale | 3.27 - 4.66 | 48.68 - 80.06 | 13.11 - 13.91 |
| Chinese kale(young) | 1.77 | 33.43 | 18.29 |
| Chinese Radish | none - 2.76 | none - 20.96 | 6.60 - 7.62 |
| Chinese White Cabbage | 2.86 - 5.62 | 35.60 - 41.96 | 10.70 - 12.87 |
| Coriander | 2.46 - 3.81 | 49.06 - 67.23 | 16.44 - 19.93 |
| Cucumber | none - 0.55 | none - 3.87 | 6.05 - 8.02 |
| Celery | 4.34 - 5.23 | 99.50 - 113.35 | 19.85 - 21.62 |
| Leaf Mustard | 2.31 - 3.95 | 32.70 - 53.39 | 16.67 - 14.55 |
| Lettuce | 1.81 | 19.39 | 10.65 |
| Chinese Cabbage | 5.03 - 6.27 | 73.72 - 104.03 | 14.81 - 16.86 |
| Multiplier Onion | 3.18 - 4.53 | 35.72 - 42.47 | 8.71 - 9.72 |
| Chinese Convolvulus | 2.45 - 3.00 | 27.20 - 42.63 | 12.07 - 15.46 |
| Water Convolvulus | 3.29 - 3.70 | 38.96 - 43.21 | 11.61 - 13.88 |
| Yard Long Bean | none | none | 18.02 - 21.40 |

One of the advantages of this study was to investigate whether lead levels in various vegetables approach the concentration which is generally acknowledged to be undesirably high for human consumption. For lead, some countries have established a maximum safe concentration in foodstuff. This figure differs from country to country, e.g., 2,2 and 4 ppm in the United Kingdom, Canada and Australia, respectively (78, 79, 80).

Although the recommended limit for lead in water, beverages and fruit juices is 0.5 ppm in 1976 (81), there is no legislation controlling the amount of lead present in vegetables. The lead contents found in various vegetables by this study may provide some guidelines for the establishment of the standard value of lead content in vegetables. In addition, the quality of domestic tap water must be improved since lead contents in vegetables were proved to increase from a regular washing of vegetables with tap water before cooking.

In future, the increasing concentration of lead in vegetables might be correlated with the increasing gasoline consumption of the country. Advances in industrial processing might cause a disposal of highly toxic materials which are hazard to individuals and whole communities. Thus, government agencies should be created to act in the public interest to control or lessen pollution.

Since the anodic stripping voltammetry is simple, fast, inexpensive and applicable for any common chemistry laboratories, it is **advisable** to encourage the study of this method for the investigation of other traces of **toxic elements,** such as arsenic, cadmium, selenium etc., and **utilization of the** developed procedure for **analyses** of environmental samples.