

Is a Vegetarian Diet Killing You?

Identification of Heavy Metals in Vegetables

Premier Girls Secondary School

Mwajuma Mzee and Lidya Lucas



Introduction

The study was carried out in the cultivated sites of Msimbazi river at Mivinjeni in Dar es salaam. The selection of Mivinjeni area along Msimbazi river valley was due to the reason that it is a low land area in form of a damp site with a very gentle slope where water moves very slowly making most wastes and mud to accumulate in the area as water moves on its way to the Indian Ocean. The area receives wastes from the three municipalities of Ilala, Temeke and Kinondoni .The type of vegetables we found in the area include Cow pea leaves, Pumpkin leaves, Okrah, Potato leaves, Cassava leaves and Sweet Potato leaves.

Method

Samples for this study were collected at Three different locations where vegetables were grown at Mivinjeni area. Twenty nine samples (500g) each of leaves of vegetables from six different types of vegetables namely Cow pea leaves, Pumpkin leaves, Okrah, Potato leaves, Cassava leaves and Sweet Potato leaves were collected. The samples were packed in special bags and given specific ID names for identification, lastly the samples were transported to the University of Dar es salaam at Geology department for further preparation and analysis.

Procedure

Sample handling and preparation

Vegetable samples were transported to the University of Dar es salaam at the Geochemical laboratory of the Department of Geology where sample preparation and analysis was to be conducted. The samples were oven dried at 60 degrees for 24 hours, ground using mortar and pestle, and sieved to pass through a 250 μ m sieve, the samples were then split into two portions; one portion was stored in a sample bag and the other sample was filled in special sample bags ready for analysis by portable XRF analyzer.



Results

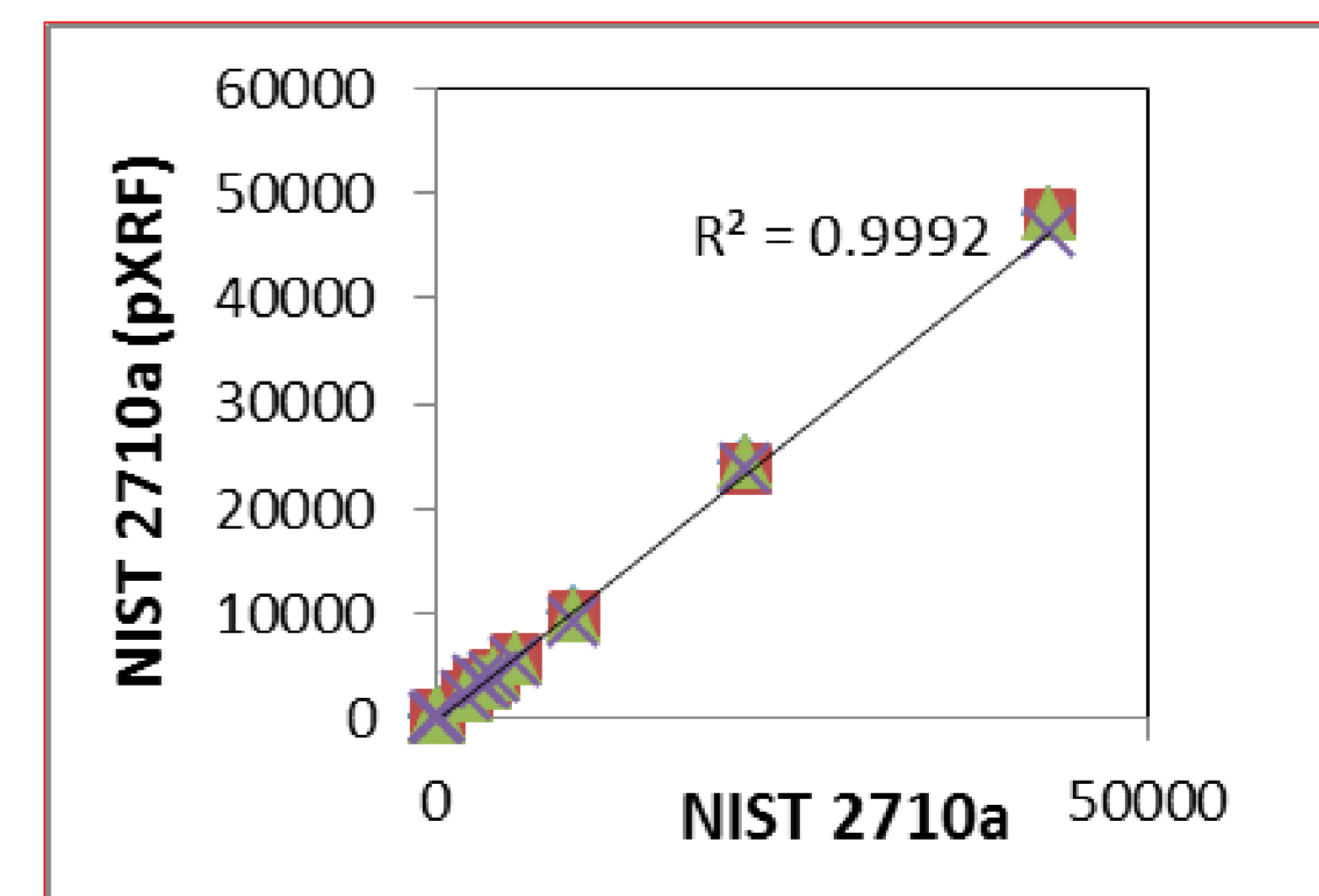
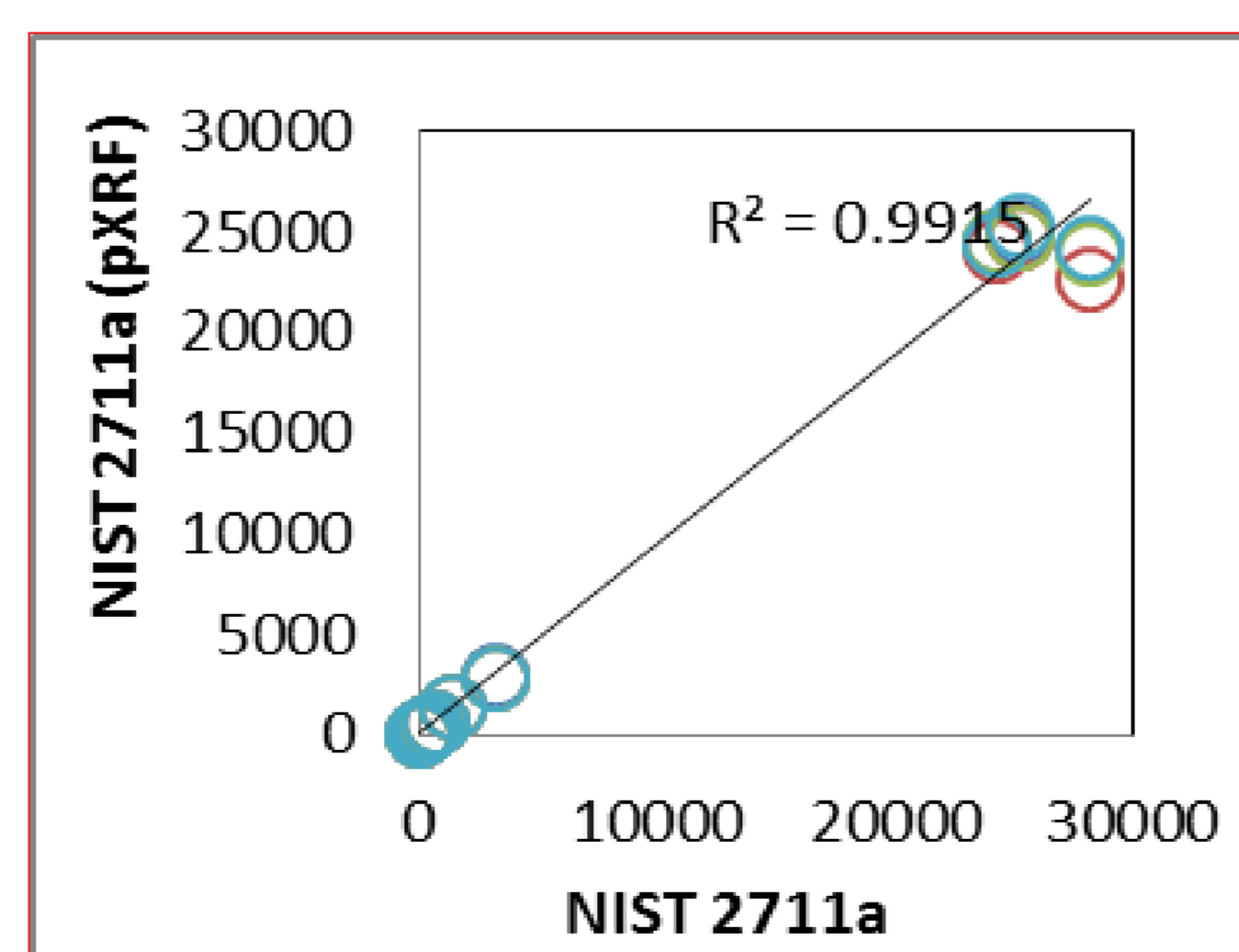
Metal determination in the soil samples was done using a Portable X-Ray Fluorescence analyzer, Delta classic model with Tantalum anode in the mining and soil modes. The finer fraction of the samples less than 250 μ were analyzed together with standard samples NIST 2711a, NIST 2710a and Pure Silica (Si so as to check the accuracy and precision of the instrument. The Portable XRF was calibrated before starting the measurements and after every ten sample interval. Each sample was analyzed three times for a 60 seconds exposure time and the average reading was taken as the result for further interpretation.

Quality control measures were taken in analytical procedures to confirm the accuracy of the analytical data obtained. Four Standard samples namely; Pure silica (SiO₂), Tomato leaves (NIST 1573a), NIST 2711a and NIST 2710a were analysed so as to check the accuracy and precision of the instrument.

In order to access the accuracy of Portable X-Ray fluorescence the concentration values measured by Portable X-Ray fluorescence for the standard samples were plotted against the known values of the of the standards (NIST 2710a and NIST 2711a). The graphs showed for NIST2711a and for NIST10a (Figure 5). This indicates that the values obtained from the Portable X-Ray Fluorescence are very significant.

The maximum allowable limits of toxic metals in vegetables have been established by standard regulatory bodies such as World Health Organization (WHO), Food and Agricultural Organization (FAO) (Chiroma et al. 2014).

These levels of toxic metals were compared with the concentration of toxic heavy metals in vegetables from Mivinjeni area along Msimbazi river valley. The results are presented in the graphs below . The comparison shows that Msimbazi Mivinjeni area has higher toxic heavy metal values than the values obtained from previous studies and most samples have exceeded the maximum allowable limit of toxic heavy metals in vegetables as by WHO and FAO.



Conclusions

The investigation in this study revealed that the vegetarian crops in this area are more polluted with toxic metals as compared to the levels of toxic heavy metals obtained from previous studies and as recommended by WHO and FAO standards for heavy metal limits in foods.

Precaution has to be taken especially for the people living around this river since the polluted soils and water may pose risks people using the water for domestic purposes, to the majority who buy the vegetables in the markets and use them as food and to young children who may eat the soils or eat using unclean hands and get severe health problems.

Acknowledgments

Firstly we would like to give our special thanks to Premier Girls Secondary school for giving us a chance to study and to seek for this opportunity of participating in Young Scientists project competitions

We acknowledge Mr. Emmanuel Bundala, our Project Supervisor and Supporting teacher for his kindness, hospitality and generosity for all the time we have been working with the project ,his readiness to cooperate to ensure that we are well trained, supervised and assigned with various activities associated with our project.

We also acknowledge Dr. Charles Messo and the Department of Geology at the University of Dar es salaam who assisted us in sample preparation and analysis by using Portable X-Ray Fluorescence analyzer.