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Analysis of Deltamethrin Residue Amounts Using HPLC in Some Vegetables Consumed in a Rural Area - Makuyu, Kenya

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Abstract:

Vegetables are brimming with fibre, plus a whole range of vitamins and minerals, and because they are low in calories, they make an important and healthy addition to any diet. Scientific studies have shown that people who eat a lot of vegetables may have a lower risk of getting illnesses, such as heart disease and some cancers. For this reason, health authorities recommend that you eat at least five portions of fruit and vegetables every day. Pests, diseases, and weeds destroy vegetables reducing their yield and causing blemish thus making them unfit for sale and consumption. Pesticides maintain the high levels of vegetable production in Kenya. There are many pesticides in use today including; insecticides, acaricides, nematocides, herbicides, and avicides. Pyrethroids are the most commonly used insecticides. The pyrethroids in use include; deltamethrin, lambda-cyhalothrin and chismethrin. However, although vegetables are widely consumed by almost everybody in Kenya, there is little work reported on the analysis of pesticides residues in vegetables. Most of the vegetables are grown in the rural areas, with most farmers growing them on small-scale and hence these vegetables never reach cities. In this study deltamethrin was analysed in selected vegetables which include; kales, cabbages and tomatoes grown in rural area during the dry and wet seasons. The vegetables were bought from different sellers in Makuyu market. They were then homogenized to give analytical samples. Deltamethrin residues were extracted from the samples using organic solvents. The residues were then determined using high performance liquid chromatography (HPLC). Analyses of data was done using ANOVA, t-test and regression analysis. The deltamethrin mean residue levels ranged between 0.0800 ± 0.1300 and 0.1400 ± 0.0800 mg/kg during the dry season and between 0.0012 ± 0.0016 and 0.1100 ± 0.0080 mg/kg during the wet season. The study showed that deltamethrin mean residue levels were higher during the dry than during the wet season in the vegetables analysed. The differences were not statistically different for most of them. During the dry season the deltamethrin mean residue levels in the vegetable samples were all higher than the Acceptable Daily Intake (ADI) of 0.02 mg/kg, but they were all lower than the Maximum Residue Levels (MRLs) of 0.2 mg/kg. During the wet season the deltamethrin mean residue levels were lower than the ADI except in kale samples. During the same wet season the deltamethrin mean residue levels were all lower than the MRLs.

Keywords : Vegetables, rural area, pyrethroids, deltamethrin residues and HPLC

1. Introduction

Vegetable is a culinary term, which generally refers to an edible part of a plant. All parts of herbaceous plants eaten as food by humans, whole or in part, are normally considered as vegetables (Swedenborg, 2003)¹. Thus potatoes, bean, onions, cabbages and tomatoes are vegetables. Vegetables provide vitamins, minerals and flavonoids (Gallow *et al.*, 1993)². These substances contained in vegetables are very important, for instance vitamin C is required for the production of collagen - the substance that gives structure to muscles, veins, arteries, bones and cartilage. A study by Unlu *et al.* (2005)³ reported that avocados act as a nutrient "booster," allowing the body to significantly absorb more nutrients like alpha-carotene, beta-carotene and lycopene found in fruits and vegetables. Vegetables in the daily diet have been strongly associated with reduced risk for some forms of cancer, heart disease, stroke, and other chronic diseases (Goldberg, 2003)⁴. Vegetable production is one of the major branches of Horticulture. They are considered as an asset for providing a good source of income to the growers and they form a vital part of the human diet (Gallow *et al.*, 1993)². Vegetables are also considered a cheaper source of natural supplementary food because they contain essential nutrients. Many of the vegetable crops possess high medicinal value in curing certain diseases. For instance, onion and garlic have been reported to possess anti-bacterial property, and to lower the rising blood sugar of rabbits (Shan, 1989)⁵.