

Development of a Household Washing Liquid for the Efficient Removal of Pesticides Residues in Vegetables and Fruits using Natural Substances

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ABSTRACT

Pesticides are chemical or biological agents that are used in agriculture to minimize plant diseases, insect, pests and weeds. In the current Sri Lankan context, the commercial production of fruits and vegetables is extremely dependent on the regular usage of pesticides. Farmers tend to use pesticides more than the recommended amounts to achieve higher harvest by reducing the crop lost due to pests, insects and weeds [1, 2]. As a consequence, excessive pesticides residues have been detected on the surface of the vegetables available in the Sri Lankan market. According to literature, accumulated pesticide residues in food products have been associated with a wide variety of human health hazards, ranging from short-term effects to long-term health issues such as neuron problems, cancers, immune system deficiency and inborn deformities [1,3]. Therefore, it is significantly important to remove pesticide residues from fruits and vegetable before consumption. Current practice in most of the households in Sri Lanka is washing vegetables and fruits using tap/well water to remove pesticides. However, using tap water is not an effective method as it is not sufficient to remove most pesticide residues. Hence, this study focuses on developing a biosafe, effective and easily applicable washing liquid to remove pesticide residues using natural substances. Chlorpyrifos which is one of the mostly used pesticides in Sri Lanka, was selected as the model pesticide and the removal efficiency of this pesticide by natural substances such as vinegar, lime, turmeric and tamarind was investigated using computational simulations. The main hypothesis was that the efficiency of removal would depend on the interaction between the biogenic substance and Chlorpyrifos [4]. Therefore, in the computational study the interaction that could occur between the active chemical of the biogenic substance and Chlorpyrifos was predicted and the Spartan software was used to obtain information about structure, relative stabilities, and properties of the predicted product. Further, the potential energy of bond between acid substances and chlorpyrifos was also calculated using Spartan software. The stability of the product formed between Chlorpyrifos and citric acid (lime) resulted to be -948.98 kJ / mol while that of curcumin (turmeric) and acetic acid (vinegar) resulted to be -472.69 kJ / mol, -286.73 kJ / mol respectively. According to the hypothesis, citric acid can be named as the most suitable candidate as it results in a product with the lowest potential energy.

Overall, the results from the theoretical study provides a good basis for the selection of natural substances for future laboratory studies to develop a washing liquid with a higher efficiency of pesticide removal.

Keywords: *pesticide residues, Fruits, Vegetables, Chlorpyrifos, Health, Biogenic substance*

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