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Innovative Pesticide Kit Model for Vegetable Farm Safety Surveillance Program

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Abstract

To develop 4-groups innovative pesticide test kit and vegetable farm safety surveillance program, the quasai study was performed in intervention klongtabak and control ta-ngoy village groups, Nakhonratchasima province. 62 Chinese kale samples were screened for pesticide residues using innovative test kit and confirmed by GLC/HPLC. Percent acetyl cholinesterase inhibition was measured in vegetable samples, containing anti-cholinesterase pesticide residues, using spectrophotometer. Pre-intervention analysis, two detected chlorpyrifos (>MRL) in control group, two detected cypermethrin (<MRL) and one detected <MRLs methomyl, carbofuran and carbofuran-3-OH in study group. No pesticides were detected in both groups at post-intervention. Self-test was trained to agriculturists, 92% accuracy competence results was acceptable at post-laboratory kit test training. Small farm land pesticide safety manual was used to educate agriculturists and %enzyme inhibition measurement at post-intervention period, compared with pre-intervention period was decreased 51.9% at p -value <0.011, reveal that intervention program affect reduction of pesticide inhibition at 0.05% significance level.

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1. Introduction

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Recognizing that agricultural farming, the most common sector of Thailand represented 65% of labor force in 2006 (1). Some contaminated pesticides in the environment and accumulated in the food chain, posing hazards to human health, maturely organophosphate, carbamate, pyrethroid and organochlorine (2). The first three groups were popularly used for farming, while the organochlorine was banned in many countries (3), it was still being used in Thailand (4). Despite prohibition process and public announcements regarding bans, the weak enforcement in Thailand, resulted use of prohibited pesticides, as documented continued use of endosulfan, methamidofos, parathion-methyl, and monocrotofos (5, 6, 7). Many farmers believed that pesticide application was necessary and continued use of large amount of pesticides was likely unless a campaign was conducted that educated farmers, changed pesticide attitude and proper pesticide use (8). Pesticide residues were highly detected in marketed Chinese kale vegetable by MOPH, Thailand, (9). Detected unsafe pesticide residues in 22 samples, 5.6% of 396 vegetable samples, marketed in Suranakorn central market, Nakhonratchasima province, 9 out of those 22 (40.9%) were tested pesticide unsafe in Chinese kale samples (10). The contamination could not be treated in isolation from the environment which food was produced, simple test method must be evaluated, where results can help improve pesticide application strategies and develop remediation (11). Validated test kit of Department of Medical Sciences, granted petty patent from Thailand Intellectual Property Department, using to screen 4 pesticide groups in vegetable farm samples (12). Pesticide monitoring should be emphasized for food safety. Transfer of innovative kit technology to strengthen agriculturists should be focused for the safety monitoring of pesticide contamination to guarantee vegetable produce safety. Some pesticides particularly organophosphate and carbamate had ability of inhibiting the acetyl cholinesterase enzyme and % enzyme inhibition assay can be measured in vegetable by spectrophotometer to evaluate difference of variables after intervention study. Small farm land pesticide safety education should also be trained to agriculturists for safe farm produce with less chemical use and proper cultivation practice.

2. Aim of the study

The study was aimed at evaluating the effectiveness of innovative pesticide kit model for farm safety surveillance program by measuring association of pesticide residues in vegetable produce by agriculturists in Klongtabak village, Nakhonratchasima province before and after intervention, and transferring technology of self-test LAB in study farm community, obtained by training and testing their laboratory competency.

3. Materials and Methods

The quasai study was conducted during March 2012 to October 2013, the protocol was reviewed and approved by the Institutional Review Board of Ethical Committee of Chulalongkorn University, Thailand.

3.1. Innovative pesticide test kit, spectrophotometer and GLC/HPLC use to assay pesticide residues

To intensify safe agricultural production with less chemical use and awareness of good and safety practice, using integrated model of knowledge and innovative pesticide kit, was needed to reduce toxic contamination. Pesticide residues in farm produce was difficult to be measured by reference laboratory that is very expensive and time consuming. (13). Department of Medical Sciences' researchers developed test kit 4 groups of pesticide residues in vegetable, fruit and cereal that was validated to have high specificity, accuracy and sensitivity (14). Used Spectrophotometer for % acetyl cholinesterase inhibition assay, that was inhibited by organophosphate and carbamate pesticides, more than limit of detection in samples by test kit and above tolerance enzyme inhibition level by the colorimetric assay (15), were quantitatively determined of 4 groups

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