

Prevalence of Pesticide residues in Fresh Chili sold in Fresh Markets in Nonthaburi Province, Thailand

Pichayakorn Buasuwan¹, Ratchaneevipa Pusuwan¹, Nuttida Runhiwa¹,
Suphatchaya Prasertphon²

¹St.Francis Xavier School, Thailand, ²Westbury Christian School, U.S.A.

DOI: <https://doi.org/10.5281/zenodo.7053562>

Published Date: 06-September-2022

Abstract: Background: Pesticide residues were found in many samples of vegetables sold in fresh markets for consumers. Chili pepper is one of the most popular food ingredients.

Objective: Find the percentage of vegetables from the produced market and organic vegetables from the department store that were detected Organophosphate and Carbamate pesticide residue above MRL (maximum residue limit for pesticide).

Method: In this research, the samples were tested for pesticide residues with MJPK pesticide test kit that applies colorimetric cholinesterase inhibitor assay.

Result: The detection of pesticide residues in Chili pepper, a total of 60 samples, consisted of 30 samples of Chili pepper and 30 samples of red pepper was found Carbamate residues at safe level in 6 samples representing for 20% of Chili pepper and Organophosphate were detected residues at safe level in 5 red pepper samples, representing 16.67% of the 60 samples of Chili pepper and red pepper, did not detect Organophosphate and Carbamate residues at unsafe level.

Conclusion: The results of this study examined 60 chili pepper samples and found no residuals of Organophosphate and Carbamate at Unsafe Level in Chili pepper.

Keywords: pesticide residues in vegetable, Organophosphate, Carbamate.

1. INTRODUCTION

Background and Significance

Chili is a popular agricultural product that Thai people like to consume. Chili has been an essential ingredient in Thai food for a long time. Popular dishes with chili as an ingredient such as Tomyam Kung, Papaya Salad, Pork Satay, etc. Chili gives the fiery taste. More and more people prefer to eat spicy foods that contain primroses. However; pesticide residues have been found in many fruits and vegetables including chili [1-4]. It is a substance used to prevent plant diseases, may be insecticides, fungi, rodents, as well as catalysts. From research that examined chili, it was found that pesticides were sprayed. Organochlorine group Organophosphate containing Phosphorus known as Malathion, Paraacinnon, etc. Carbonate group, Pyrethreem group and Synthetic Pythyroid substances agricultural pesticide was used not only cause a direct effect on the pest but also affects the environment, ecosystem, food chain system and spreading to the environment, causing the environmental quality to deteriorate adversely affect the health of living organisms in the ecosystem. Chemical pesticides are extremely dangerous to humans which can destroy many organs in our body, such as Carbofuran that kills insects such as clump worms, worms, mealy bugs, plant hoppers, when exposed to this substance in large quantities can cause vomiting

loss of balance, blurred vision, and to the point of being a severe carcinogen. Methomyl (Methomyl) kills insect bites, mouth suckers, aphids. This substance will cause nausea, vomiting, diarrhea, seizures, heart toxicity, decreasing testosterone, breaking the ducts in the testicles In the long run, it destroys DNA. make chromosome abnormal and toxic to the spleen Organophosphate substances (Organophosphate) will have fatigue, chest tightness, dizziness, blurred vision, sweating and salivation, nausea, vomiting, abdominal pain, diarrhea, loss of consciousness, dilated pupils, muscle spasms, runny nose, shortness of breath, coma until death, and finally, Carbamate cause, headache, dizziness, muscle weakness, slow heart rate, puffy or tight in the chest, sweating and nausea. It also affects the eyes irritation, vision loss, lack of clarity, red eyes, watery eyes, difficulty in controlling eye muscles, and retinal detachment [1-4].

Because chili is a popular food ingredient. Chemicals are frequently detected. There has not been a study on this subject in Pak Kret District, Nonthaburi Province Therefore, the researcher is interested in studying the prevalence of pesticide residues, Organophosphate and Carbamate in chili from the markets in Pak Kret District, Nonthaburi Province in order to prevent danger from exposure to residual chemicals. It promotes the safety of consumption and being a guideline to prevent consumers' awareness of the dangers of pesticide residues, and research studies will be fundamental information that will lead to improvement of production processes by reducing consumption, chemical overuse of farmers and surveillance by the Provincial Public Health Office.

Objective

To determine the residues of Organophosphate and Carbamate residues in Chili pepper sold at the fresh markets in Pak Kret District, Nonthaburi Province by

1. Determine the percentage of pepper fresh market that detect unsafe level of Organophosphate and Carbamate residues.

Quantitative Research Hypothesis

1. Residues of Organophosphate and Carbamate in Chili pepper at unsafe levels.

Benefit

1. Know the safety level of Organophosphate and Carbamate that may be residual in chillies.

2. METHODS

In this research, this was to determine the cholinesterase inhibitor group of insecticides using Colorimetric cholinesterase inhibitor assay principle with the MJPK test kit of the Department of Medical Sciences. The lowest dose of enzyme inhibition of the test kit equal to 15%, was considered unsafe. The testing procedure is as follows [5].

Experimental Procedure

- 1) Cut the vegetables or fruits into small pieces. Put in the bottle to get 3 caps of the bottle.
- 2) Add 6 ml. of extract solution, cover the bottle tightly and shake vigorously about 2 minutes.
- 3) Gently open the cap of the bottle and pour all the extract into the glass tube.
- 4) Dip a glass bulb halfway into a glass of warm water then shake off the extract.
- 5) Swing the tube immersed in a glass of warm water until 1 drop of the extract is left approximately. Lift it out and turn the tube until dry.
- 6) Mix reagent 1 with 1 ml. of distilled water and shake well.
- 7) Add reagent 2 to each of the 3 mL glass tubes (1.5), control tubes and shake well.
- 8) Add 2 drops of prepared reagent 1 into the glass tube, control tube and shake well.
- 9) Pour the reagent from the glass tube into the plastic tube and mix the reagent 3 with 1.5 ml. of distilled water.
- 10) Add reagent 3 to the sample tube and control tube 2 drops each, shake well and observe the color immediately.
- 11) Read the results by the solution color change rate between the control lamps. If the sample tube changes color slower than the control tube, it means that there is pesticide. If the color of; the solution is dark orange liked a control tube can be

interpreted that as safe, If the color of the solution is orange and pink can be interpreted as unsafe (15% inhibition) and if the color of the solution is totally pink, It can be interpreted as very unsafe. (13) (14)

12) Pour the finished test solution into a kettle containing a disinfectant such as Dettol or Clorox diluted 1:10. Wait for at least 30 minutes and pour it down the drain. Turn on the faucet for 30 seconds approximately, rinse the used glass tube with dishwashing liquid and rinse thoroughly with water. Keep it for next time.

13) Quality control in testing must always be carried out in conjunction with the sample tubes to compare colors in reading results If the control tube color is not dark orange, repeat it.

14) Caution, test liquid is a chemical. If it gets on your hands or any other parts of your body, rinse suddenly with water and soap thoroughly. For the test reagent 2, it may cause infection.

Use a cotton swab coated with alcohol or disinfectant to clean.

Equipment and Chemicals in Experiment

1) Equipment

1.1) 180 plastic bottles (extracted bottles)

1.2) 180 glass test tubes

1.3) 180 plastic test tubes

1.4) 72 pieces of 3 cc. dropper tubes

1.5) 36 pairs of gloves

2) Chemical Reagent

2.1) 18 bottles of extraction liquid

2.2) 18 bottles of distilled water

2.3) 18 bottles of reagent 1

2.4) 18 bottles of reagent 2

2.5) 18 bottles of reagent 3

Population and Examples

The samples used in this research were 2 popular types of chili pepper, Chili pepper and red pepper. Using random sampling method by sampling Chili pepper and red pepper for 1 sample from 30 vegetable shops, including 30 chili pepper and 30 red pepper, a total of 60 samples from a total of 39 vegetable shops in Pak Kret District, Nonthaburi Province representing for sampling of Chili pepper and red pepper from 76.90% of shops that sell chili pepper and red pepper in Pak Kret District, Nonthaburi Province.

Research Tools

The instrument in this research was to determine the pesticide residues in Organophosphate and Carbamate group with the MJPK Pesticide Test Kit for Vegetables and Fruits for the determination of pesticide residues of the Cholinesterase inhibitor group in vegetables and fruits of the Department of Medical Sciences.

3. RESULTS

From the testing of 30 samples of Chili pepper and 30 red pepper samples, a total of 60 samples were tested with the MJPK test kit of the Department of Medical Sciences which is a preliminary test kit for detecting pesticide residues of cholinesterase inhibitors in vegetables and fruits by colorimetric Cholinesterase inhibitor assay. That causes the body to have symptoms of mild poisoning is considered as unsafe. Residues of Organophosphate were found and Carbamate group in 6 samples of Chili pepper, representing for 20% of the samples of Chili pepper. Residues of Organophosphate were found and Carbamate group out of the 5 samples of red peppers, representing for 16.67%, of the 60 samples of both Chili pepper, residues of Organophosphate were found and the Carbamate group of 11 samples, representing for 18% (Table 1).

Table 1: Results of pesticide residues in Organophosphate group and Carbamate in Chili pepper and red pepper

Types	The number of samples	Find residues of Carbamate & Organophosphate	Percentage of residue
Chili pepper	30	6	20.00%
Red pepper	30	5	16.67%
Total	60	11	18.33%

From the detection of Organophosphate and Carbamate residues in 30 samples of chili pepper, no Organophosphate residues were found. The unsafe level of Carbamate was 0% in the chili pepper samples, and out of the 30 red pepper samples, no Organophosphate residues were detected and unsafe level of Carbamate in the red pepper samples were 0% (Table 2).

Table 2: Results of pesticide residues in Organophosphate and Carbamate group in chili pepper and red pepper at unsafe level

Types	The number of samples	Find residues of Carbamate & Organophosphate		Percentage of residue at unsafe level
		Safe Level	Unsafe Level	
Chili pepper	30	6	0	0%
Red pepper	30	5	0	0%
Total	60	11	0	0%

4. DISCUSSION

From the detection of pesticide residues in 30 samples of chili pepper and 30 samples of red pepper, Organophosphate and Carbamate residues were found at safe level in 6 samples of chili pepper, representing for 20%, and Organophosphate and Carbamate residues were detected at the safe level in 5 red pepper samples, representing for 16.67% of all 60 chili pepper and red pepper samples, no Organophosphate and Carbamate residues were detected in unsafe Level.

This may be because in the area of Nonthaburi Province. Pesticide residues in vegetables were examined and continuous surveillance [6], resulting in awareness of pesticide residues and being more careful about pesticide residues in vegetables sold in the markets. The results of this study are consistent with the study by Wijitra Liaotrakoon and et al. [7] of the Detection of Organophosphate and Carbamate Pesticide Residues in Fresh Vegetables in Phra Nakhon Si Ayutthaya Province at safe level in all samples of vegetables tested. According to the study by Surachai Sungngarm who studied Contamination of Organophosphate and Carbamate Residues and Methods of Washing Fresh Vegetables in the Market, Surat Thani Province: A Case Study of Pho Wai Fresh Market found that vegetables had pesticide residues in the safe level at 64% [8].

This is inconsistent with the study by THAI PAN [9] to detect pesticide residues in fruits and vegetables. It was found that 58.7% of the fruit and vegetable samples contained more than the standard of pesticide residues. The fruits with the most pesticide residues were Chinese jujube, chili, celery, kale and small tomatoes. This may be because THAI PAN has studied the samples taken from various areas which may be used chemical pesticides in various areas of agriculture including imported fruits. Besides, the results of this study are inconsistent with the study by Supaporn Chaigarun and et al. [10], who investigated pesticide residues in Southeast vegetables of Thailand and local food. It was found that pesticide residues in Organophosphate and Carbamate group in the 4 provinces were quite high. This may be because farmers are using large amounts and using improperly, resulting in relatively high residues in vegetables in the area.

5. CONCLUSION

The determination of pesticide residues in a total of 60 samples which comprised of 30 samples of chili pepper and 30 samples of red pepper. Organophosphate and Carbamate residues were detected at the safe levels in 6 samples of chili pepper, representing for 20%, and Organophosphate and Carbamate residues were detected at the safe levels in 5 red pepper samples, total 11 (16.67%) samples were detected Organophosphate and Carbamate. No Organophosphate and Carbamate residues were detected in unsafe Level.

REFERENCES

- [1] THAIPUBLICA. Thai-Pan revealed results of vegetable and fruit chemical residues tested. [cited on 2022 August 15]. Available from: <https://thaipublica.org/2016/05/thai-pan-4-5-2559/>
- [2] Patcharee Kakakasama, Suwanee Saisilp and Soramon Suthin. Detection of Organophosphate and Carbamate Pesticides Residues in
- [3] Vegetables in Samutprakarn Province. APHEIT JOURNALS: 2016: 5(1), Jan-Jul. Available from: <https://apheit.bu.ac.th/journal/science-22-1/03patcharee.pdf>
- [4] Chiraphon Chaikiang, Siriporn Janmanee, and Orapan Hnookaw. Detection of insecticides residues in vegetables from the market in Muang District Suratthani Province. [cited on 2022 August 20]. Available from: https://kukr.lib.ku.ac.th/kukr_es/kukr/search_detail/download_digital_file/13009/87757
- [5] Department of Medical Science, Ministry of Health, Thailand. Food Test Kit Manual. [cited on 2022 July 01]. Available from: http://bqsf.dmsc.moph.go.th/bqsfWeb/wp-content/uploads/2017/Publish/e-book/foodsafetymanual_fulltext.pdf
- [6] CAD Anti corruption. Visiting farmers who produce free chemical vegetables. [cited on 2022 August 28]. Available from: <https://www.cad.go.th/ewtadmin/ewt/nonthaburi/main.php?filename=new5907>
- [7] Wijitra Liaotrakoon, Vachiraya Liaotrakoon, Priyanoot Peanleangchep and et al. Detection of Organophosphate and Carbamate Pesticide Residues in Fresh Vegetables in PhraNakhon Si Ayutthaya Province and Effectiveness of Washing Methods on Pesticide Residues in Kale. King Mongkut's Agr. J. 2020 : 38 (1) : 131-138. Available from: <https://li01.tci-thaijo.org/index.php/agritechjournal/article/view/185608/165015>
- [8] Surachai Sungngarm, Kampanart Sakrangkul, Laddaporn Krongnut and et al. Contamination of Organophosphate and Carbamate Residues and Methods of Washing Fresh Vegetables in the Market, Surat Thani Province: A Case Study of Pho Wai Fresh Market. Journal of Health Science, Thaksin University 2020; 2(1) January - April.
- [9] THAIPAN. 58.7% of pesticide residues found in samples of vegetable and fruits. [cited on 2022 August 30]. Available from: <https://thaipan.org/highlights/2283>
- [10] Supaporn Chaigarun, Sungwarl Somboon, and Samart Wanchana. Insecticide Residues in Isan Vegetable and Local Foods. KKU Journal for Public Health Research. Vol.6 No.3 July-September, 2013. Available from: <https://he01.tci-thaijo.org/index.php/kkujphr/article/view/117988/90539>