



Editor:
Wasu Pathom-aree,
Chiang Mai University, Thailand

Article history:
Received: January 28, 2020;
Revised: May 25, 2020;
Accepted: May 27, 2020;
<https://doi.org/10.12982/CMUJNS.2021.002>

Corresponding author:
Tippawan Prapamontol,
e-mail:
tippawan.prapamontol@cmu.ac.th

Research article

Multiple Pesticide Residues Found in Vegetables and Fruits from Rural and Urban Markets in Upper Northern Thailand

Tippawan Prapamontol^{1*}, Surat Hongsibsong¹, Warangkana Naksen^{1,2}, Tanyaporn Kerdnoi¹, Sawaeng Kawichai¹, Watcharapol Polyiem¹, Nisa Pakvilai^{1,3}, Buran Phansawan^{1,4}, and Choochad Santasup⁵

¹ Environment and Health Research Unit, Research Institute for Health Sciences (RIHES), Chiang Mai University, Chiang Mai 50200, Thailand

² Faculty of Public Health, Chiang Mai University, Chiang Mai 50200, Thailand

³ Environmental Science Program, Faculty of Science and Technology, Valaya Alongkorn Rajabhat University, Pathum Thani 13180, Thailand

⁴ Division of Environmental Science, School of Energy and Environment, University of Phayao, Phayao 56000, Thailand

⁵ Department of Plant Science and Natural Resources, Faculty of Agriculture, Chiang Mai University, Chiang Mai 50200, Thailand

Abstract Multiple pesticides are used in vegetable and fruit cultivation worldwide, including in Thailand. A survey series on pesticide residues in vegetable and fruit samples sourced from markets in urban and rural areas of upper northern Thailand during 2007–2013. Sixteen different vegetables ($n = 412$) and 11 different fruits ($n = 301$) were analyzed for 43 pesticide residues including 20 organophosphates (OP), 6 synthetic pyrethroids, 12 carbamates, 2 abamectins, imidacloprid, dithiocarbamates, and carbendazim. Out of the 412 vegetable samples, 235 (57%) had pesticide residues and 185 (45%) had pesticide residues that exceeded the maximum residue limits (MRLs). For the fruit samples, 245 (81%) of the 301 samples had pesticide residues and 165 (55%) had pesticide residues that exceeded the MRLs. The vegetable and the fruit samples had multiple synthetic pyrethroid residues and higher levels of residues than OP and other pesticides. Among the OP pesticides, chlorpyrifos was the most frequently detected pesticide. Residue detection in the rural samples was higher than that in the urban samples. The present study found very high numbers of samples to be above the MRLs: 45% of the vegetable samples and 55% of the fruit samples. Therefore, multi-residue methods are proposed as a regular monitoring system to ensure coverage of the multiple pesticides that are commonly used in agriculture and secure the national food safety policy.

Key words; Pesticide residues; Vegetables and fruits; MRL; Food safety

Funding: The present study was part of studies supported by the Thailand Science Research and Innovation (TSRI), formerly the Thailand Research Fund (TRF) (BDG5080018 and RDG5130010) and Chiang Mai University (2007-2010). The authors gratefully acknowledge this support.

Citation: Prapamontol, T., Hongsibsong, S., Naksen, W., Kerdnoi, T., Kawichai, S., Polyiem, W., Pakvilai, N., Phansawan, B., and Santasup, C. 2021. Multiple pesticide residues found in vegetables and fruits from rural and urban markets in upper northern Thailand. *CMUJ. Nat. Sci.* 20(1):e2021002.