PROPOSED SURVILLENCE SYSTEM FOR PESTICIDE RESIDUES AND HEAVY METALS IN GRAINS

By

Ghada Adel Ali Abdalla
B.Sc. Science, Ain Shams University, 1993
M.Sc. Environmental Sciences, Institute of Environmental Studies & Research, 2002

A Thesis Submitted in Partial Fulfillment of the
Requirements for the Doctor of Philosophy

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Environmental Sciences

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نظام مقترح لمراقبة متبقيات المبيدات والعناصر الثقيلة فى الحبوب

رسالة مقدمة من الطالبة

غادة عادل على عبد الله

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لاستكمال متطلبات الحصول على درجة الدكتوراة

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ABSTRACT

Ghada Adel Ali Abdalla. Proposed surveillance system for pesticide residues and heavy metals in grains. Unpublished Ph.D. Thesis in Environmental Sciences, Institute of Environmental Studies and Researches, Ain Shams University 2010.

Wheat plant was treated with malathion which is classified as an insecticide and recommended for use on cereal grains either pre-harvest or post-harvest application. Malathion was applied at the rate of 150g a.i./100L water under the normal field conditions.

Wheat samples appeared to be devoid of any detectable amounts of malathion 28 days after treatment. The pre-harvest interval (PHI) is about 6 days and the half-life time of malathion is 2.9 days.

Monitoring of pesticide residues in cereal grains showed that 3.6%, 32.2%, 10.9%, and 10.5% of barley, wheat, white maize, and yellow maize respectively were contaminated with one or two residues. The residues detected were for eight insecticides (chlorpyrifos, chlorpyrifos-methyl, diazinon, fenitrothion, malathion, permethrin, pirimiphos-methyl, and profenofos), one fungicide (diniconazole), one acaricide (bromopropylate) and one carbamate (carbaryl). Violation was due to chlorpyrifos and malathion residues which exceeded the maximum residue levels by 1.2%, 1.67%, 1.22%, and 3.16% in barley, wheat, white maize, and yellow maize respectively, while no maximum residue levels was established for diazinon, diniconazole, permethrin and profenofos.

Other part of this study concentrated on assessing the pesticide residues levels in some processed products of wheat such as wheat flour and bread. No pesticide residues were detected in any of the bread samples while wheat flour samples showed 14.7% contamination with no violation.

On the other hand, monitoring heavy metal content (Cd, Cu, Pb) of the commodities under investigation showed that 100% of the samples were contaminated with one or more of the studied heavy metals and the violation percentages were 31.4%, 18.3%, 9.8%, and 13.7% in barley, wheat, white maize and yellow maize, respectively.

Throwing the light on the effect of storage and storage conditions on the levels of pesticide residues and heavy metals, samples of wheat and white maize were withdrawn from lots stored in Imbaba Silos and

analyzed for their content of pesticide residues and heavy metals. Results of pesticide residue analysis showed that all white maize samples were free from any residues, while total contamination and violation percentages were 56% and 4% in wheat samples, respectively. Also results of heavy metals analysis showed that all wheat samples were contaminated with at least two of the heavy metals under investigation (cadmium and copper), while maize samples were contaminated with copper and lead only and no cadmium was detected.

Data obtained from this study was used in designing a model for a surveillance system for assessing levels of pesticide residues and heavy metals in cereal grains.

Key Words: cereal grains, wheat, yellow maize, white maize, corn, barley, wheat flour, bread, monitoring, surveillance, pesticide residues, heavy metals, silos, storage, and monitoring programs.

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