Determination of Copper and Lead in Samples of Fungicides and Insecticides in Diyala Governorate

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Abstract

This investigation included the estimation of heavy metals (copper, Cu and lead, Pb) in four types of pesticides that were been selected randomly from commercial markets in the Governorate of Diyala. Two types of insecticides (Lambada Cyhalothrin 5% EC and Zoro Super) and two types of fungicides (Folicur and Goldtanol 50% SL) were tested. The results showed that the highest concentration of lead was found in the insecticide Lambada Cyhalothrin 5% EC (5.621 Mg. l^{-1}), while the lowest value was recorded in the fungicide Folicur (0.147 Mg. l^{-1}). The highest concentration recorded for copper was found in the fungicide Goldtanol 50% SL (28.323 Mg. l^{-1}) whereas a much lower value was found in the pesticide Lambada Cyhalothrin 5% EC (5.995 Mg. l^{-1}). When a search of pesticides banned in the Gulf Cooperation Council (GCC) was performed it was found that the insecticide Lambada Cyhalothrin 5% EC is among the banned pesticides.

Keywords: *Copper and Lead, Fungicides, Insecticides, Diyala Governorate*

Introduction

A pesticide is a substance or a mixture of several substances that kill agricultural pests and prevent their propagation. The term "pesticide" refers to toxic chemicals that are spread in the environment of the pest by different means and forms [1]. Pesticides are classified in several ways, some of which are classified according to the targeted pest as fungicide, insecticide or spiders pesticide etc. They can be also classified according to the final form of the pesticide, such as liquid, emulsion, concentrated or wettable. Another criterion for classification is toxicity, where pesticides are classified as highly, moderately or lightly toxic, while they are classified according to the mechanism of action into systemic pesticides and contact-transmitted [2]. The circulation of pesticides and irrational use of them have caused some undesirable environmental manifestations. In fact, pesticides are elements that contribute to shifting the environmental balance with serious threats to both nature and humans which confirms the urge of their avoidance [3]. Shortage in farmers' knowledge about the risks of pesticides to humans and the environment was previously reported, as well as the poor application of measures necessary to reduce their risk [4]. Addiction of farmers to the use of pesticides was reported to cause countless environmental problems [5]. As high as 20% of the amount of pesticide used remains for one day after treatment, which may lead to higher rates of colon and stomach cancer according to the report of the World Health Organization, due the consumption of food contaminated with pesticides [6]. Despite the different components of pesticides, the present study sheds the light on the concentration of copper and lead, which are considered as heavy elements withe highest specific density. They exist in different environments at low levels, but increase through the introduction of various industrial and agricultural wastes, leading to increased change in the quality of the environment and damage to the living organisms [2] .

Materials and Method

Pesticides were taken from the commercial markets at random. Four pesticide brands of two types were studied, including two brands of insecticides, Lambada Cyhalothrin 5% EC and Zoro Super, and two of fungicides, Goldtanol 50% SL and Folicur

1: Pesticides for which heavy metals are estimated

1.1. Lambada Cyhalothrin 5% EC

An insecticide that works by skin contact and through digestive system and has an active effect on

insects that attack fruit leaves and soil surface, including the biting and the sucking insects.

1.2. Zoro Super

An effective pesticide on insects and spiders that is used used to treat vegetables, broad plantations, fruit trees, and ornamental plants. It is a concentrated emulsion with an active ingredient called Abamectin with a concentration of 36 g / L.

1.3.Goldtanol 50% SL

A fungal and bacterial pesticide that is used to treat soil and has a soluble liquid form.

1.4. Folicur

A systemic fungicide that is emulsified in water and specialized in the control of fungal diseases of wheat and other crops such as vegetables.

*Method of Digestion of Pesticides

The pesticides were directly digested by placing them in the furnace according to the previously described "graphite tube" method [7] .

* Quantification of heavy elements in pesticides

Quantification of the copper and lead in the samples was conducted using the atomic absorption device (AA-700 Atomic Absorption Shimadzu) because of its high precision in the diagnosis of heavy metals.

Results and Discussion

The results in table 1 show the presence of copper and lead in all pesticides used in the current study, with the highest value of the lead element in the Lambada Cyhalothrin 5% EC insecticide (5.621 Mg. l^{-1}) whereas the lowest was recorded in the fungicide Folicure (0.147 Mg. l^{-1}). Copper concentration showed a highest value in the fungicide Goldtanol 50% SL (28.323 Mg. l^{-1}) and a lowest value in the insecticide Lambada Cyhalothrin 5% EC (5.995 Mg. l^{-1}). The results demonstrate the presence of copper and lead in all of the tested pesticides. It was reported [8] that lead as well as chemical pesticide residues are serious sources of environmental pollution [9]. It was also demonstrated that insecticides and heavy metal compounds such as lead and copper, which are spread in the aquatic environment, are considered as dangerous environmental contaminants. The insecticide Lambada Cyhalothrin 5% EC is a pyrotechnic insecticide that is widely known and highly used in Iraq. The chemical structure of this type of pesticides includes a Cyanide atom (a-cyano-3-phenoxybenzyl 3-(2-chloro-3,3,3-trifluoroprop-1-eny1)-2,2-dimethylcyclopropanecarbo xyylate). So far, there is no specialized substance that acts on the toxic antagonism of pyrethroid pesticides, but some sedative drugs that relax muscles and reduce spasm levels can be used [10]. It was reported that most of the pollution with heavy metals is resulting from human environmental activities, including pesticides and chemical fertilizers [3]. A previous investigation of the effect of heavy metals in Al Hilla River region demonstrated that exhausts of cars, generators and waste materials are sources of lead pollution that affects human health, especially children. Lead can be distributed in the body reaching the brain, liver, and kidneys and is stored in teeth and bones where it accumulates over time. There is no current known level of safe exposure to lead. However, this study and our results propose to include chemical pesticides as main sources of heavy elements [11]. It was reported that fungicides that are added to the seeds or the soil are transferred from the roots to the leaves, whereas those sprayed on the leaves are transferred to the inside of the plant [3]. This cycle suggests that caution is required when using fungicides, because, in addition to the increased damage that may occur as a result of chemical compounds of the pesticide, there is an accumulation of heavy metals found in these pesticides, which increases the risk and effects of their frequent use. Lead and copper are dangerous elements that are sometimes transmitted from the plant to the body of the consumer (human and animal) through the food chain [12]. Lead is dangerous due to its cumulative feature, causing physiological damages such as mental retardation and lack of vital functions. The absorption of heavy metals by plants may vary from one class to another and from one type to another. The absorption of elements depends on many factors, including the movement of elements from the soil to the root, the ability of the elements to transit through the cells of the root epidermis, and the transfer of elements from the epidermal cells to the xylem tissue. These metals are then transferred to the leaves that perform the processes of photosynthesis and food manufacturing for all parts of the plant. At the end, the transmission of these elements takes place from the leaves to the storage tissues such as seeds, roots, and buds [13]. Previous reports demonstrated that henna extract can inhibit the radial growth of the fungus in tissue cultured of different varieties of date palm trees [14]. The inhibitory effect of the growth of

fungus when using henna leaf extracts may be attributed to the effect of active compounds found in the extracts such as resin, flavones, tannins and glycosides. Those results of henna leaf extract inhibition were consistent with many studies that proved similar effects in inhibiting the growth of other fungi. In addition, studies on the effect of volatile oils from lemon and mandarin showed a complete inhibition of the growth of the fungal pathogens compared with the use of fungicides [15]. Thus, such treatments could become substitutes for chemical pesticides. The use of powdered Cinnamomum cassia bark and bitter orange leaves showed inhibitory effects on the growth of *Aspergillus ochraceus* isolated from some grains and poultry, leading to reduced negative effects [16].

Table1 concentration of heavy metals lead and copper in Samples of Fungicides and Insecticides

Pesticides	Concentration Mg. l^{-1}	
	Lead(Pb)	Copper(Cu)
Lambada Cyhalothrin 5% EC	5.621	5.995
Goldtanol 50% SL	0.955	28.323
Folicur	0.147	16.332
Zoro Super	0.294	16.591

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Conflict of Interest: None to declare.

Ethical Clearance: All experimental protocols were approved under the College of Education for Pure Sciences, Biology. Dep. / Univ., of Diyala, Iraq and all experiments were carried out in accordance with approved guidelines.

References

1. Al-Mimar A, Jamal A , Zakaria A. Pesticides. Publications of Damascus University, Faculty of Agriculture, Syria. 2009.
2. Salman JM, Fikret M, Maysam A. Practical Methods in Environmental and Pollution Laboratories. Center for Environmental Research and Studies, University of Babylon, Iraq. 2017.
3. Al-Malah N, Abdul R. Chemical pesticides, their aggregates, methods of effect and metabolism in organisms and environment. Dar Al Yazouri Scientific Publishing & Distribution, Amman.
4. Jumaili MH. Application level of crop cucumber measures to reduce the risk of pesticides in the district of Samarra Salah - Religion and its relationship to some factors. University of Kirkuk Journal of Agricultural Sciences, 2017; 8 (3):11-21.
5. Al – Saab M. Possible Problems of Insecticides in Food Products, Thesis PhD, College of Agricultural Sciences, King Faisal University,Al - Ahsa, Saudi Arabia 2000
6. FAO/WHO Codex Alimentarins Commission). Food Additives and Contaminats.Joint FAO/WHO Food Standards Program, ALLNORM 01/12A. 2001;1-289.
7. ME Varju , E Elek A. Absorpt. Newsl. Determination of Soluble Copper in Soils by Atomic Absorption Spectroscopy. 1971; 10:128
8. Tamen, Zamil Lili. Pollution of drinking water in the city of Baghdad. Journal of the professor, 2017;2 (225):171-192.
9. Al-Hasnawi, Jawad Kadhim , Kefaya Hassan Maytha. Spatial variation of Shatt Al - Hillah water pollution, Journal of Babylon Center for Humanities Studies: 2018;8(4)185-206 University of Babylon.
10. Kazem A. Determination of heavy metal concentrations and some physical and chemical properties of soil used in domestic brick making. Journal of Education for Pure Sciences - Dhi Qar University, 2019; 9 (1): 49-60.
11. Alawi H. Environmental feasibility study of the

Hilla River in the light of the wastes in the area between the ruins of Babylon and the massacre. Journal of Kirkuk University for Agricultural Sciences, 2018 3rd International Agricultural Conference Issue: 2019;1044_1055.

12. B Mohsen, S Mohsen. Investigation of metals accumulation in Some vegetables irrigated with waste water in share Ray- Iran and toxicological application . American-Euras-ian. J. Agric. Environ. Sci. 2008;4(1): 86-92.
13. Taha D, Saleh H , Yehia F , Alaa K. Determination of Some Heavy Metals in Wheat Plant and Soil Cultivated for Al-Kour Brick Factories Area (Babylon). Babylon University Journal, 2013;8 (21).
14. Abbas M, Osama A , Insam M. Efficiency of Henna Leaf Extract and Some Fungicides in Reducing Fungal Contamination in Date Palm Tissue Culture Phoenix dactylifera L. Iraqi Journal of Biotechnology, 2007;6 (2):21-40.
15. Mahmoud A. Effect of volatile oils extracted from the peel of two citrus fruits on some fungi Journal of the University City Science College, 2013;5 (1): 56_65.
16. Al-Baldawi M, Halima Z , Khalid M. Effectiveness of Urea, Felix and Powders of Some Medicinal Plants in Inhibiting Growth of Two Aspergillus Fungi in Cultivated Media. Journal of Iraqi Agricultural Sciences, 2009; 40 (2): 82-92.