January 2007 Volume 2 Issue 1

Trade Science Inc.

Environmental Science

An Indian Journal

Ecotoxicology

ESAIJ, 2(1), 2007 [7-9]

Determined Organophosphorus Pesticide-Methyl-Parathion In *Achyranthes Bidentata*

Corresponding Author

QU Ling-bo[1,2]

[1]Department of Chemistry, Zhengzhou University, 450052, Zhengzhou, Henan, (CHINA)

[2]Anyang Normal University, 455002, Anyang Henan, (CHINA)

E-Mail: qulingbo@zzu.edu.cn

Co-Authors

Zhang liuji , SUN Wu-yong , LI Jian-jun

Department of Chemistry, Zhengzhou University, 450052, Zhengzhou, Henan, (CHINA)

Received: 14th October, 2006

Accepted: 29th October, 2006

Web Publication Date: 27th December, 2006

ABSTRACT

The levels of representative organophosphorus pesticide-methyl-parathion have been measured by different methods in 11 different samples of *Achyranthes bidentata* (AB). A new method by fluorimetry with calcein-Pd^{2+} was used to determinate organophosphorus pesticide- methyl-parathion. Although the frequency of methyl-parathion was relatively high, the levels of its residues were lower than that could be harmful to human health. To the samples collected from the same habitats, a rule could be found from the results that the levels of methyl-parathion in the samples mix-fried with wine decreased more or less, compared to the raw samples.

KEYWORDS

Methyl-parathion;
Achyranthes bidentata.

INTRODUCTION

Pesticide constitute a major group of potential environmental hazards to man. Pesticides have been routinely used in most countries of the world to control harmful pests. One of the most important aspects for minimizing the potential hazards to human health is the monitoring of pesticide residues in food. Organophosphorus pesticides are the most widely used in all kinds of pesticides, methyl-parathion is one of the organophosphorus pesticides used generally and of severe toxicity. It was reported that 75.4% of pesticides poisoning were caused by organophosphorus pesticides, furthermore, 80.0% within that ascribed to the participation of methyl-parathion[3].

Industrialization has improved the technology as

well as the quality of life, but also resulted in an increase of metals concentrations in environment. Heavy metals that may contaminate different foods constitute serious health hazards depending on their relative levels. *Achyranthes bidentata* (AB), is widely distributed and grown in Korea, China and Vietnam and has been shown to have wide application in traditional and folk medicines in these, as well as, other eastern countries[5]. The leaves and seeds have been reported as excellent cereal grain substitutes during periods of famine in both India and China. The whole plant, and particularly the roots, has been shown to contain various saponins, sterols, polysaccharides and alkaloids[1,5] and has well-defined expectorant, anti-in. Ammatory, antipyretic, antirheumatic and diuretic activities. In addition, to the above phytochemical compounds, several bioactive polysaccharides have been shown to possess immuno potentiating effects and also antitumor/necrotic activity in animal trials[2].

Although much is known about its function, little, if any information is available on pesticides residues in AB. It was, therefore, the purpose of this study to determine the content of the residue of the organophosphorus pesticide-methyl-parathion is of paramount importance to help in assessing the AB quality. Also it conducted to reveal and draw attention to the great problem of environmental pollution.

MATERIALS AND METHODS

Materials

1. Sample collection and sample preparation

11 samples were collected randomly from four primary habitats in China (including Provinces of Henan, Hebei, Anhui and Shanxi) to assess the levels of some heavy metals as well as methyl-parathion. Within them 7 samples was raw, and the other 4 samples of different processing method, mix-fried with wine, were assayed for comparative purposes in the same experimental conditions.

The samples were dried in an oven at 60°C for 24h and the dried material was powdered using a porcelain crucible. The analyses were carried out in triplicate.

2. Instrumentation

The following apparatuses were used: a HITACHI F-4500 fluoro spectrophotometer; respectively.

3. Standards and reagents

Standard of methyl-parathion was provided by the Environmental Protection Agency (EPA).

All reagents were of analytical grade. Deionized water was used. All glassware was soaked in a solution of 50% nitric acid for 24h, followed by rinsing with deionized water.

Methods

1. Determination of methyl-parathion residue

A fluorometric determination of trace methyl-parathion was established. The method was based on that the calcein displayed fluorescence in pH=7.4 buffer solution and its fluorescence disappeared when the calcein reacted with Pd^{2+}(mol/mol=1:1). The complex of methyl-parathion-Pd^{2+} was more stability than the complex of calcein-Pd^{2+}, when methyl-parathion reacted with calcein-Pd^{2+}, the calcein was freed and its fluorescence appeared again. The fluorescence maximum excitation and emission wavelengths were 492 and 512nm, respectively. The linear range was 1.0×10^{-7}~1.2×10^{-6}mol/L, calibration curve was $y= 3.02 +3.01\times10^{7}x$, r=0.9969, y and x present fluorescence and the concentration of methyl-parathion (mol/L), respectively. The detection limit was 5.0×10^{-8}mol/L. Recovery was 87~108%, RSD<4%.

The extraction of the methyl-parathion residue in samples was conducted according to procedures outlined in the FDA's PAM 1(1994). The determination procedure was that 5ml of 1.0×10^{-6}mol/L calcein-Pd^{2+} solution, 5ml of pH=7.4 buffer solution(preparation with NaOH-KH_2PO_4) and the preparation solution of each sample were added to a 25ml volume flask. The volume was completed to 25ml with the deionized water. The obtained solution was used for determination after 8h.

RESULTS AND DISCUSSION

The results of the methyl-parathion in the eleven samples were showed in TABLE 1

TABLE 1: Concentrations of methyl-parathion in 11 AB samples

Samples	Methyl-parathion (ug/g)
Henan 1	3.45
Henan 2	3.27
Henan 3[a]	2.31
Hebei 1	3.34
Hebei 2	3.55
Hebei 3[a]	3.00
Hebei[b] 4	1.91
Hebei[b] 5[a]	0.56
Anhui 1	1.24
Shanxi 1	2.14
Shanxi 2[a]	0.29

[a] **The samples mix-fried with wine**

[b] **Samples of Hebei 4 and Hebei 5 were collceted from Heibei Province but of the different species with Hebei 1, Hebei 2 and Hebei 3**

The results in TABLE 1 showed that the organophosphorus pesticide- methyl-parathion was found in all of the eleven samples and presented concentrations from 0.29-3.55ug/g. The lowest and highest values were found in the samples of Shanxi 2 and Hebei 2, respectively. From the above results it can be concluded that, although the frequency of methyl-parathion was relatively high, the levels of its residues were lower than the level that can be harmful to human health. But with the view to severe toxicity of methyl-parathion, it was suggested to avoid being used as it as possible.

It was worthy of note that, to the samples collected from the same habitats, a rule could be found from the results that the levels of methyl-parathion in the samples mix-fried with wine decreased more or less, compared to the raw samples. For example, the values of methyl-parathion residues in Henan 1 and Henan 2 presented 3.45 and 3.27 ug/g, respectively, whereas it decreased to 2.31 ug/g in Henan 3, which was mix-fried with wine. The same trend occurred in Hebei 1 and Hebei 2 vs Hebei 3 (3.34, 3.55 to 3.00 ug/g), Hebei 4 vs Hebei 5 (1.91 to 0.56 ug/g), Shanxi 1 vs Shanxi 2 (2.14 to 0.19 ug/g), respectively. It can owe to the same strong polarity of methyl-parathion and alcohol. When the AB samples were mix-fried with wine, the alcohol can take some methyl-parathion away. So it was recommended that AB mix-fried with wine will be better than the raw material for use as medicine, as well as food.

REFERENCES

[1] G.H.Bisht, Sanhu, B.Bisht; Chem.Soc., **67(12)**, 1002-1003 **(1990)**.

[2] Z.K.Li, D.D.Li; Acta Pharmaceutica Sinica, **32(12)**, 887-891 **(1997)**.

[3] H.Z.Long, Y.T.Lu; Translation of Pesticide, **19(3)**, 54-56 **(1997)**.

[4] T.D.Luckey, B.Venugopal; 'Metal Toxicity in Mammals', Plenum Press, New York, **(1977)**.

[5] S.Nikolov, N.Thuan, V.Zheljazkov; 'Flavonoids from Achyranthes Bidentata BC', **(1996)**.

[6] I.PAM; Pesticide Analytical Manual (Vol. **I**, 3rd Ed.). US Department of Health and Human Services, Washington, DC: Food and Drug Administration, **(1994)**.

[7] PUNE; Les pollutants d'origine en Mediterranee. Rapports et Etudes du PUNE sur les Mers Regionales, No. 32, PNUE/CEE/ONUDI/FAO/UNESCO/OMS/AIEA, **(1984)**.

[8] WHO World Health Organization. Health criteria other supporting information. In: Guidelines for Drinking-water Quality, **2**, 2nd Ed., Geneva, 31-388 **(1996)**.

[9] Y.Z.Xie, Z.X.Zhuang, Z.G.Zhang, C.L.Yang, P.Y.Yang, B.L.Huang; Journal of Analytical Science., **13(4)**, 296-299 **(1997)**.