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## AN INVESTIGATION OF PESTICIDE RESIDUES IN AGRICULTURAL CORPS OF KERMANSHAH, IRAN

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### Abstract

Present work is addressed an investigation of residual pesticides in agricultural corps of Kermanshah, Iran. The residual concentration of Phosalone and Chlorpyrifos in vegetarians' products including cucumber, tomato, lettuce, cabbage and spinach were survived. High level of Phosalone for cucumber, spinach, tomato and lettuce were determined from the both two location. At among, higher concentration of Phosalone was obtained for cucumber and spinach equal  $28 \pm 3.5$  and  $18 \pm 2.2$   $\mu\text{g}/\text{kg}$ , respectively. The average Phosalone for tomato and lettuce was  $11.4 \pm 1.7$  and  $13 \pm 1.6$   $\mu\text{g}/\text{kg}$ , respectively. During second phase and tracking the Chlorpyrifos, a higher amounts concentration of pesticide were found in spinach, cucumber and tomato. For Miandarband location, cucumber significantly was high containing Chlorpyrifos ( $88.6 \pm 7.5$   $\mu\text{g}/\text{kg}$  with p-value 0.012). The results recommended that the some parameters including the pesticide dose, frequency and lack of spraying awareness can affected to undesirable amount of pesticide.

**Keywords:** Phosalone, Chlorpyrifos, pesticide residues, agricultural corps.

### Introduction

Kermanshah city is the capital of the Kermanshah province of Iran in the calendar year 2006, and it is located in Western Iran (1). Kermanshah is the trade center of rich agricultural region. Also, Ravansar and Miandarband have more agriculture potential. To ensure high crop yields and during production and post-harvest treatment of agricultural commodities synthetic pesticides are utilized (2). Phosalone is a non-systemic pesticide and acaricide and

often is used against aphids, red spider mite and Lepidoptera on apple trees (3). Similar to phosalone the Chlorpyrifos is a non-systemic pesticide that used to control a large range the pests in soil, fruits and other agricultural products (2). Chlorpyrifos commonly is used to improve the crops yields in many countries. Pesticide management in the developing countries is often weak and it occurs by lack of resources and legislation (4). However, a relatively high level of pesticide residues during spraying inter to environmental and return introduce to food. Thus increased use of pesticides in agriculture has resulted in the occurrence of residues in food commodities (2). As the result health effects arise due to intakes of pesticide residues on food. To develop Governmental actions, guarantee the fruit program, production, safety and commercialization, monitoring, planning and regular survey program is necessary to evaluate commodities and pesticide contamination (5). However, awareness from present state is provided with correct implementation of these programs. Since the Fruits and the vegetables eaten raw, there is a lot of attention in monitoring programs for them (2). On the other hand, these food groups aren't processed before than eating, likely it is expected that they contain higher pesticide residue levels. Today, the synthetic pesticide plays a major role for controlling vegetable diseases and pests. With regard to food and environmental concerns, the use of pesticide causes many problems (6). However, due to prevention of these problems responsibly planning and survival works are very important keys. From these categories can be mention such as pesticide management, regular survey and monitoring, improve the awareness of farmers, and develop the pesticide detection methods. In line with nominated strategies to be decline the health and environmental concerns present study was conducted. The main goal of this work is evaluation of Phosalone and chlorpyrifos levels in the popular vegetarians' products in Kermanshah, Iran.

## **Material and methods**

### **Chemical regents**

All chemical regents such as methanol, acetonitrile, acetone, 1-decanol, 1-dodecanol, 1- undecanol, hydrochloric acid and sodium chloride were obtained from regular authentic company (Merck, Germany). The used Pesticides (Phosalone and chlorpyrifos) were prepared from polyscience (Niles, USA). The used solutions were prepared by dilution of the stock solution. The stock solutions were stored in a dark place at 4 °C and used daily.

### **Study area**

At present work forty samples encompass cucumber, tomato, lettuce, cabbage and spinach were collected from Miandarband and Ravansar farms (province of Kermanshah, Iran). As seen as in Fig.1, there is a geographical image of studied area. Ravansar is located in the northwest of Kermanshah. Miandarband is the central district of

Kermanshah county includes about 101 villages. The considered area hosts a range of land uses, including residential property, and mainly agricultural actives. The samples were provided from four different farms with two sampling phases.

### Analysis

The Dispersive liquid–liquid microextraction (DLLME) was considered for analyzing the samples. To analysis the final extraactant at sedimentation phase was injected into a HPLC. The analysis of pesticides was performed by a HPLC with Smartline-UV-2500 variable wavelength programmable detector (Berlin, Germany) and H5-ODS C18 column (15 cm × 4.6 mm, with 5 μm particle size) from Anachem (Luton, UK).

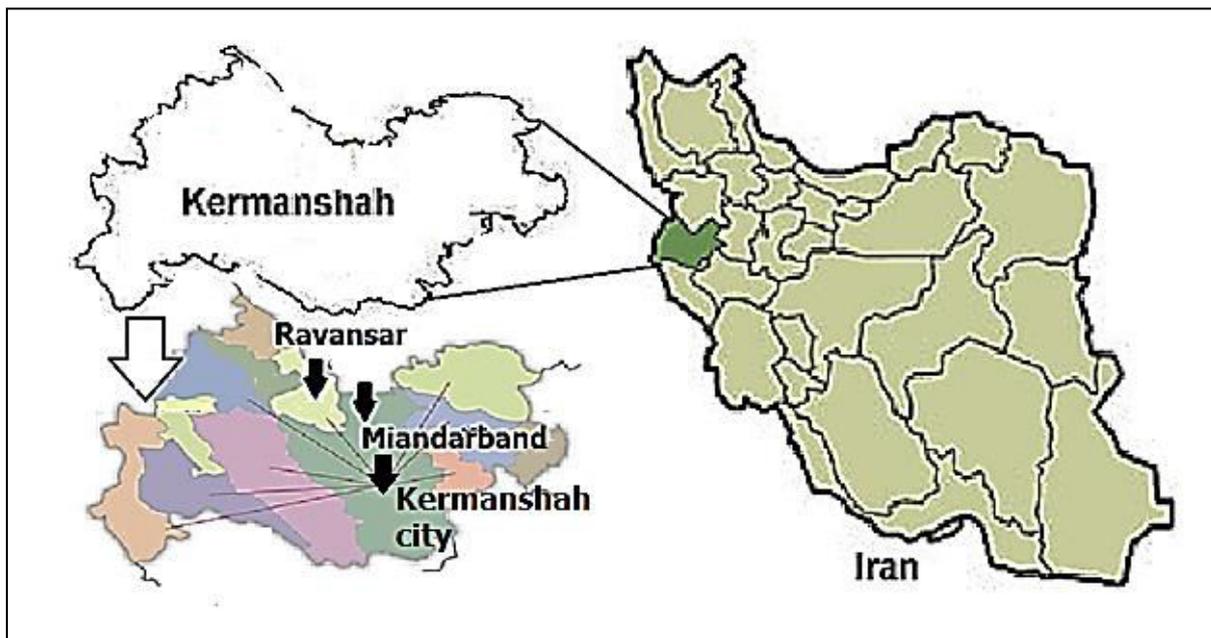


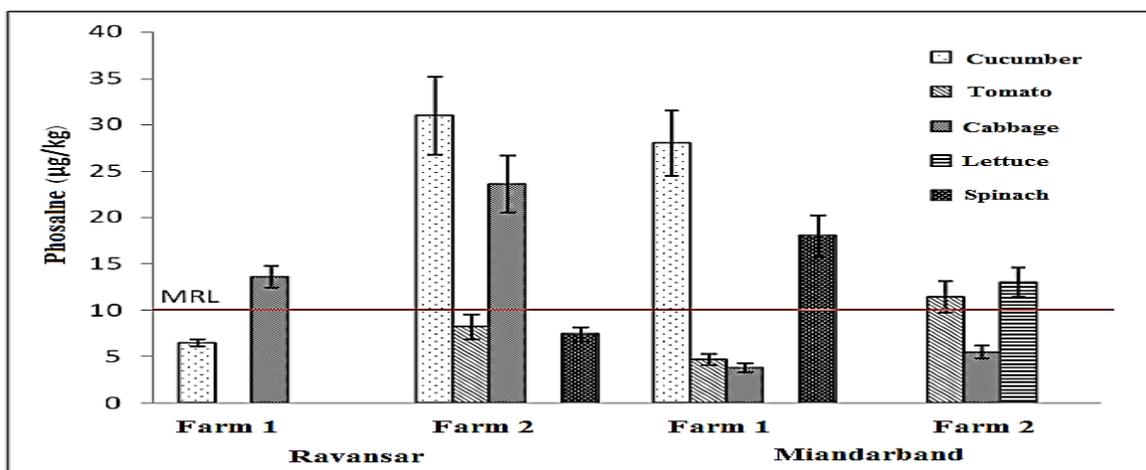
Fig. 1. The geographical image of study area (Ravansar and Miandarband location).

### Result and discussion

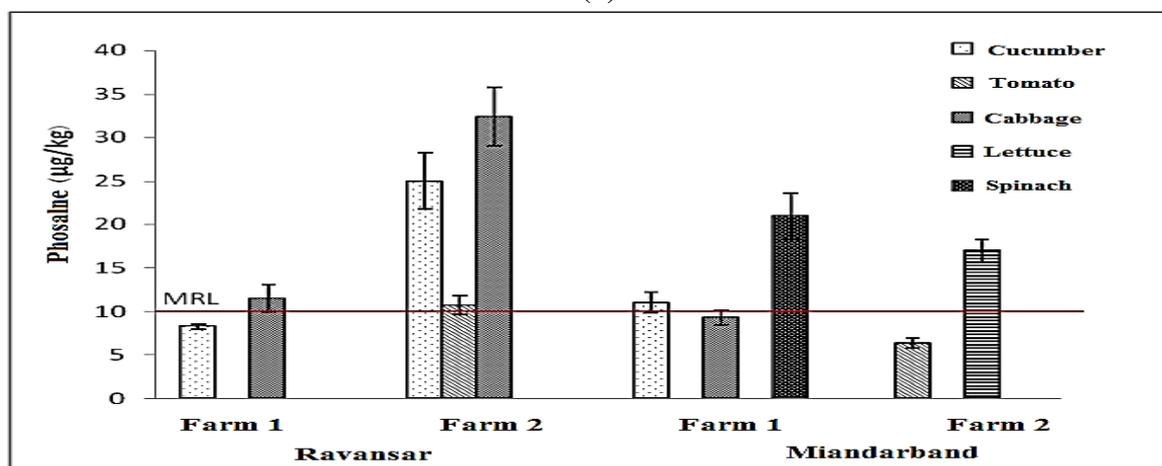
At first stage, to evaluate the contain Phosalone, about twenty samples were taken from five agricultural products. The results of this step are illustrated in Fig. 2a. Accordingly, it is clear that the cabbage in Ravansar Farm 1 (RF1) and cabbage and cucumber in Ravansar Farm 2 (RF2) are more than standard red-line that it represents as maximum residue level (MRL). The MRL is defined as the highest amount of a pesticide residue in food when appropriate pesticides dose are used and it has considered for Phosalone equal to 10 μg/kg. Average level of Phosalone in cabbage was determined about 13.6±1.2 and 23.6±3.1 μg/kg, in RF1 and RF2, respectively. Also, a significant (p-value>0.05) level of this pesticide (31±4.2 μg/kg) was found in RF2 for cucumber. With regard to Miandarband Farms (MFs), can be seen a high level of Phosalone for cucumber, spinach, tomato and lettuce. At among, higher

Phosalone concentration was obtained for cucumber and spinach equal  $28\pm 3.5$  and  $18\pm 2.2$   $\mu\text{g}/\text{kg}$ , respectively. The average Phosalone for tomato and lettuce was  $11.4\pm 1.7$  and  $13\pm 1.6$   $\mu\text{g}/\text{kg}$ , respectively. Other samples were lower than MRL or the Phosalone not detected. In second round of survey, all determination was repeated. Fig. 2 b, illustrates the pesticide analyzing during second survey. According to plot, similar pattern of residual level is acquired. Pesticide residual levels mainly were determined for cucumber, spinach, tomato and lettuce in the both location farms. One-fourth on samples were determined with higher than MRL for Phosalone. To detect the Chlorpyrifos like the Phosalone vegetarian products were analyzed. The MRL for Chlorpyrifos was set equal to 50  $\mu\text{g}/\text{kg}$ . Fig.2, displays the results of this survey. According to Fig.2 a, higher amounts of Chlorpyrifos were found in spinach, cucumber and tomato. The spinach from RF1 and RF2 were  $58\pm 4.3$  and  $63.6\pm 6.2$   $\mu\text{g}/\text{kg}$  without significant level of probability (p-value~ 0.063 and 0.084). For Miandarband, cucumber was high containing Chlorpyrifos significantly ( $88.6\pm 7.5$   $\mu\text{g}/\text{kg}$  with p-value 0.012). As seen from Fig.2 b, the second survey for Chlorpyrifos is represented. At this survey one-fifth of samples were contaminated. Like second Phosalone survey, second Chlorpyrifos survey was similar to first evaluation. These results can demonstrate accuracy of obtained data. Although, there is similar contamination in the both location by pesticide, but the pesticide levels were different. It can be concluded that the some parameters were affected such as pesticide dose, frequency and lack of spraying awareness. Phosalone is degraded under aerobic and anaerobic conditions similarly. Its degradation by soil microorganisms is one of the major decomposition pathways. Typically, the Half-live of phosalone are more than 9 days depending on pH, but it is varying according to the ambient conditions (7). By adsorption coefficient ( $K_{oc}$ ) of phosalone that has been demonstrated strongly, can be found that it is not very soluble in water (7). This result recommends that why phosalone is relatively more than MRL? Because of higher soil adsorption of phosalone it can contact to agricultural products for long time. By a higher half-live more than agricultural products consumption it is remain at higher levels. Sinha et al. reported a study entitle "Distribution of pesticides in different commonly used vegetables from Hyderabad, India" and they showed that the phosalone was seen in eggplant, cabbage, cauliflower and chili about 50.85, 27.43, 4.596 and 22.19  $\mu\text{g}/\text{kg}$ , respectively (8). In other study Sinha et al. have been shown that the Phosalone in all vegetable samples (encompass eggplant, cabbage, cauliflower) were existed (9). Celik et al. reported that the phosalone in pepper and grape was dropped below the tolerance limits within 16 d in peppers and within 10 d in grapes and apples(6). They demonstrated the main effective mechanisms in reducing phosalone are including volatilization, solar irradiation and bacteria.

Due to short to moderate persistence of the Chlorpyrifos in the environment and relatively high MRL than phosalone it has shown lower concern. The main dissipation pathways include volatilization, photolysis, abiotic hydrolysis, and microbial degradation (10). Like phosalone the Chlorpyrifos has longer half-life time about more than 11 days (10) and it can cause the Chlorpyrifos usage become important due to longer contact to products and environmental/health concerns. Qin et al. have been documented a complete report entitled 'Pesticide residues determination in China vegetables in 2010–2013' and they reveal that the Chlorpyrifos has been found in many agricultural products such as cabbage and Wild cabbage, Water spinach, Spinach, Lettuce, Cucumber etc. with a range of 0.0008–2.3344 mg/kg (11). They reported that six samples having levels above the MRL. In addition, similar findings because of higher levels of Chlorpyrifos concentration have been reported for Bangladesh vegetarian farms (0.010–0.70 mg/kg), Poland (0.012 mg/kg), India (0.011 mg/kg) and Venezuela (0.14–0.16 mg/kg)(11). Chen et al. reported that the chlorpyrifos had measurable residues in 7.3% of the samples mainly in Chinese cabbage, at concentrations from lower than detection limit to 2.545 mg/kg.

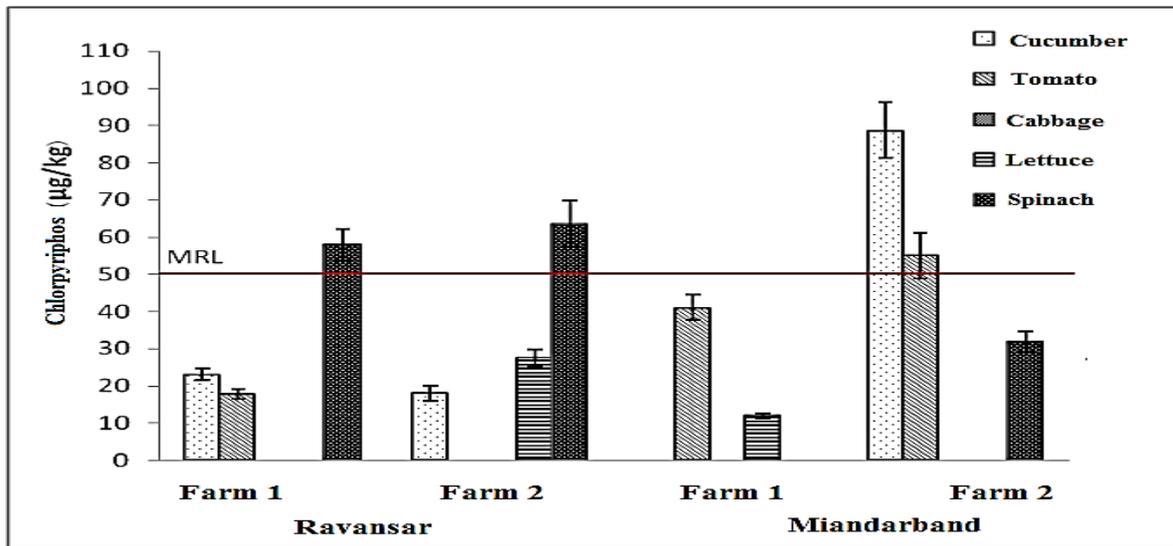


(a)

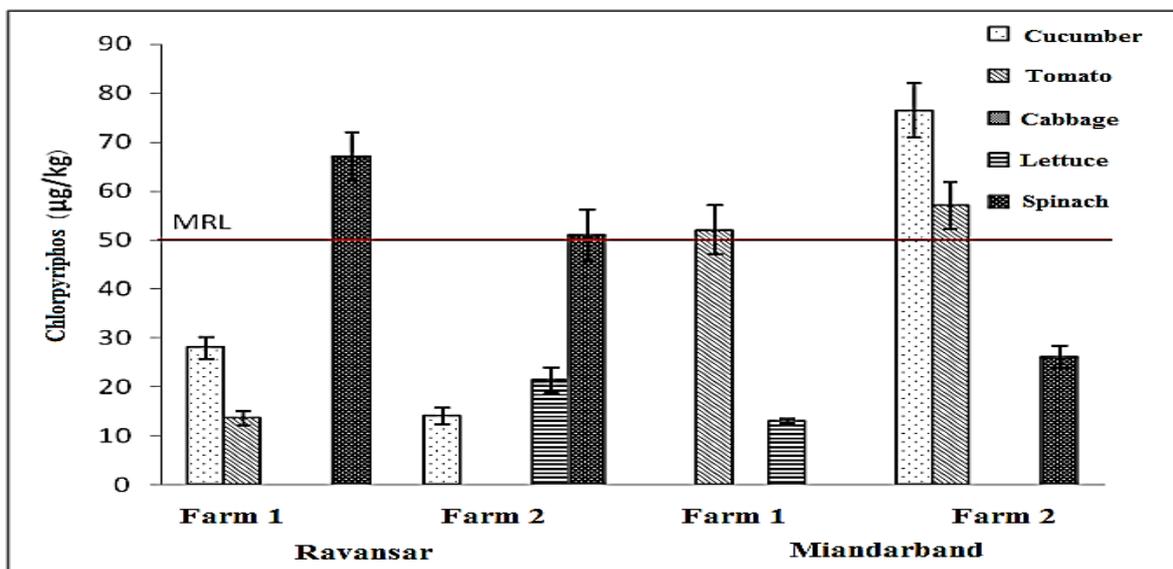


(b)

Fig. 2. Residual Phosalone in samples from four different farms of Ravansar and Miandarband during two sampling periods; (a) first and (b) second sampling.



(a)



(b)

**Fig. 2. Residual Chlorpyrifos samples from four different farms of Ravansar and Miandarband during two sampling periods; (a) first and (b) second sampling.**

### Conclusion

At present work the residual concentration of Phosalone and Chlorpyrifos in some popular vegetarians' products were studied. High level of Phosalone for cucumber, spinach, tomato and lettuce were determined from the both two location (Ravansar and Miandarband). During second phase and tracking the Chlorpyrifos, a higher amounts concentration of pesticide were found in spinach, cucumber and tomato. These results implied that the some parameters such as pesticide dose, frequency and lack of spraying awareness can affected to undesirable amount of pesticide in analyzed products.

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