Research Journal of Biological Sciences 2 (6): 670-673, 2007
ISSN: 1815-8846

Measurement Residue of Two Current Used Pesticides (Endosulfan and Fosalon) in Colorado Potato Beetle Control

[1]Fatemeh Nasehi, [2]Mohammad Zaeefi Zadeh, [3]Hossein Shahbazi and [4]Ghadir Noori Ghonbalani
[1]Department of Environmental Science, [2,3]Department of Agricultural Science,
Islamic Azad University of Ardabil Branch, Ardabil, Iran
[4]Department of Entomology, Mohaghegh Ardabili University, Ardabil, Iran

Abstract: In our country high amount of insecticides are been consumed to fight agricultural pest that can severely contaminate environment and arable crops. Phosphoric and chlorine toxins, are from important one's for high toxicity and long-term persistence in the environment, respectively. These toxins directly or indirectly enter environment and enter crops and through it enter nutrition cycle of organisms. Determining of these toxins residue consistency and comparing with world standards will help us in management of correct use of pesticides. In present research effects of different consistency of toxin and crop-dusting time on the rest of two toxins [Endosulfan (Thiodan) and Fosalon (Zolone)] that frequently used in control of Colorado potato beetle were been evaluated. The procedure includes sampling stage, condensation, concentrating and analysis. Analysis was been performed by GC machine and FTD, ECD detectors. According to result, it is specified that using of different consistency with applying of different consistency, residue of these toxins weren't higher than standard, again it is specified that residue of Fosalon was more than Endosulfan. Results showed that there was no meaningful difference between different consistencies and different using time, from the viewpoint of residue of toxins. Sampling with one month interval showed that with lapse of time toxin's residue has been reduced as 0.008 PPM.

Key words: Potato, fosalon, endosulfan, environment, residue

INTRODUCTION

Environment pollution is from issues that has caused so many problems. Discovery of chemical substances, especially pesticides is from historical events that followed by human's power waxing in control of environment. Undoubtedly discovery of chemical substances is for harmful creations killing and then it won't be surprising that pesticides harm as they benefit.

According to widespread usage, either allowable or illegal of pesticides in Iran, crops and environment will face accumulation of toxins problem (Hatami, 1987). High consistency of a toxic compound may kill all or most of creations in the region which in the consistency has increased. Also if these substances enter soil directly or through raining water, some of chemical reactions and important biologic exchanges will be harmed, which are in the center of live world. Nitrate production which in, plants are furnished with air nitrogen is a good example. Special pesticides cause nitrate production cessation and some of them reduce its speed two week after usage (Karson, 1989). Sometimes problems occur through population's subtle disequilibrium. Sometimes pesticides usage causes population explosion in some cases, through reducing other creation's population and unsettling hunt and hunter relation. One of best points should be remember about pesticides is their persistence in soil not only within months but also years. For example, Aldrine a chlorine toxin has been found four year after usage in soil in the changed form (Dildrin). The amounts that seem moderate may create significant amounts after accumulation. After each use of all persistent chlorine toxins (e.g., Endosulfan) previous amount will be increased in soil (Karson, 1989).

In this study, which in, two current used toxins in potato crop of Ardabil, which is important pole of potato production in country, were evaluated. No residue of Endosulfan was observed and also residue of Fosalon in comparison with world standards was low in as much as that could be ignored.

Analysis in America within 1994-2002 and obtained results of studies performed at 1998 in Michigan State on

Corresponding Author: Fatemeh Nasehi, Department of Environmental Science, Islamic Azad University of Ardabil Branch, Ardabil, Iran

various samples of potatoes, showed no residue of two studied toxins (Max *et al*., 2002; Charles and Ben, 2004; Sealar *et al*., 1994; Lecy and Hmmeschmidt, 1995).

After these results, entrance of massive amounts of these pesticides into environment, a group of scientist who were gathered for soil condition evaluation in Syracuse University, all were agreeable that continuous usage of pesticides and their persistent residue's accumulation in soil will definitely create problems (Karson, 1989).

MATERIALS AND METHODS

The experiment was executed in research land of Islamic Azad University of Ardabil, in three-factor factorial form and in the form of completely randomized Block design.

First factor include toxin type in two layers (Fosalon and Endosulfan) second factor included dose of toxins in three layer (1.5, 3 and 4 L ha^{-1}) and third factor included two crop-dusting time (at pedicel growing at June and July). Variety of potato was Draga which has been cultivated in 4 terraces that each terrace includes 3 rows with 6 cm interval and 5 m length (Zar, 1984). The method includes three stages: Sampling, extracting and analysis.

Sampling: Sampling was executed in two times, which each time regarded as a repeat, as each time 12 and totally 24 samples were supplied. For example, 10 bushes were selected randomly and then from these samples 0.5 Kg potato was selected. These samples were sent Tehran to be analyzed in Food and Drug Control Lab of Ministry of Health (It is noteworthy that samples were refrigerated till sending Tehran).

Extracting and condensation: Five gram of samples plus 5 mL distilled water and 500 mL Acetone and 17.5 g salt were mixed then 50mL Cyclohexan and Ethyl acetate were added, with 50/50 proportion and after mixture two phase ,fluid and organic phase were separated. Organic phase contain toxin. To achieve toxin in high amounts, extracting were repeated frequently. After sample filtration, using moving evaporation set that was been added with Dodecan, extracting and condensation of samples was executed to reach 1 mL of content (Tomline, 1985; Beltean, 1998; Miles, 1992).

Analysis: Sample analysis was performed using Gas Chromatography which is one of most authentic and successful methods in analysis of toxins residue.

Endosulfan and Fosalon analysis was executed using ECD (for its sensitivity to chlorine toxins) and FTD (for its sensitivity to phosphorous toxins) detectors, respectively and finally toxin's residues were calculated with comparison between standard chromatograms and obtained chromatograms and comparison of their under peak area (Tomline, 1985; Beltean, 1998; Miles, 1992).

To determine sensitivity of this method recovery test was performed. After machinery procedure execution results showed recovery average as 70-80%.

Statistical analysis: To analysis data, we used variance analysis method in the factorial form. There was zero among data and then data don't have normal distribution. We used square root conversion method for data normalization. It means that variance analysis was performed on the $\sqrt{0.5}$ + toxin residue.

RESULTS

Results of data variance and average of rest of toxins for studied factors are presented in Table 1 and 2, respectively. On the basis of variance analysis of data and comparison between averages, it has been specified that:

- There is meaningful difference between rests of 2 toxins types in the probability of 5 % as average Fosalon's residue was 0.018 ppm while Endosulfan have had no residue (Table 1 and 2).
- On the basis of results obtained from variance analysis table it has been specified that although there is no meaningful difference between various consistencies of toxins, still the most observed average of Fosalon's residue was in 4.5 L ha^{-1} consistency with consistency average of 0.023ppm. It is axiomatic that extensive difference of dose levels of toxins will induce significant differences in residue of toxins (Table 1 and 2).
- In comparison between residue's consistency averages in various times, it has been specified that residue of toxins average in one crop-dusting is less than residue of Fosalon's average in two crop-dusting with values as 0.007 and 0.011ppm respectively. This difference isn't meaningful statistically but comparison between above values show high difference between two residue of Fosalon (Table 1 and 2).
- According to Table 1 and 2 it has specified that although pesticides residue in two sampling have no significant difference however average of pesticide residue in first and second sampling has been 0.013 PPM and 0.005 PPM respectively, consistency of toxins has been reduced (0.008 PPM).

Table 1: Results of variance analysis of toxins rest in potato knurl (Draga type) in Ardabil Region within 2003

Change source	Level of freedom	Sum of squares	Average of squares	F value
Sampling rotation	1	0.000	0.00	0.8893^{ns}
Toxin type	1	0.001	0.001	4.8472*
Toxin condensation	2	0.000	0.00	0.169^{ns}
Toxin type × toxin condensation	2	0.000	0.00	0.169^{ns}
Time of toxin usage	1	0.000	0.00	0.2641^{ns}
Toxin type × Time of usage	1	0.000	0.00	0.2641^{ns}
Toxin condensation× Time of usage	2	0.001	0.00	1.5764^{ns}
Toxin type × condensation × Time of usage	2	0.001	0.00	1.5764^{ns}
Error	11	0.002	0.00	

ns: Statistically insignificant, *: Significant at level of 5%

Table 2: Average of Fosalon and Endosulfan residues in potato's knurl in different levels of treatment

Type of treatment	Treatment level	Residue value
Toxin type	Fosalon	0.018
	Endosulfan	0.000
Sampling rotation	First Sampling	0.013
	Second Sampling	0.005
Toxin condensation	1.5	0.010
(L ha^{-1})	3	0.006
	4.5	0.012
Dusting number	One	0.017
	Two	0.011

- All mutual effects (bipartite and tripartite) were insignificant; it means reaction of a factor hasn't been changed from one level to another.

DISCUSSION

According to results it has been observed that potato's root doesn't absorb Endosulfan. Then it can be concluded that considerable amount of Endosulfan which is consumed against Colorado beetle enter environment. Whereas Endosulfan is chlorine toxin and chlorine toxins have a great persistence in the environment (Noorzian, 1999) this toxin either in primary form or decomposed form accumulate in soil and enter water sources through frequent raining.

According to performed studies at Florida, which in, absorption and persistence of some pesticides in soil, were been evaluated, Endosulfan's absorption by soil and its persistence were 12.400 mL g^{-1} and 50 days, respectively.

According to persistence period of this toxin it is concluded that within 50 days, Endosulfan enters water sources easily and contaminate them. According to most extensive report of water sources monitoring performed by research of Environment Defense Organization of U.S.A at 1993, it is specified that in 10.4% of rural house borehole rest of one or more pesticides are found (Nabizadeh, 2000).

Fosalon is a dangerous phosphorous toxin that is absorbed in low quantity by potato's root and world standard for rest of this toxin in potato is 0.1 PPM (WWW.pmf-org/stat.htm/2003) and this toxin's residue in results is lower than standard then it is said that Fosalon don't have residue in potato.

Examination performed on various potatoes' sample in India at 2004 have shown that residue of Fosalon in potato's knurl wasn't seen and Endosulfan's residue is unimportant and bagatelle, too Kumari *et al*. (2004).

Then using these pesticides on potato doesn't cause risks for consumers, because residues of these toxins don't be found in this crop.

But if look at this issue from another aspect we apprehend that these pesticides enter environment, air, soil and water sources easily because of imprudence of farmers and raining. Beside irrecoverable damages for these sources, enter nutrition cycle of creations and finally human's and have risks for it.

In a examination performed on 61 sample of soil including surface soil and soil from 30cm depth, results have shown that Malathion insecticide (that is phosphorous insecticide like Fosalon) have been detected 2 month after crop-dusting in the surface soil and deep soil, as 0.1 PPM and 0.2 PPM, respectively.

On the basis of these finding it seems that with time lapse entrance of pollutant into water is definite. Then to prevent or at least to minimize catastrophic events in environment should do enterprises.

The most important action is correct management of pests, it means, select correct agricultural pest control methods that guarantee congenial economic, bioenvironmental and social results.

According to reduction of Fosalon's residue content, in second period, in comparison with first one.

CONCLUSION

It is concluded that with time lapse residue's condensation of toxins reduce then maybe the most advisable action is to don't market immediately after harvest. Therefore, to clarify suitable time of marketing, examination on residue's condensation of toxins according to storage period is needed to evaluate the residue values in different time of storage.

REFERENCES

Beltean, 1998. Analysis methods. J. Chromatogr., 808: 257-263.

Charles, M. and C.M. Ben Brook, 2004. Minimizing dietary exposure through the consumption of organic food. An Organic Center of Science Review.

Hatami, B., 1987. Pesticides and management of pests. Mashhad Jahad Publication.

Karson, R., 1989. Silent spring. Translated by Vahhabzadeh A. Mashhad Jahad Publication.

Kumari, B., V.K. Madan, J. Singh, S. Singh and T.S. Kathapal, 2004. Monitoring of pesticidal contamination of farm gate vegetables from histar. Environ. Assess., 901: 65-71.

Lacy, M.L. and R. Hmmeschmidt, 1995. Disease of potato: Late blight. Michigan State University Extension Bulletin E-11802.

Max Buffler, P.A., R.B. Gunnier, G. Duhl, M.T. Smith, K. Reinier and P. Reynolds, 2002. Critical windows of exposure to house hold pesticides and risk of childhood leukemia, Environ. Health Preserv., 110: 955-960.

Miles, C.J., 1992. Gas Chromatography. J. Chromatogr., 592: 283-290.

Nabizadeh, R., 2000. Industrial waste and chemical toxins excretion in soil and its effect on water sources. Civic Seminar of Water Sources Preservation, pp: 228-305.

Noorozian, M., 1999. List of permitted Toxins of Country. Vegetable Preservation Organization.

Phosalon Maximum Residue Limit for Potato, 2003. MRL Values of Pesticides on Food commodities in WWW. pmf-org/stat.htm/

Sealar, L.A., D.F.A. Rutz, J.W. Allan and M.A. Karmin, 1994. Extox Net, Extention toxicology network. Pesticide Information Notebook.

Shayeghi, M. and Z.S. Motasddi, 1999. Evaluation of rest of Malathion insecticide in soil of orange garden of Ramsar research center. 2nd civic Seminar of Environment Hygiene.

Tomline, C., 1995. The Pesticide Manual (10th Edn.), British production council.

Zar J.H., 1984. Biostatistical Analysis (2nd Edn.), Department of Biological Science Nor Them Illinois University, pp: 177-189.