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MONITORING OF INSECTICIDE RESIDUES IN BRINJAL COLLECTED FROM MARKET OF NOSHERA VIRKAN, PAKISTAN

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ABSTRACT

Insecticide residues were monitored in brinjal. Samples were collected from different locations of Noshera Virkan District Gujranwala during 2006. Brinjal samples were exhaustively extracted with ethyl acetate, cleaned-up with charcoal column and analyzed with high performance thin layer chromatography (HPTLC). On the basis of extant of inhibition of acetyl cholinesterase enzyme, insecticide residues were detected. The insecticide residues in brinjal samples were calculated on average spot area basis of the standards. Imidacloprid was in the range of 0-0.028 mg/kg, carbofuran 0-0.034 mg/kg and chlorpyriphos 0-0.060 mg/kg. Thus, the residues of imidacloprid and carbofuran were below the maximum residue limits (MRL's) which was 0.050 mg/kg for carbofuran and chlorpyriphos and 0.230 mg/kg for imidachloprid, respectively except residues of chlorpyriphos. The present research revealed that fresh brinjal samples of the studied area were contaminated and not suitable for consumption by public. It needs special attention due to the hazards of pesticide residues consumed by residents of the study area.

Key words. Brinjal, insecticide, residues, HPTLC

INTRODUCTION

Vegetables play a significant role in human nutrition, especially as sources of vitamins, minerals, and dietary fiber (Wargovich, 2000). Vegetables also supply 16% of magnesium, 19% of iron, and 9% of the calories. Vegetables in the daily diet have been strongly associated with reduced risk for some forms of cancer, heart disease, stroke, and other chronic disease (Prior and Cao, 2000; Southon, 2000; Wargovich, 2000). Vegetables are strong antioxidant and functions to modify the metabolic activation and detoxification/disposition of carcinogens, or even influence processes that alter the course of the tumor cell (Wargovich, 2000).

Brinjal (*Solanum melongena* L.) is a summer vegetable grown over 8670 hectares area throughout Pakistan with the annual production of 91260 tonnes, out of which the Punjab has the highest share in terms of area of sowing (4890 hectares) and production, 60890 tones (Anonymous, 2007). Pesticides are important for modern farming in order to feed the world's growing population but quality is of equally important as quantity. Pesticides are man-made chemicals that control insects, pests, rodents and other infestations. Pests in the world are probably destroying about 55% of all potential crops before and after harvest (Pimentel and Pimentel, 1979). Thus, the careful use of pesticides actually improves our diet by decreasing the cost of food and quality of the product. This can be done through IPM (Integrated Pest Management). IPM prevents unacceptable level of pest damage by using the most economical control that entails the least possible risk to people, property and the environment (Kogan, 1998). Residues of pesticides were remained in continuous food supply. Residues of DDT, DDE, and other pesticides have found in different vegetables (Salwa *et al*. 1999; Tahir *et al*. 2001; Dogheim *et al*. 2002;, Iqbal, *et al*., 2007). Keeping in view this subject, this study was planned to monitor pesticide residues in brinjal collected different locations of Noshera Virkan, Gujranwala with special reference to public health impact according to FAO/WHO.

MATERIALS AND METHODS

Collection and storage of brinjal samples: Samples were taken randomly from different locations (wholesale market (mandi), main bazaar and shops of the vicinity) of Noshera Virkan, Gujranwala during 2006. Seventy two samples were collected during the mentioned year. One kg of each sample was taken, sealed in polythene bags and stored at -4^{o}C temperature in freezer for further processing.

Extraction and clean-up procedures: The samples were taken from freezer and thawed for 1 hr to bring them at room temperature, chopped with high speed blender and taken 50g in Erlenmeyer flask (500 ml). Anhydrous sodium sulphate (20 g), 2.5g NaCl and 70 ml freshly glass distilled ethyl acetate and shaked for 1 hr. The solvent layer was filtered with whatman flute filter paper No.42. This extract was cleaned up by activated charcoal. Charcoal was activated at 105 ^{o}C temperature for four hours. The cleaned extract was transferred in the round

bottom flask and reduced the volume upto 1 ml using rotary evaporator. The final volume was evaporated with nitrogen stream for dryness and the residues were dissolved in acetone (HPLC grade) and analyzed with the validated HPTLC method (Asi *et al*., 2002).

High performance thin layer chromatographic analysis (HPTLC): Pre-coated silica gel glass plates 20 x 20 cm with 0.25 mm layer thickness (Merck, Germany) were activated at 105 ^{o}C for 30 minutes. The plates were spotted with sample along with standards of related pesticides and developed in pre-saturated tank of ethyl acetate. After developing the plates up to 12 cm, these were air dried in fume hood. The plates were treated with bromine vapours for 60 seconds. The plates were taken out and excess bromine was removed in fume hood for 45 minutes. The plates were sprayed with horse blood enzyme solution and developed in an incubator pre-set at 37 ^{o}C for 30 minutes having moisture content greater than 90% with water vapors. Then the plates were taken out from incubator, dried and sprayed with substrate solution and repeated the same cycle as aforesaid method. The plates were dried and sprayed with acetyl cholinesterase enzyme (Horse Blood Serum). Blue spots appeared on white background. The distance traveled by spots and solvent was noted and R_f values were calculated and compared with the marker compound (Asi *et al*., 2002).

RESULTS AND DISCUSSION

The average residue concentrations of different insecticides (imidacloprid, carbofuran and chlorpyriphos) in brinjal of different localities of Noshera Virkan, Gujranwala are summarized in Tables 1-3. The data show that brinjal collected from different sites are contaminated with above mentioned pesticides but some site samples have no detectable residues. Out of 24 samples collected from wholesale market, 6 samples (25%) were free of imidacloprid pesticide residues. Similarly 6 samples did not contain carbofuran, whereas only 3 samples (13%) were not contaminated with chlorpyriphos residues in brinjal of wholesale market. The vendors of main bazar usually wash the vegetables in water and then sale out. It may be the reason that pesticide residues are low in samples of main bazar as compared to wholesale market. The average concentration of imidacloprid in samples collected from main bazar was 0.013 mg kg^{-1}. The concentrations of chlorpyriphos were higher as compared to carbofuran and imidacloprid (Table 2).

The pesticide residues found in brinjal samples collected from vicinity shops are included in Table 3.

Table 1. Insecticide residues (mg/kg) in brinjal of wholesale market

Insecticide	Sampling sites								
	1	2	3	4	5	6	7	8	R_f
Imidacloprid	N.D	N.D	0.019	N.D	0.017	0.028	0.028	0.020	0.230
Carbofuran	0.032	N.D	0.026	0.028	N.D	0.034	N.D	0.036	0.05
Chlorpyriphos	0.049	0.046	N.D	0.052	0.038	0.055	0.065	0.035	0.05

*Values are mean of 3 replicate

Table 2. Insecticide residues (mg/kg) in brinjal of main bazaar

Insecticide	Sampling sites								
	1	2	3	4	5	6	7	8	R_f
Imidacloprid	N.D	0.024	N.D	0.018	0.016	0.026	N.D	0.018	0.230
Carbofuran	0.030	N.D	0.024	0.026	N.D	0.032	N.D	0.034	0.05
Chlorpyriphos	0.045	0.042	0.052	0.050	0.036	N.D	0.062	0.035	0.05

*Values are mean of 3 replicate

Table 3. Insecticide residues (mg/kg) in brinjal of vicinity shops

Insecticide	Sampling sites								
	1	2	3	4	5	6	7	8	R_f
Imidacloprid	N.D	N.D	N.D	0.016	0.014	0.024	0.022	0.016	0.230
Carbofuran	0.028	N.D	0.022	0.024	N.D	0.030	N.D	0.032	0.05
Chlorpyriphos	0.050	0.038	0.040	0.048	0.032	0.060	N.D	0.030	0.05

*Values are mean of 3 replicate

From the data it is clear that least average concentration of imidacloprid was found in samples. Using the average value a graph (Fig. 1) has been plotted which depicts that the chlorpyriphos has the highest

concentration in all samples collected from different sites. The graph also shows that concentration of insecticides in wholesale market samples is maximum as compared to others i.e. main bazar and vicinity shops.

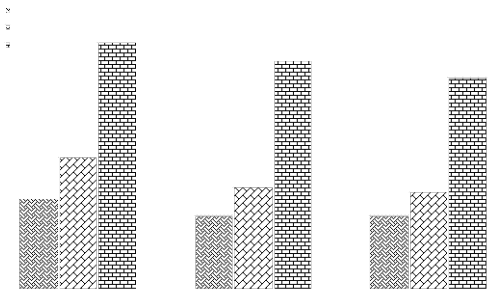

Fig. 1. Average concentration of insecticides in brinjal samples

Imidacloprid residues were in the range of 0 to 0.028 mg kg^{-1} in the collected samples. The carbofuran residues were detected in the concentration of 0 to 0.036 mg kg^{-1} whereas the chlorpyriphos insecticide was found (0-0.065 mg kg^{-1}) in the studies samples. The R_f values of insecticides detected in brinjal vegetable are given in Tables 1-3. The results show no interference with the colour materials like chlorophyll etc. present in vegetable samples. The spots visibility was very high and clear.

Statistical analysis revealed that imidacloprid residues in wholesale market showed less significant difference from main bazar and vicinity shops. On the other side the relationship between main bazar and vicinity shop was significant. Carbofuran residues in whole sale market did not differ significantly from main bazar and vicinity shops. The relation ship between main bazar and vicinity shop was significant. The detected residue level in brinjal was compared with the established value of Codex Alimentarius Commission, FAO/WHO (Anonymous, 1993). Average chlorpyriphos residue in brinjal was non significant than the recommended limits (MRL 0.05 mg kg^{-1} for chlorpyriphos and carbofuran) but samples from few sites showed significant difference from recommended levels. The average concentration of carbofuran and imidacloprid showed significant effect. These results are similar to Bhanti and Taneja, (2007); Mukherjee (2003). With the passage of time the consumption of contaminated brinjal could be a risk so urgent measures are needed to lessen the residues in fresh vegetables. The effects of same insecticides were significant after seven days (Mansoor *et al.* 2005).

The above discussion suggests that the consumer of the Noshera Virkan, Gujranwala is exposed to the lower concentration of pesticides that may cause chronic diseases. The concentration of the detected pesticides were below than the established tolerances but continuous use of such vegetables even with moderate contamination level can accumulate in the receptor's body and may prove fatal for human population in the long term. Since the farmer are neither observing recommended waiting periods nor following good agricultural practices (GAP). Use of pesticides in appropriate dose and restricting the spray of pesticides just before harvesting the crop or during transport will reduce the level of residues in vegetables.

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