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| Title | Dichlorodiphenyltrichloroethane in Environmental Samples and Human Blood of Chittagong Chemical Complex Area and Pesticide Residues in Some Vegetable Samples | | |
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| Abstract |  |
| Pesticide is one of the most used components in current agricultural practices for protecting the crops from different kinds of pests. The widespread use of pesticides contaminates soil, water, air and crops. The result of mishandling or overusing of pesticides on rice, vegetables, fruits etc. are the foremost concern in many countries including Bangladesh. Organochlorine pesticides (OCPs), especially DDT was used in Bangladesh for crop manufacture and to abolish vector diseases from early sixties. The only DDT production factory within Chittagong Chemical Complex (CCC) area started in 1966 and soon supply started in the local area. However, due to long persistence in the environment, bioaccumulation, bio magnifications and accumulation to the fatty tissues of human over food chain, the consumption and manufacture of OCPs became restricted worldwide from nineties. The Stockholm Convention identified 12 persistent organic pollutants (POPs) and recently included 13 more, including DDT which are harmful for wildlife and human health and formulated a treaty in 2001 to stop production, usage and elimination of OCs pesticides where Bangladesh is a part of it and has been paying the fees regularly to the secretariat and actively participating in biannual conference (COP). DDT had been emitted in Bangladesh and the factory at CCC area was shut down as a signatory of Stockholm convention. Bangladesh closed down the DDT factory in 1995 without deciding what should happen to the stored DDT in the factory of the CCC area. This study was shown to monitor the range of dichlorodiphenyltrichloroethane (DDT) and its metabolites (DDE & DDD) in environmental samples (soil, sediment, water and fish) and human blood from areas nearby a closed DDT factory in Bangladesh. Soil, sediment and water samples were collected on 13 July, 2011 from the CCC area in the southern, south western and eastern directions. Fifteen different fish (n=15) samples were collected from a pond in the factory area during June 2016. Thirty human blood (n=30) samples were randomly collected from people (men and women) living inside ii and near the factory on June 2014 to determine the level of exposure. DDTs (DDT and its metabolites) from soil and sediment samples were extracted using solvent extraction (SE), water samples by liquid-liquid partitioning, fish samples by solid dispersion method and finally human blood samples by Hovander and coworkers method with slight modification with a mixture of n-hexane: MTBE (1:1) followed by cleaned up using silica gel impregnated with conc. sulphuric acid (2:1 w/w, 1 g). All samples were analyzed by Gas Chromatograph equipped with an Electron Capture Detector (GC-ECD). Linearity’s expressed as coefficients (R2) were ≥0.995. The recoveries were 72–120% and 83–110%, with <15% RSD in soil and water, respectively at two concentration levels. The limit of quantification (LOQ) was 0.0165 mg kg-1 in soil and 0.132 μg L-1 in water. Higher amounts of DDTs were revealed in the southern (2.2– 936 × 102 mg kg-1) or southwestern (86.3– 2067 × 102 mg kg-1) track from the factory than in the eastern track (1.0– 48.6 × 102 mg kg-1). An exemption was the soil sample collected 50 ft (15.24 m) east (2904 × 102 mg kg-1) of the factory. The range of DDTs in the water bodies (0.59–3.01 μg L-1) was approximately equal in all directions. The recovery for fish samples were conducted (n=3) at three concentrations (0.05, 0.1 & 0.2 mg kg-1). The recoveries were 70–105 %, with <16 % RSD. LOD & LOQ was found 0.063 μg kg-1 & 0.206 μg kg-1 respectively in fish sample. The highest amount of DDT and its metabolites (8.9 μg kg-1) were found in the Shing fish. Boal fish showed small amount of DDTs. By using internal standard, the recoveries of human blood were 73−108 % (0.05 μg L-1) and 75−98 % (0.025 μg L-1) for CB-53. LOD & LOQ was found 0.025 μg kg-1 & 0.083 μg kg-1 respectively, in blood sample. The concentration of ΣDDT was in the range (0−1686 μg kg-1) of human blood samples. We established that DDTs might have been discarded randomly around the warehouse after the closing of the factory. Vegetables are being consumed by the local people of Bangladesh almost every day. Pesticides are being used to protect the crops and there is no guide line about the safe harvesting period of the crops and MRL values for any pesticides in Bangladesh. Studies of dissipation pattern of pesticides in growing crops is necessary which will give a safe harvesting period as well as MRL value after final application. Dissipation pattern of cypermethrin in five different vegetables (tomato, bitter gourd, pumpkin, iii eggplant & green chili) were collected February 2016 from the farmer’s fields Norundi near Jamalpur district of Bangladesh. For these studies the samples were kept at ambient temperature. Twenty four vegetable samples (snake gourd, ridge gourd, wild ridge gourd & pointed gourd) were also collected from different locations of Bangladesh to analyze the presence of chloropyrifos, cypermethrin, diazinon and fenvelarate residues. All vegetable samples were extracted by QuEChERS method, cleaned-up by adsorption chromatography technique and analyzed by GC-ECD. Linearity’s (R2) ≥ 0.995 for matrix-matched standard, LOD and LOQ was 0.01 μg kg-1 and 0.033 μg kg-1 in cypermethrin, respectivly. The recoveries were 82−106 % (RSD ≤ 17 %) at two concentrations (0.25 & 1 mg kg-1) and storage stability was 83% (RSD ≤ 9 %). The MRL of cypermethrin in all vegetables were identified on 0 day samples (2 h after spray). The residue levels went down progressively with days and 74−88% dissipations was observed within 10 days. It was established that cypermethrin residues went lower the MRL value after 1 day of spraying in tomato (143 μg kg-1) & in eggplant (106 μg kg-1) and at 0 day (134 μg kg-1) in bitter gourd (Codex, 2013, 2009). The half-life of cypermethrin was calculated. The most of the vegetable samples were not detrimental to health as all samples had lower the MRL of cypermethrin. The LOD and LOQ were found 0.8 μg kg-1& 2.64 μg kg-1 for diazinon, 0.002 μg kg-1and 0.007 μg kg-1for chlorpyrifos, 0.01 μg kg-1& 0.033 μg kg-1for cypermethrin, and 0.002 μg kg-1& 0.007 μg kg-1for fenvalerate, respectivly. The recovery experiments were conducted (n=3) at two concentration levels (0.25 and 0.5 mg kg-1). The average recoveries of the four pesticides in the four vegetables (73 – 115%) with RSD ≤8% Pesticide residues were detected in 40% of the market samples but all were below the MRL values. Fluxapyroxad is a second-generation carboxamide fungicide that inhibits succinate dehydrogenase of mitochondrial respiratory chain. This study was carried out to assure the safety of fluxapyroxad residues in butter bar (moie) by developing a method and the dissipation pattern was observed under greenhouse conditions from two different treatments (T2 and T3). This experiment was carried out in the laboratory in Republic iv of Korea. The leaves which were grown in greenhouse at Naengcheon-ri, Masan-myeon, Gurye-gun, Jeollanam-do, Republic of Korea, from the last week of February until the first week of April, 2015. The method was developed and validated using high performance liquid chromatography coupled with tandem mass spectrometry (LC–MS/MS). The extraction was carried out by the QuEChERS, and then purified with silica solid phase extraction (SPE) cartridge. Correlation coefficient (R2) of matrix-matched standard was 0.998, LOD was 0.01 μg kg-1 and recoveries were 88% & 93% at both concentration 0.5 & 2.5 mg kg-1, respectively with RSD ≤ 10% and storage stability 95±7.04. The method was successfully applied to the experimental field samples, which were collected randomly at 0 to 14 days’ post application. In this study, fluxapyroxad was dissipated below the MRL value after 10 days at triple of recommended dose. The rate of disappearance was described to 1st order kinetics with half-life of 2.6 days. The initial residues after application were 11 and 20 μg kg-1 on the zero day for T2 and T3 respectively. After 14 days the residues declined to 0.42 and 0.36 mg kg-1 for T2 and T3 respectively. | |