Levels of 48 pesticides in vegetables and water and evaluation of health risk resulting from dietary intake in gardening areas in Burkina Faso.

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Field surveys have underlined the lack of knowledge regarding good agricultural practices and the use of unsuitable and obsolete pesticides in gardening areas. Improper selection and use of pesticides can result in undesirable level of residues even after processing. Food constitutes the most common route of exposure of the consumer to pesticides. To prevent health hazard and unnecessary exposure, European countries have implemented Maximum Residue Limits (MRLs) and Admissible Daily Intake (ADI). In order to guarantee continuous access to water, gardening areas are located on lake coasts. Pesticides application, washing of clothes and equipment used for spraying can lead to contamination of this resource used for drinking water. A total of 45 vegetables and 33 water samples have been collected around the study area, the lake of Loumbila. Multiresidue extraction procedures have been developed and applied to determine the concentrations of 48 pesticides in vegetable and water samples. Pesticides residues in food commodities were extracted using a modified QuEChERS extraction method. Briefly, composite samples were chopped into small pieces, and mixed. 10 g of homogenized sample were extracted in 10 ml ACN, cleaned-up by Dispersive SPE (dSPE) with Supelco Z-sep/C18® sorbent, concentrated and separated prior analysis on GC-MS and LC-MS/MS. Water samples were extracted by SPE on 200 mg Water Oasis® HLB cartridge prior separation and analysis. Daily consumption was estimated by a dietary survey conducted on 126 gardeners using a 24 hours recall method. The Estimated Daily Intake (EDI) takes into account pesticide residues in vegetables and water, respective daily consumption, processing factor and body weight. 24 samples exceed MRLs for five pesticides: acetamiprid (n=1), chloropyrifos-ethyl (n=2), cyhalothrin lambda (n=5), dieldrin (n=6) and profenofos (n=13). Exceedance of MRLs induces a risk for the consumers and limits the opportunities of exportation for a sector identified by the authorities as having a great potential for the fight against poverty. A hazard index (EDI/ADI) more than the unity indicates a risk for the consumers in the study area. Risk was identified for: chloropyrifos-ethyl, dieldrin and cyhalothrin lambda in every exposure scenarios. Health hazard was also identified for profenofos in worst case scenario and with exclusion of the processing factor. Every scenarios exhibit a greater exposure of the consumer through vegetables consumption. Processing factor appears to largely influence the risk occurrence. In this study, 60% was set as default value for cooked commodities (boiled or fried). Further refinements could include the definition of specific processing factors dependent of the local processes and pesticides used. Multiresidue analysis allows to detect residues of pesticides not identified by investigators nor gardeners during field surveys. This imply other sources that need to be further investigated (lack of knowledge, spray drift, etc.).