

HAZARD CHARACTERIZATION AND HUMAN EXPOSURE ASSESSMENT OF CHEMICALLY TREATED TOMATO

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Extended Summary

Tomatoes, which are actually a fruit and not a vegetable, are loaded with all kinds of health benefits for the body. One of the most well known tomatoes eating benefit is its lycopene content. It plays a vital role in providing a substantial quantity of vitamin C and vitamin A in human diet. Proper science based risk assessment is essential to evaluate whether the agro-chemicals used for cultivation is actually threat for consumers during the time of consumption. Depending on the situation, pesticides could enter body by inhalation exposure, dermal exposure and oral exposure. So, the basic research objective was to make a list of available agro-chemicals used during the cultivation of tomato, to characterize their hazards, to evaluate their exposure and to predict the theoretical risk and provide suggestion regarding safety.

For hazard identification a list of available agro-chemicals generally used during the cultivation/harvest of tomato was prepared based on the field visit to three different areas of Bangladesh. During field visit, farmers' interviews were conducted following a formal set of questionnaire. Further information was also collected by visiting Upazila Agricultural Officer, Agriculture Extension Officer and different pesticide shops. For hazard characterization and risk assessment the material safety data (MSDS) of registered and survey based agro-chemicals was compared and evaluated. Further evaluation was done via the material of the different govt. and international organization's website (such as FDA, EFSA, WHO). The degradation properties of those agro-chemicals which is influenced different post-harvest activity, packaging and transportation method was considered. Moreover, ADI (acceptable daily intake), MRL (maximum residue level) and RFD (reference dose) value of agro-chemicals were also used which were referred by different by different organizations like WHO, EPA, FDA, EFSA, FAO, Codex, etc. For safety measurement, various recommended suggestions regarding safe handling and processing were also considered. Results of field survey revealed that for tomato production farmers not only use pesticides that are registered for tomato but also use other pesticides that are not recommended for tomato. The most commonly used pesticides were

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sulphur, carbendazim, iprodione, mancozeb, mancozeb+metalaxyl, malathion, chlorpyrifos, cartap, carbofuran, carbosulfan and diazinon. All the pesticides available in the markets were found as authorized pesticides and none of them were found to be extremely hazardous according to the WHO recommended classification. Only carbofuran was classified as highly hazardous (Ib). In most cases farmers do not follow rational use of pesticides. The present study indicates that there is a high chance to have residual effects of pesticides in tomato as a result of preharvest or postharvest application. However these residual levels are affected by different physio-chemical properties of pesticides such as photolysis, hydrolysis, oxidation and reduction, metabolism, temperature, and pH. Several mitigation processes was mentioned for the safe consumption of tomato. As most of the pesticides after application remain in the outer surfaces and can penetrate in lesser amount, washing, peeling or trimming can be effective ways of pesticide removal. Washing with dilute salt (sodium chloride) solution is a convenient method to lower the load of contaminants form food surfaces particularly fruits and vegetables. Chlorine water and dilute solutions of other chemicals can be used for disinfection of Tomato. The heat treatment can be given in many ways including pasteurization, boiling, cooking etc. depending upon the nature of food and aim of processing. Boiling is effective in reducing the level of water-soluble pesticides. A set of processing techniques such as drying and dehydration, canning of fruits and vegetables, juice/concentrate preparation etc. can reduce the amount of residue in the final product depending upon a set of parameters employed and length of processing. The packing process before shipment to retail outlets is generally effective in removing pesticides that may be present on peel at the time of harvest. Dispersion of pesticides in tomato results better in room temperature than cold condition while storage.

Based on the present study an attempt could be taken to analyze the actual residue level of pesticides in tomato using GC-MS and purity analysis can also be done by using GC-FID which is available in the department of agricultural chemistry of SAU. It may also be done with the collaboration of BARI toxicology lab at Gazipur. Farmers should follow the recommended dose of registered pesticides. On the other hand consumers also need to be aware of proper handling and processing of tomato and its byproducts for safe consumption.