Title Pesticide and pathogen contamination of vegetables in Ghana's urban markets

Author P. Amoah, P. Drechsel, R. C. Abaidoo and W. J. Ntow

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Abstract

The objective of the study was to determine and compare the current level of exposure of the Ghanaian urban population to hazardous pesticide and fecal coliform contamination through the consumption of fresh vegetables produced in intensive urban and periurban smallholder agriculture with informal wastewater irrigation. A total of 180 vegetable samples (lettuce, cabbage, and spring onion) were randomly collected under normal purchase conditions from 9 major markets and 12 specialized selling points in 3 major Ghanaian cities: Accra, Kumasi and Tamale. The samples were analyzed for pesticide residue on lettuce leaves, total and fecal coliforms, and helminth egg counts on all three vegetables. Chlopyrifos (Dursban) was detected on 78% of the lettuce, lindane (Gamalin 20) on 31%, endosulfan (Thiodan) on 36%, lambda-cyhalothrin (Karate) on 11%, and dichloro-diphenyl-trichloroethane on 33%. Most of the residues recorded exceeded the maximum residue limit for consumption. Vegetables from all 3 cities were fecally contaminated and carried fecal coliform populations with geometric mean values ranging from 4.0×10^3 to 9.3×10^8 g^{-1} wet weight and exceeded recommended standards. Lettuce, cabbage, and spring onion also carried an average of 1.1, 0.4, and 2.7 helminth eggs g^{-1}, respectively. The eggs were identified as those of *Ascaris lumbricoides*, *Ancylostoma duodenale*, *Schistosoma heamatobium*, and *Trichuris trichiura*. Because many vegetables are consumed fresh or only slightly cooked, the study shows that intensive vegetable production, common in Ghana and its neighboring countries, threatens public health from the microbiologic and pesticide dimensions. Standard recommendations to address this situation (better legislations, law enforcement, or integrated pest management) often do not match the capabilities of farmers and authorities. The most appropriate entry point for risk decrease that also addresses postharvest contamination is washing vegetables before food preparation at the household or "chop" bar (street restaurant).