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Pesticide residues in tea and consumer exposure: health risk assessment*

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Abstract

Tea is one of the most widely consumed beverages worldwide, including in Poland. Despite well-documented health benefits, tea consumption may contribute to dietary exposure to chemical contaminants, for example pesticide residues. This study aimed to assess consumer health risk associated with tea contaminated with pesticide residues, based on official monitoring data. The analysis used data from the national official monitoring and control programme for pesticide residues in tea (Poland, 2022; NIPH-NIH/NIZP-PZH report). Chronic exposure assessment was performed using mean and 95th percentile residue concentrations of selected pesticides (e.g., bifenthrin, chlorfenapyr, thiamethoxam, folpet). Estimated daily intake (EDI) was calculated, and non-carcinogenic risk was characterised using THQ and HI relative to toxicological reference values (ADI). Acute risk results (ARfD) for individual samples exceeding MRLs were also discussed. For compounds with available ADI values, chronic exposure was low and indicated no non-carcinogenic risk (THQ < 1; HI < 1) for both mean and conservative (P95) scenarios. For isolated MRL exceedances, acute exposure did not exceed ARfD in critical populations. Anthraquinone required a precautionary interpretation due to the lack of established toxicological reference values, limiting quantitative risk characterisation. Based on official 2022 data, no health concern was identified for chronic or acute exposure to the assessed pesticide residues via tea consumption. Continued monitoring, improved mixture-risk approaches, and attention to substances with toxicological data gaps are recommended.

Keywords: tea, pesticide residues, dietary exposure, risk assessment

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