

RISK ASSESSMENT OF ARSENIC VIA CONSUMPTION OF RHIZOMES OF
SELECTED MEDICINAL PLANTS IN FAMILY ZINGIBERACEAE USING @RISK
PROGRAM

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ABSTRACT

Many Zingiberaceous rhizomes have been used for consumption and treatment of diseases, but they were rarely considered regarding arsenic accumulation. Therefore, the human health risk associated with ingesting arsenic through consumption of Zingiberaceous rhizomes cultivated in Thailand was studied. The raw herbal materials were collected from different regions from December 2011 to January 2013. A selection of six well known species, 16 samples from each, for a total of 96 samples, was analyzed: *Alpinia galanga* (Khaa), *Boesenbergia rotunda* (Kra-chaai), *Curcuma longa* (Khaminchan), *Curcuma zedoaria* (Khamin-oi), *Zingiber cassumunar* (Plai) and *Zingiber officinale* (Ginger). The samples were analyzed by atomic absorption spectrometry interfaced with the hydride generation system (HG-AAS). The concentrations of inorganic arsenic based on dry weight were 48.8 ± 7.0 , 66.3 ± 12.7 , 25.5 ± 5.0 , 38.7 ± 4.7 , 71.2 ± 11.6 and 38.5 ± 5.5 ng/g, respectively. Among these, Plai and Krachaai exhibited high levels of total arsenic and inorganic arsenic accumulation. The estimated hazard quotient (HQ) and cancer risk (CR) were obtained by deterministic risk assessment (DRA) and probabilistic risk assessment (PRA) approach through the same model of lifetime average daily dose (LADD) for calculation. The estimated CR based on a 95% probability of edible and medicinal rhizomes, ranged from 5.5×10^{-6} to 3.8×10^{-5} and 4.8×10^{-8} to 1.0×10^{-7} , respectively. The probability of CR fell within an acceptable range of 10^{-6} - 10^{-4} . Moreover, the HQ used to evaluate the non-carcinogenic risk, the values for food and medicinal rhizomes based on 95% probability of exposure, ranged from 0.012 to 0.062 and 1.1×10^{-4} to 2.3×10^{-4} , respectively. All values were below unity, indicating that rhizome consumption contributed only a little to non-carcinogenic risk. The comparative results between DRA and PRA approaches were slightly different.

KEY WORDS: RISK ASSESSMENT / ARSENIC / CONSUMPTION / RHIZOME /
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