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Editorial

Metal Contaminated Turmeric: A Threat to Human Health

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Turmeric (*Curcuma longa L*) is perennial herb belongs to *Zingiberaceae* family and distributed throughout the tropical and subtropical regions around the world. From centuries, the powder rhizome of turmeric is widely used in foods for coloring agent and spice by virtue of its pleasant aroma and yellowish orange color. Medicinally, turmeric is used for treatment of skin wounds and anti-inflammatory agent. Numerous pharmacological activities are exhibited by turmeric such as antioxidant, antimutagenic, antiparasitic, hypatoprotective, chemopreventive, antiviral and antimicrobial activities.

Elements like Al, Cu, Cd, As and Pb are present in all food virtually in low concentration. Addition of certain metals in high concentration is detrimental. After conducting the studies for metal contamination in turmeric, various toxic metals were found in varying concentration.

Cu contents obtained in ranged between 1.32-74.82mg/kg whereas the permissible limit 50mg/kg as advised by Codex given by FAO. Cu^{1+} and Cu^{2+} are present in human body in range of 50-150mg. 0.6-0.8mg of daily intake of Cu is recommended and higher concentration of Cu associated with Wilson's disease which is characterized by deficiency of ceruloplasmin.

The study showed the concentration of Al was in range between 0.43-5.87mg/kg. The higher contents found might be due to its manufacturing and packing. The commercial powder formed after boiling, drying and grinding of roots, the water used for boiling and subsequent its grinding and packing in Al foiled sachet might be contaminated source of this element. Human metabolic system does not absorb Al and it is excreted in urine and 2mg/kg body weight Al is permissible from all sources. The values obtained in

commercial products are quite high. Nephrotoxicity of Al is well documented, so commercial powder investigation are not adequately safe regarding the level of Al found.

The As was found in range between 0.13-1.85mg/kg in our study while the maximum permissible level of As in edible vegetable is 0.3mg/kg. The contaminated soil is source of As because first uptake of metals is occurred by roots. We consider some locations are potentially polluted by exhaust of brick kiln factories and level of As resulted elevated. As in its methylated form which is produced by glutathione transferase, S-adenosyl methionine and As III methyl transferase is highly toxic to humans. These enzymes compete DNA methyltransferase which results in reactivation of silenced tumor suppressor genes. Chronic toxicity from inorganic As associated with cancer and melanosis, arsenicosis, keratosis of skin.

The Cd concentration found ranged between 0.11-1.15mg/kg. In II oxidation state, Cd and Zn formed similar compounds because of their placement in same group in periodic table. Cd can bind Zn-dependent enzymes which results in decrease their biological activity. Due to non-biodegradable nature Cd can cause high blood pressure, mutation and prostate malignancy. The maximum permissible level of Cd in edible vegetable is 0.2mg/kg.

The Pb concentration found ranged between 0.11-0.62mg/kg and the permissible level of Pb is 0.3mg/kg. Pb is a toxic environmental pollutant and it is chemically identical to Ca, Fe, Zn replaces their metabolic sites which results in disability of function. Pb competes with the Ca in neurons and hindered the oxygen carrier Fe in hemoglobin. Elevated levels of Cd and Pb are reasonably assumed the presence of increased contamination of soil and atmosphere by these elements from exhaust gases of vehicular traffic. All samples in this study exhibited concentrations of Pb and this is considered a normal situation for plants.