TRANSFER OF PESTICIDES TO THE BREW DURING MATÉ DRINKING PROCESS AND THEIR RELATIONSHIP WITH PHYSICOCHEMICAL PROPERTIES

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Maté is a well known beverage from South America prepared by adding hot water over yerba maté (dried leaves of *Ilex paraguariensis)* and the infusion is drunk by sucking trough a silver pipe [1]. Yerba maté is highly consumed in the Pampas Region being Uruguay the largest consumer with 8 Kg per capita/year. The major world producers of Yerba Maté are Brazil and Argentina employing conventional agricultural practices, and within this frame, insecticides are normally used to protect the crop. Although highly consumed, neither determination of pesticides residues during infusion process nor MRLs for pesticides were published up to date. Due to the peculiarities of maté drinking, which are different from normal tea infusion, a single, simple hot water extraction does not account for the whole amount of extractables that can be ingested while drinking maté. These points have to be considered when trying to asses the amount of pesticides one person drinks together with maté, and for that reason we designed an experimental simulation model and the analytical approach for the determination of 12 organophosphates, 5 synthetic pyrethroids and 2 organochlorines at the residue concentration.

In order to investigate the extraction rates of pesticides during infusion process, pesticide spiked samples of P.U.1 yerba type leaves at 1μg/g, were studied with the simulation model.

Yerba maté was poured into a designed glass container of curbi shape to ¾ of its internal volume (60g) and then hot water (80±10ºC) is poured subsequently in 30 mL aliquots on the depressed side of the yerba surface to complete 1L. Infusion is prepared waiting 30s and vacuum at the bottom is used to collect fractions. An aliquot of the collected volume is subjected to CH_2Cl_2 partition and then a SPE clean-up using Florisil is performed [2]. Residues were determined using a double-channel GC-ECD/FPD system.

A recovery study was performed and the pesticide transfer into the infusion was determined (n=4). Transfer rates (%) ranged from 4.11±1.78% in the most extracted pesticide (dimethoate) to 0.15±0.04% in the less one (deltamethrin). Relationships between percentage of transfer and physicochemical properties such as water-solubility (Ws), partition coefficient (Kow) and Henry's constant (H) of the studied pesticides are also discussed.

The present study revealed that during maté drinking consumption pesticides residues are extracted particularly those pesticides with higher water solubility.

Although non linear relationship between physicochemical properties such as Kow, Sw or H with transfer for all pesticides was found, predictable trends in extraction rates can be obtained, suggesting combination of mechanisms acting in the extraction process for each pesticide.

To prevent any health problems to consumers, the establishment of MRL for pesticide residues in yerba maté should be considered. This study can help to understand the real fate of pesticides during maté drinking.

[1] Vázquez, A., Moyna, P., 1986 Studies on Maté Drinking, Journal of Ethnopharmacology 18: 267-272.

[2] Ozbey A., Uygun, U., 2007 Behaviour of some organophosphorus pesticide residues in peppermint tea during the infusion process, Food Chemistry 104: 237-241.

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