Potassium incorporation in fruits of South American tropical species

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This work proposes the use of a new mathematical model liable to describe the temporal evolution of potassium concentration in fruits of tropical species. Studies of the potassium incorporation are important for two main reasons: a) from the physiological point of view, this flux characterizes the dynamics of the demand of this essential macronutrient during the gestation period of the fruit; and b) from a radioecological perspective, potassium is a chemical analogue of cesium, particularly of ^{137}Cs, one of the most important contaminant deposited after accidental releases of radionuclides into the environment. Therefore, describing the potassium incorporation, we can obtain crucial information on how this radionuclide can enter to the human food chain trough fruits.

Nutrients accumulation by fruits has been extensively studied for different trees. These investigations have been addressed to evaluate the nutritional status at different stages of the fruit development, estimating the amount of the soil nutrient removal and then to know the better time to program the control and supply of fertilizers The fruit quality and its aptitude to the conservation are closely related with de nutrient content and the equilibrium between.

The rate of the weight increment in fruit is not uniform. The dry mass accumulation is small in the initial period, later a more expressive increment is observed and, finally during the maturation period, a lower dry mass accumulation was observed. The lengths in days of each one of these grown phases depend of the fruit type. A sigmoid grown model appears to be a very good approximation. The nutrient accumulations follow characteristics patterns along these fruit grown phases.

When food-chain model are used to describe the radionuclide key transfer processes for dose assessment, the steady state radionuclide concentration is assumed in each compartment. In many cases that could be a strict simplification of the reality. Fruits could be harvested at different stages of maturity with substantially differences in the radionuclide concentration.

Recently soil-to-fruit transfer factors (*Fv*) have been reported for temperate regions. *Fv* values for caesium cover two orders of magnitude, from 10^{-4} to 10^{-2}. *Fv* values for fruits of woody trees range from 8.6×10^{-4} to 8.0×10^{-2}. This variability is attributable primarily to the different properties of soils, the plant input characteristics, the internal distribution processes and the dynamics of the accumulation processes by fruits.

In previous works performed by our group, the activity concentration of ^{137}Cs and ^{40}K from root to shoot for a tropical woody fruit specie (C*itrus aurantifolia*) were assessed in order to improve the understanding on the behavior of monovalent inorganic cations in plants and its capability to store these elements. We have been found that $^{137}Cs^+$ and K^+ show very similar distribution, exhibiting, then, similar behaviours. In this study we have specifically studied the dynamics of growth fruit and the K accumulation by fruits for two different tropical fruit species: lemon (*Citrus aurantifolia*) and Coconut (*Cocos nucifera L.*). K concentrations have been measured by both gamma spectrometry (^{40}K) and neutron activation analysis during the entire cycle of the fruit development. The mathematical model proposed to simulate the fruit grown and the potassium accumulation exhibited a very close agreement with the measures of potassium fruit content in both woody fruit and palm species.