A FIRST APPROXIMATION TO THE ADJUSTMENT OF PESTICIDE USE AND THEORETICAL MRL'S AND ADI ACCOMPLISHMENT IN FRUITS AND VEGETABLES IN URUGUAY

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Introduction

Pesticide residues in fruits and vegetables (F&V) are of primary concern as these foods can be usually consumed as such. Little if any processing is done prior to their consumption apart from peeling and washing, depending on the type of F&V considered. Because of that, monitoring programs are performed, all over the world, to ensure legal MRL's accomplishment. The MRLs pursue two main objectives: to enforce Good Agricultural Practices accomplishment and to protect consumer's health. During the past decade, in Uruguay, the number of legally allowed pesticides dropped from 453 to 285 active principles. For instance, no pesticide of toxicological Level I is permitted in the country. In this work, thorough research on the active principles employed in Uruguay in F&V was performed.

Why? Goals and objectives

This work aims to collect information at the national level in order to make a theoretical adjustment of the use of pesticides.

How? Methodology

Research:

- Phytosanitary data (registered compounds, import volumes).
- Crop types (fruits and vegetables) and cultivation areas.
- Consumption data for fruits and vegetables

Results and discussion

Phytosanitary data

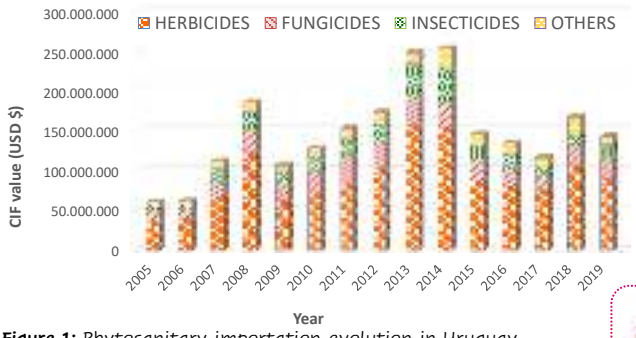
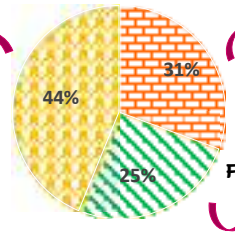


Figure 1: Phytosanitary importation evolution in Uruguay.

There are currently **233 registered phytosanitary** products in Uruguay.



Herbicides (101)

Insecticides (72)
20 Organoph; 10 carbamates; 11 pyrethroids, 6 neonicotinoids, 25 other chemical classes (matrine, azadirachtin, chlorantraniliprole).

Fungicidas (60) - *Ditihocarbamates; Phtalimides, Cyt-P450 inh., Strobilurins*

Thirty five different crops

Fruits (11)

Vegetables (24)

Apple, Peach, Citrus, Olive, Melon,Pear, Watermelon, Blueberry, Quince, Strawberry, Khaki, Grapevine

Beans, Potato, Cucumber, Pumpkin, Celery, Garlic, Peas, Beet, Parsley, Leek Cauliflower, Broccoli, Cabbage, Lettuce, Carrot, Sweet potato, Aubergines, Pepper, Onion, Tomato, Spinach, Chard.

Study cases

A **deterministic approach** for the evaluation of chronic dietary risk for pesticide intake was performed following the recommended procedures by the World Health Organization **(WHO)** for chlorpyrifos, an insecticide from the organophosphate class, and the two most employed dithiocarbamates in Uruguay: mancozeb and ziram.

$$IDTMN = \sum_{i=1}^{n} MRLi \; x \; Ci \qquad ADI\ (\%) = \frac{IDTMN \; x \; 100}{ADI \; x \; BW}$$

Equations: The National Maximum Theoretical Daily Intake (IDTM) was calculated using MRLs (from EU) and Consuption data of F&V of the National Survey of Household Expenditure and Income (ENGIHS). ADI is calculated using IDTMN, ADI (expressed as (mg/kgBw/day) and Body weight (60 kg).

ENGIHS, in Uruguay, provides **data consumption** in three categories:
- Average population
- 20% of the poorest households
- 20% of households with higher incomes

For this study, it was used the average consumption.

Chlorpyrifos case:

Chlorpyrifos theoretical intake represented **92%ADI** value, which is below the safety limits.

Frequency: It is applied in 32% of the crops analyzed (11 crops).
MRLs were between 0.01 (potato, apple and pear) and 1.5 mg kg^{-1} (for citrus)
IDTMN= 0,05

Dithiocarbamates case:

Results varied depending on the studied compound. The MRL for the whole chemical class is expressed as mg of CS_2/kg sample, correction factors for each specific compound must be applied to assess dietary risk assessment.

Mancozeb, represented **48%ADI** and **Ziram 427%ADI.**

Frequency: They are applied in 41% (Mancozeb) and 29 % (Ziram) of the studied crops.
MRLs were between 0.05 (celery) and 5 mg kg^{-1} (for most crops)
Obs: Ziram ADI value is one order of magnitude higher

CONCLUSIONS AND FUTURE PERSPECTIVES

These calculations are the first step to check the adjustment of the established MRLs to the Uruguayan diet. The research team is currently monitoring the most consumed fruits and vegetables on a seasonal basis in order to obtain experimental data from the monitoring of F&V of the local market and adjust the values to the national reality.

ACKNOWLEDGEMENTS

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