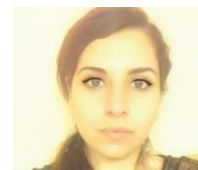


Impact of Organochlorine and Organophosphorus Pesticide's Residues in Consumption Water on Virulence of E.coli K12, Pseudomonas aeruginosa H103 and Salmonella Enterica: Application to « Akkar » Region (Lebanon)

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Abstract

Introduction: Lebanon's agriculture represents 2.92% of its economy [1] and it is mainly used to feed the country even if part (potato, cereals, citrus fruits, etc.) is also exported to other countries (Kuwait, Qatar, Saudi Arabia, etc.) [2]. However, intensive and unregulated use of pesticides in the agricultural regions of the Northwest of Lebanon, specifically in Akkar (second agricultural region in terms of surface area) has generated contamination of the water resources adjacent to the cultivation areas [3]–[4]–[5]. The inhabitants of this region use groundwater as the main source of drinking water but also for irrigation [6]. Thus, the risks associated to the degradation of sanitary water quality has lead researchers to set up programs for monitoring organic pollutants from 2014. The aim of this study was to assess the actual contamination of groundwater by two classes of pesticides (organochlorines – OCPs, organophosphates – OPPs) in 14 wells sampled in the Akkar plain. The present project also study the possible induction of bacterial virulence induced by the co- presence of pesticides and bacteria in water. For that, several criterion of virulence were tested using different model bacteria on water samples collected from field campaign.

Materials and Methods: Water samples were taken from 14 wells and then conditioned to allow the isolation of pesticides. A methodology implementing a solid phase cartridge extraction (SPE, HLB) followed by an analysis by gas chromatography coupled to a mass spectrometer (GC / MS) was implemented and validated to allow quantification of the pesticide content. Present results were also discussed in relation to two previous studies carried out in 2014 and 2016 [4]–[7] in some identical sites. For microbial virulence evaluation, three bacteria were testing: E.coli K12, Pseudomonas aeruginosa H103 and

salmonella enteric. Five standard tests were involved: growth, mobility, morbidity, ability to form a biofilm, and specific toxin-production gene.

Results: The results showed that the levels of organochlorine pesticides identified in Akkar's groundwater exceed the limits set by the Stockholm Convention on Persistent Organic Pollutants. OPPs and OCPs are detected at similar significant levels (from a few $\mu\text{g} / \text{L}$ to almost $60 \mu\text{g} / \text{L}$). In addition, the concentration of several molecules seems to increase gradually since 2014. Different ratios, including $\alpha\text{HCH} / \gamma\text{HCH}$ and $2,4\text{'-DDT} / 4,4\text{'-DDT}$, were used in order to identify the main sources And historical use of pesticides. Thus, it appears the lindane and the DDT found could be linked to a still recent use. Interesting effects on bacteria growth were seen after being in contact with these pesticides. Thus, organic pollutants might modify growth, ability to form biofilm. All of these observations show that changes in the practices of use of phytosanitary products (education and training of farmers ; establishment of regulations : eg protection near catchments) are necessary, as is the establishment of more systematic monitoring of these residues, particularly in the case of wells used for water supply.

Biography:

Roukaya Al Haj Ishak Al Ali a PhD candidate in analytical chemistry (second year) in Poitiers university in France. She is 26 years old, working on pesticides's quantification in a rural region and study the virulence effects of this persistent organic pollutants on three bacteria's model..

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