

Physiological burden on workers exposed to plant protection products in apple growing

Thesis Director; Jean François Viel PU-PH, Professor of Public Health, University Hospital Rennes, Inserm U1085, IRSET Team 9

1. Context

Fruit growers may be exposed to plant protection products during the preparation of the spray mixture, the treatment and cleaning of the equipment, but also during the re-entry phases in the treated plots: manual thinning, pruning, opening and closing of nets, checking and recording pest and disease attacks, harvesting. This exposure, mainly to the skin, can be exerted several days after the treatment.

This raises the question of the factors responsible for differences in good practices among farmers who, despite their knowledge of the risks, continue not to systematically protect themselves. As farmers are constantly having to decide between production and prevention, it is necessary to better adapt PPE to agricultural tasks. For the same prescribed task, the difference in the worker's behaviour and conduct may lead to variability in exposure.

Wearing PPE implies an increase in the physical and physiological constraints (sweating, heart rate) of operators. These constraints make the task more difficult, especially since PPE is not suitable.

To improve the acceptability and therefore the use of PPE, it is necessary to accumulate new knowledge on the physical and physiological constraints exerted during the different phases of the school year, particularly in arboriculture, where phytosanitary treatments are frequent and where multiple tasks increase exposure.

2. Objectives

The main objective of this thesis is to analyze the organizational and human technical determinants that can influence the physiological constraints and demands of apple workers in real conditions.

The implementation of the new approved PPE during the back-to-school phase will be analysed and the comfort of these PPE will be studied (in the laboratory and in the field), as well as the difficulty of the tasks (during the handling of the products and when re-entering the treated plots), based on an ergonomic analysis of the activity.

Usability is also a determining criterion for the acceptability of an equipment. It is assessed through three factors: effectiveness, efficiency and satisfaction. In this study, only efficiency will be measured by the additional constraint generated by PPE and satisfaction by a subjective evaluation of comfort criteria.

In a research-action approach, this project will identify the different processes by which apple growers can become actors of their safety during the re-entry phases in the treated plots.

The research will be based on a population of 200 apple growers from the Tarn et Garonne and Ille et Vilaine.

3. Planning

| Trimestre | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|--|---|---|---|---|---|---|---|---|---|----|----|----|
| Bibliography | | | | | | | | | | | | |
| Pre- Diagnosis - Activity analysis | | | | | | | | | | | | |
| Characterization under experimental conditions | | | | | | | | | | | | |
| Characterization of the difficulty - Controlled conditions | | | | | | | | | | | | |
| Data analysis | | | | | | | | | | | | |
| Writing publications | | | | | | | | | | | | |
| Manuscript writing | | | | | | | | | | | | |
| Soutenance | | | | | | | | | | | | |

4. Organization

The thesis will take place at the UMR ITAP in Irstea Montpellier, under the supervision of Sonia Grimbuhler and Jean-Francois Viel from IRSET - INSERM U1085.

Thesis Director: Jean-François Viel, Professor of Public Health, INSERM U1085, IRSET Rennes.

Doctoral School: Health Biology integrated into the doctoral network in Public Health, coordinated by EHESP

Profile of the candidate sought: The candidate must have a solid initial training in health risk assessment, expology or ergonomics, as well as experience in data analysis. Finally, the candidate must demonstrate initiative in the field and have the ability to communicate with the various actors in the field.