

13. Interfaces

ABSTRACT

Year : 2017-2021

Project number :

Type of funding :

Project type :

Research units in the network : QUALISUD, SQPOV, HORTSYS, MOISA, PSH, SPO

Start date : 2017-01-01

End date : 2021-06-30

Flagship project : yes

Project leader : Catherine Renard, Véronique Broussolle and Dominique Pallet

Project leader's institution : INRA-INRAE CIRAD

Project leader's RU : SQPOV QUALISUD

Budget allocated : 900 000 €

Total budget allocated (including co-financing) : 3 500 000 €

Funding : Labex

GOAL

The aim of the “Interfaces” project is to understand which factors, by influencing the characteristics of fresh fruits, allow the characteristics of processed fruits to be modulated. Dealing with the diversity and heterogeneity of agricultural raw materials and optimising their processing for more sustainable food systems the aim is to create the conditions for an integrated approach, shared between the research community and stakeholders, to better take into account diversity in a pre-harvest and post-harvest continuum in order to achieve optimised processing for a shared benefit. The main objective is to create a research continuum between the development of agricultural raw material and its transformation in order to define the margins of flexibility (technological and economic) that exist with regard to the variability of the raw material. Two main questions are posed:

-* What are the responses of fruits to processing operations?

-* How can these processing operations be characterised in order to use them for specific fruits or to refine unit operations?

This interface interfaces between fruit production and processing are considered key points for the sustainability of the food chain. It is characterized by discontinuities: i) it is not the same scientific disciplines that are mobilized, ii) it is not the same socio-economic actors, and iii) it is not the same logics that are at work. It is obvious that the characteristics of the raw materials largely determine the qualities of the finished products, and specifically for fruits, which are, often little processed. However, the expected changes in production take into account the need to adapt to new agricultural systems and environmental conditions, but not or very rarely, the fate of the product between the field and the plate. Conversely, the demands of processors are not necessarily adapted to these new raw materials. In order to limit losses and waste it seems essential to have indicators and tools to better take into account and valorise the variability and heterogeneity that are created in the field and during the ripening and storage of fruit.

ACTION

The combinations of fruits and processed products were chosen as examples of typical behaviour, related to ecophysiological conditions: apples in compote (with the issue of structural dry matter content and cell size as determinants of texture), mangoes in dried mango (with the issue of content and nature of sugars present), and grapes in wine (with the issue of the impact of ripening on the extraction of polyphenols).

To demonstrate the possibility to make scientists work together on both sides of this interface to better build together the qualities of the products ultimately consumed, taking into account their variability, the project is structured in five “workpackages” answering scientific questions:

- * How to identify and quantify the variability and heterogeneity of fruits through the development of indicators and tools allowing rapid qualification as well as the integration of operator knowledge, from the field to the plant (WP1)
- * How the microstructure of fruits, itself influenced by pre-harvest conditions, can influence the characteristics of processed products, and how this microstructure can interact with unit operations (WP2)
- * What is the microbial ecosystem of fruits, a major cause of invisible variability in the production chain from tree to plate? Do the culture systems and conditions influence the microbial communities that produce mycotoxins or the microorganisms responsible for alterations, or even possibly protective species allowing the biopreservation and production of fermented food (WP3)
- * How does the interaction between the environment and cropping systems modulate the quality of the fruit at harvest? How will this information allow the estimation of fruit variability at harvest and allow the design of agronomic practices to obtain the desired processed fruit? Is it possible to link the pre and post-harvest models? (WP4)
- * How to take into account the variability in the fruit in the value chain? What are the challenges of the different stakeholders and how can the market be regulated? Are there generic questions that could be used to guide the identification of quality? (WP5)

The “Interfaces” project brings together five entities of the Agropolis Fondation network: UMR SQPOV and UMR Qualisud as coordinators, UR PSH and HORTSYS, UMR SPO and UMR MOISA. INTERFACES had an impact on the relationship of this research community on several fronts of research. From its start, the project encouraged doctoral training with the integration of seven PhD students in the different WPs, as well as two post-doctoral scientists.

RESULTS

The approaches emphasise developments in instrumentation (adaptation, method creation, database consolidation, quality model from fruit data). At the stage of each fruit, there is significant potential for progress through the programme. Some results are original or confirm mechanistic hypotheses, they clearly show the significant role of storage/maturation (more on apple than on mango). The mechanistic hypotheses concerning the determinants of the impacts of processing appear to be reliable for apples (ability to detach cells during crushing).

The project started in January 2017 for a contractual period of 4 years. Finally, with an extension, the project ended in June 2021. A symposium organized in November 2020 enabled us to return most of the results to the scientific community. Unfortunately, the closing meeting planned for 2021 could not take place due to health restrictions. Follow-ups are planned as part of the inter-unit collaborations set up in this flagship project. Finally, the scientific results are substantial; they have enabled 16 published papers, 4 submitted papers, 13 manuscripts in preparation and at least 22 oral communications and posters in national and international conferences (in the context of the Covid19 pandemics). This project has enabled connections between the teams involved and other research teams.

Significant efforts have been made to train the young researchers associated with the project.

The project has established bridges with the private sector by soliciting representative bodies of companies, by organizing feedbacks of the most applied results and by better integrating the needs and requests for innovations.

Full final report here :