

# Preface

This book presents the proceedings of the Workshop on Plant Biopolymer Science: Food and Non-food Applications, which was held in Nantes at the Congress Centre on 24–27th June 2001. This meeting followed in the footsteps of the one organised in September 1998 in Montpellier at ENSAM, in collaboration with Professor Stephane Guilbert. The main idea behind this first meeting was that scientific approaches dealing with the structural or functional properties of macromolecules are rather similar whatever the type of biopolymer – protein, starch or cell wall polysaccharide. As this concept is now widely accepted, and since this first meeting was highly successful, it was consequently decided to organise this second ‘Plant biopolymer workshop’ here in Nantes.

Nantes was chosen as the location because of its INRA Research Centre, which is renowned for its basic and applied research on plant biopolymers, starch, proteins and cell wall polysaccharides. The main objectives of the Nantes Centre in Plant Science first of all concerns the biosynthesis of macromolecules and assemblies *in planta*, secondly their structural characteristics and related physico-chemical and functional properties, and thirdly with their behaviour in multiphasic systems in relation to end-uses in food and non-food applications. In addition, human nutrition is also considered.

One of the challenges for our scientific community over the next few years will be to improve how we respond to social demand, which has changed considerably over the last three years, and to hand down to our children a sustainable world. The situation today is indeed characterised by accelerating changes in many aspects concerning human lifestyles, social order, the environment and agricultural and industrial production systems. Increasing consumer suspicion of industrially-prepared foods, for example, means that more efforts will have to be made to guarantee the safety of these products. Consumer requirements are rather similar in most other industrial sectors like, for example, in the case of cosmetics and pharmaceutical products for which the use of animal-derived products is questionable. On the other hand, much of mankind is still suffering from de- or malnutrition, and questions concerning agricultural production and

the availability of foodstuffs are still pregnant issues in many countries. To summarise, we have to take into account more accurately in our research programmes the demands made by citizens and consumers for sustainable agriculture, environmentally-friendly processes and new technology requirements and safe products. We also have to satisfy more adequately the great diversity of cultural, social, economical or age situations of consumers in developed countries, without ignoring demands from the so-called 'southern' countries. By considering the issue of safety, the increased development and use of plant-based products could partly satisfy this demand, even if we cannot ignore the controversial GMO debate.

To meet these consumer requirements for higher quality and less-transformed products more efficiently, I am convinced that we need to consider the production-transformation chain from a more integrated approach than in the past. In contrast with the logic of the conventional upstream approach 'do your best with the existing and sometimes overproduced crops' re-engineering the chain *via* a downstream analysis from the end-products to plant production should make it possible to improve how the industrial processes, and also crop production, are adapted to consumer requirements regarding the sustainability of agriculture, the development of environmentally-friendly processes as well as the safety and diversity of end-products. A good example may be the following:

- We can expect that increased knowledge of the biosynthetic pathways of plant biopolymers may lead through to their composition, structure and interactions in biological material being controlled more effectively so as to enhance technological functionality and nutritional quality.
- Improved control of component localisation and tissue organisation should also improve the efficiency of separation processes.

Scientifically, this downstream approach needs to monitor the end-products as multiphasic systems at the various organisational levels more closely: molecular, supramolecular and mesoscopic. It requires more basic information on the role of biopolymers in such systems and on how they induce, by interacting with each other or with smaller molecules, assemblies or phase separation processes, and on how they act as surface active components at interfaces. Some of this knowledge exists already but is not efficiently integrated into strategies dealing with improving the quality of starting plant material.

We have to find a link between end-product properties and the biosynthesis, tissue localisation and supramolecular organisation of macromolecules *in planta*. The genetic engineering and modelling of these biopolymers at the molecular and supramolecular levels are key tools for establishing this link. The recent advances made in material science on the one hand, especially dealing with self-assembly technology, and on genomic, proteomic and structural biology on the other, have drastically changed the scientific landscape in our research fields. Based on material science developments, it seems easier today than in the past to study the molecular and supramolecular organisation of biopolymers in solid or condensed states, at least in model systems. *In planta*, the exploding knowledge in genomics and proteomics should make it possible to

control biosynthetic pathways and tissue organisation more effectively. Consequently, the integration of both these scientific fields applied to our area of research should make this re-engineered downstream approach successful.

The scientific programme of this workshop was established in the light of this new approach, considering that scientists from different areas were able to rub shoulders during the whole meeting. The different sessions were defined to integrate all the chains, starting with the *Biosynthesis of Macromolecules* and *Biopolymer Design*, then dealing with model systems such as *Biopolymer Assemblies*, *Interfaces and Interphases* and ending with more applied studies concerning *Multiphasic Systems*. In each area, the keynote speakers were asked to provide a fairly broad overview and, when possible, to pitch their talk at a level that could be understood by all the conference's attendees. These different sessions were defined with the help of the scientific committee which also selected the research contributions, lectures and posters.

Both the venue, Nantes Congress Centre, and the weather, proved to be first class, and the meals were excellent. Special thanks are due to P. Lefer as secretary of the congress, to INRA for financial support and the City of Nantes for its help in subsidising hospitality during this meeting, which was attended by over 120 delegates from all over the globe. Indeed, the meeting was judged to be so successful that plans for a follow-up meeting in autumn 2004 are already under way.

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