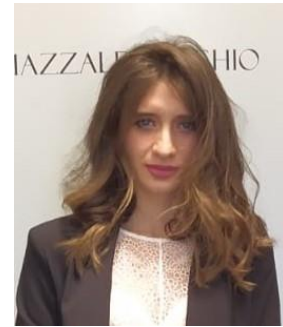


# Formulation and rheological characterization of green products for the food industry



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Curriculum: Ingegneria Chimica

The research aims to formulate, characterize and produce green recipes for the food industry, particularly jellies. The current formulation uses gelatin of animal origin to make the gel. The goal of the doctoral project is to replace gelatin with one or more hydrocolloids of plant origin, which ensures similar performance to the finished product already marketed.

Gummy candies (jellies) consist mainly of water, sugars, polyols and hydrocolloids. In their formulation, the hydrocolloids play the role of gelling agents, creating a three-dimensional network capable of stabilizing the large amount of sugars within the recipe.

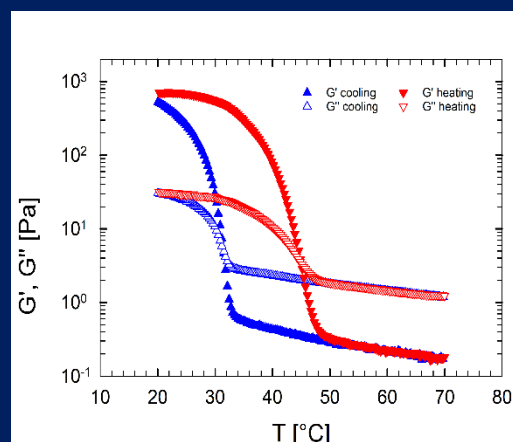
Animal gelatin is the most widely used hydrocolloid in confectionery and is, to date, the only one that can guarantee the optimal sensory performance of jellies.

In recent years, consumers, driven by various motivations (ethical, environmental, health), have been asking to replace foods of animal origin with plant products.

Rheology plays a key role in studying the behaviour of hydrocolloids in water, both in terms of identifying the process temperature range and the viscoelastic properties of the finished product, which is directly related to "customer satisfaction."

An aqueous gelatin solution forms a thermos-reversible gel whose melting temperature is below that of the body. This gives gelatin products unique organoleptic properties, such as the "melt-in-mouth" effect.

Polysaccharide gels, derived from plants, algae, fruits etc, pose as possible green substitutes for gelatin. However, only some of these form thermos-reversible gels. The goal is to formulate, rheologically test and produce green recipes containing combinations of plant hydrocolloids, so as to ensure the same performance as the final product containing animal gelatin, polyols and sugars.



During the first year of the PhD, is planned an extensive bibliographic research of the main hydrocolloids of vegetable origin, already used in the confectionery field. The objective is to select from the available plant hydrocolloids those that may be candidates for use in the product of interest. The selection will be made on the basis of unavoidable requirements that these substances must have, among which only those that give thermoreversible gels with melting temperatures close to body temperature will be chosen.

During the second year research activities will take place in the R&D laboratories of the partner company Perfetti Van Melle. Goal of this phase is to move from the idea developed in the laboratory, to the finished product. The formulation lab will serve to ensure deeper analysis of the various model mixtures with the goal of binding morphology and macroscopic response that will ensure final sensory properties.

During the third year you should study such formulations in chewing simulators

## References

- Novel synergistic transparent k-Carrageenan/Xanthan gum/Gellan gum hydrogel film: Mechanical, thermal and water barrier properties. Rukmanikrishnan Balasubramanian \*, Sam Soo Kim, Jaewoong Lee; International Journal of Biological Macromolecules
- Effects of sucrose addition on the rheology and microstructure of k-carrageenan gel. Zhi Yang a, b , Huijuan Yang a, c , Hongshun Yang. Food hydrocolloid
- Study on Rheological Behavior of Konjac Glucomannan WANG Chao, XU Mei, LV Wen-ping, QIU Pei, GONG Yuan-yuan, and LI Dong-sheng. Food Hydrocolloid