

PhD: FOOD SCIENCE

Title: Innovative protocols for the monitoring and prevention of contamination by fungal toxins to protect the production and the processing chain of tomato

Supervisor: P. Ferranti, AGR/15

Objectives of the research project and interdisciplinary collaborations:

The Regione Campania is the largest production area of processed tomatoes in Italy. The market of the sector in Campania is estimated at 2 billion euros out of a national market of 3.5 billion (1.8 of which from exports). The toxigenic fungus *Alternaria alternata* is one of the main tomato parasites after *Peronospora*. The presence/absence of *Alternaria* in the field does not imply the same for the toxins, which are released at the end of the biological cycle, making monitoring in the field and in transformation products difficult. There are no exhaustive studies on the impact of the pathogen and its toxins on human health. The levels of toxins in some foods, based on EFSA data, in addition to which the factors that determine their high presence should be investigated, are indicated in the EC Recommendation (EU) 2022/553. The values indicated therein do not coincide with safety levels, furthermore the Recommendations expressly require the execution of sampling plans according to specific regulations and the use of more sensitive analytical methods. Concentrated tomato paste is the main processing product that has shown levels of *Alternaria* toxins. The growing demand for safety certifications by foreign customers in the lack of rapid and accurate methods, as well as the lack of reference laboratories in Italy, constitutes an economic burden and an obstacle to the export of Italian companies. This PhD project aims to: 1) Development of protocols for the extraction and enrichment of *Alternaria* toxins from tomatoes and processed products: tomato puree, concentrates, in collaboration with La Doria Spa; 2) Development of a targeted mass spectrometry method for the accurate quantification of already known *Alternaria* toxins, and untargeted for yet unidentified toxins; 3) Based on the previous information, development of antibodies for the quantification of *Alternaria* toxins (this activity will be carried out in collaboration with Biogem (AV)); 4) Creation of sensors based on antibodies to be used in the field and in companies for the monitoring of transformation processes, and validation of the method In collaboration with B. Panunzi, CHIM/03); 5) Creation of databases of useful information for the preparation of guidelines on good processing practices for the prevention of *Alternaria* toxins (in coll. with A. Piscitelli, SECS-S/05).

References. 1. Commission Recommendation (EU) 2022/553 of 5 April 2022 on monitoring the presence of *Alternaria* toxins in food. 2. Dietary exposure assessment to *Alternaria* toxins in the European population, EFSA Journal 2016; 14(12):4654

Innovation and originality of the project in relation to the state of the art:

This doctoral project intends to make up for the lack of knowledge on the effect of *Alternaria* on the quality and toxicity of tomato processing products through an innovative mass spectrometry method that allows the presence of *Alternaria* toxins in the finished product to be quantified. A further element of originality and innovation is also the protection of the market of tomato transformed products through the development of an immunochemical method portable to the field/company for the determination of *Alternaria* contamination with the aim of segmenting the market and defining in real time the most suitable product category transformation to start the tomato.

Grant availability:

- PSR, Regione Campania, Tipologia di Intervento 16.1.2, 'Difesa del pomodoro campano nei confronti delle contaminazioni di *Alternaria*.', P. Ferranti (euro 67.000)
- EU Horizon 21-26 'Giant Leaps', P. Ferranti (euro 560.000)

Collaborations with foreign institutions:

- Prof. Felix Schottroff, BOKU Department, University of Wien, Austria. 6- month period abroad for production of contaminated model transformed products (II anno).

Collaboration with companies:

- 6 months at La Doria (SA), co-funding the PhD project (DM 630).