**Microbiological and physical methods to improve post-harvest quality of fruit and vegetables**

Kiwifruit [*Actinidia chinensis* Planch. var. *chinensis* and *Actinidia chinensis* var. *deliciosa* (A. Chev.)] is one of the most valuable temperate fruit crop and it is a strategic sector for several Italian Regions.

Kiwifruit production, which is mostly concentrated in China, Italy and New Zealand, generates a significant agricultural value of over three billion euros annually, with a retail market value worth over ten billion euros (FAO data, 2017).

Currently, the demand for the presence of new yellow-fleshed kiwi varieties in the market is constantly increasing, which requires a better knowledge of fruit quality and postharvest. In fact, *Actinidia chinensis* var. *chinensis* fruit is generally characterised by a shorter post-harvest viability in comparison with ‘Hayward’ or other *Actinidia chinensis* var. *deliciosa* green fleshed varieties. Having a year-long kiwifruit distribution is a crucial goal. Achieving that fruit harvested in one hemisphere are stored up to the beginning of commercialization of the one produced in the opposite hemisphere requires a fine tuning of pre- and post-harvest strategies.

Post-harvest losses related to microbiological spoilage, softening and storage breakdown (SBD) are the major challenges to achieve this goal. SBD is associated with the ripening of kiwifruit at cold storage temperature that may depend on several aspects, such as the preharvest factors, fruit maturity level at harvest, the rate at which fruit are precooled, and storage conditions. SBD develops as water-soaked area of tissue that will progressively occupy more of the inner pericarp and eventually move to the outer pericarp. Symptoms will continue to express as fruit ripen. During ripening fruit emit a complex blend of volatile organic compounds (VOCs) which contribute to their aroma. Both pathological and physiological disorders may change VOCs emission and, therefore, it could be used to detect injuries or disorder before their onset. Furthermore, some of these VOCs may also contribute to the development of symptomatology. Our study aimed at:

1. determining the risk of SBD and softening incidence in relation to fruit maturation at harvest,
2. characterizing VOCs emission by healthy and SBD affected kiwifruit to identify possible VOCs markers to be used for early detection of this disorder to minimize losses. The evolution of kiwifruit VOCs emission was studied by Proton Transfer Reaction - Time of Flight - Mass Spectrometer (PTR-ToF-MS). Our results show that different VOCs masses are emitted in SBD-affected fruit and their concentration increased with the severity of symptoms. These evidences suggest that VOCs monitoring could be a promising tool for an early diagnosis of SBD.
3. Elucidate the changes occurring in fruit microbiome during storage and relate them with the risk of disorders
4. Develop physical and microbiological strategies to prolong fruit storage and enhance quality

Applicants should have a background in physiology and post-harvest management of fruit and/or microbiology and plant pathology

Research involves field and laboratory analysis of fruit quality and quantification of fruit yield, as well as assessment of effects of girdling, plant growth regulator application, and nutritional or irrigation practices. The selected candidate will assist the program leader with all aspects of the planning, implementation and management of the research program. The main duties will be collecting and analyzing data, preparing presentations and scientific publications, and supervision of employees.

Position Duties:

30% – Field work (mainly in Latina province). Monitor fruit quality development in pre-harvest with destrictive and non-destructive tools (e.g. NIR-spectroscopy) to determine classes of uniform maturation to perform post-harvest trials. Create and validate and harvest index to decide the most appropriate harvest time for long-term storage. Collect and analyse environmental conditions (climatic data) and agricultural inputs (irrigation, fertilisation). Communicate with grower and technicians for the correct management of the experimental plots. The selected applicants will be supported by a senior research assistant

60% – Laboratory analysis (in Bologna). Assess fruit quality attributes, including size, weight, firmness, acidity and sugars and secondary metabolite content (e.g. VOCs). Design and management of post-harvest trials to assess the ripening dynamics of kiwifruit. Design and management of post-harvest trials to incidence and causes of storage breakdown (SBD). Molecular diagnosis of plant disease, gene-expression study of ripening and/or defence related plant genes. NGS description of fruit associated microbiome. Isolation and characterization of predominant fungal and bacterial species. Design of qPCR markers to monitor microbial markers associated with SBD. The selected applicants should perform microbiology experiment autonomously. A senior may assist in biochemical and physical fruit analysis

10% – Train and supervise bachelor and master students and trainees. Supervision includes planning, assigning, and approving work. Assist other faculty and technicians in carrying out cooperative experiments.