



FOOD TECHNOLOGY DEPARTMENT
POSTHARVEST BIOLOGY AND TECHNOLOGY



The members of the unit belong to the Postharvest Unit in the Food Innovation Network and to the Postharvest interinstitutional Consolidated Group of Generalitat of Catalonia. They also belong to the Fundació Centre de Recerca d'Excel·lència en Agrolimentació AGROTECNIO.

The Postharvest Biology and Technology Unit is composed by 3 work units:

- **Postharvest microbiology and technology.**
Responsible: Dra. Inmaculada Viñas Almenar
- **Postharvest physiology and biochemistry.**
Responsible: Dr. Jordi Graell Sarlé
- **Volatile compounds for postharvest improvement and control.**
Responsible: Dra. María Luisa López Fructuoso

The **goals** of the Postharvest Biology and Technology Unit are:

- To identify and control the microbiological hazards of fresh, minimally-processed and processed fruits and vegetables, developing new strategies for their reduction and control to ensure food safety without affecting quality (standard, nutritional and sensory).
- To determine the components and physiological processes that are decisive for the main quality characteristics of fruits, both during ripening and in the postharvest phase, paying special attention to the biochemical processes responsible for changes in the taste and texture of the fruit.
- To use the volatile compounds naturally presents in fruit and vegetables to develop new strategies that allow their use as bio-markers of alterations /diseases and flavourings to improve fruits and vegetable organoleptic quality and to ensure their safety.

The experience of the Unit has resulted in more than 360 international publications and more than 60 research projects funded by European, national and local agencies, CYTED, Interreg and Cost. It is worth to highlight the European projects from the marc programmes (FP 5, 6 and 7) with 7 projects (with the coordination of the European project QRLT-1999-01065) and the more than 35 national CICYT or INIA (National Plan). What is more, the technology of the use of a microorganism with proven bioconservative activity and the technology for the control of fungal microorganisms in fruits have been patented. Referring to technology transfer, the unit comprises more than 50 contracts with companies.

The current **research lines** are:

- Study of the microbiological hazards and risks of fresh and minimally processed fruits and vegetables.
- Development of new biopreservation strategies and physical/chemical treatments to control food-borne pathogens and spoilage microorganisms in fresh and minimally-processed fruits and vegetables.
- Improvement of microbiological quality and food safety of fruit and vegetable juices.



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- Physiological and biochemical bases of fruit quality.
- Improvement and quality control in pre and postharvest of fruits and vegetables, with special emphasis on their aroma and organoleptic quality.
- Detection, isolation and use of volatile compounds present in the fruit as biomarkers of alteration /diseases.
- Isolation, characterization and application of volatile compounds present in food industry by-products as flavourings in food from vegetal origin.

Research team

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Sra. Iolanda Nicolau Lapeña. PhD Student.

RUNNING RESEARCH PROJECTS:

- ✓ Reduction of biological hazards associated with *Listeria monocytogenes* using biopreservation techniques. APPCC. Nombre d'expedient: 56 30078 2019 2A. IP: I.Alegre. Ajuts a les activitats de demostració (DEMO). DARPA-Departament d'Agricultura, Ramaderia, Pesca i Alimentació de la Generalitat de Catalunya. 2020-22. 30.000 €
- ✓ Innovative strategies to prevent fruit juice spoilage caused by *Alicyclobacillus acidoterrestris* and biological risk mitigation associated with unpasteurized fruit and vegetable juice consumption. PID2019-106645RB-I00. IP: I.Viñas. Ministerio de Ciencia e Innovación (MICINN). 2020-23. 145.200 €
- ✓ Strategies to mitigate the problems associated with foodborne pathogens to improve the quality and safety of frozen and ready-to-eat strawberries. AGL2016-78086-R IP: Dra. I.Viñas. Ministerio de Ciencia e Innovación (MICINN). 2016-20. 169.400 €
- ✓ Agri and food waste valorisation co-ops based on flexible multi-feedstocks biorefinery processing technologies for new high added value applications. H2020-BBI-PPP-2015-02 (EU) BBI-IA-DEMO-720719 BBIP - Bio Based Industries Joint Undertaking. UE- 720719 IP: Dra. I. Aguiló-Aguayo. 2016-20. 307.488,75€

CONTRACTS WITH PUBLIC ADMINISTRATIONS:

- ✓ Grant for supporting research of consolidated groups (SGR). Departament d' Empresa i Coneixement (Generalitat de Catalunya). 2017 SGR 01108 (2018-2020). 37.840, 00€. Coordinador: I. Viñas

PATENTS:

- ✓ Biological culture of a strain of the species *Pseudomonas graminis*, use of said culture as an antagonist for the biocontrol of pathogenic bacteria, and method for treating fruit which comprises a step of applying a preparation that comprises said culture to the fruit.

Inventors: I.Viñas, J.Usall, M. Abadias, N. Teixidó, R. Torres.

Priority application USA: Application publication number: US 2013/0280226. Patent number: 8735136. Date of grant: 27/05/2014.

Application PCT: Application number: PCT/EP2014/078214. Date of grant: 17/12/2014. Publication number: W02015091643 (A1). Publication date: 25/06/2015.

European Priority Application: Application number: 13382530.7. Date: 19/12/2013. Publication number: EP2886665 (A1), publication date: 24/06/2015. Concession number: 2886665. (1/02/2017) Countries: Italy, Germany, Spain, France and UK.

PUBLICATIONS (2020-2017):

2020

- ✓ Ortiz Sola J; Valero A; Viñas I; Colas Meda P; Abadias M. (2020). Microbial interaction between *Salmonella* enterica and main postharvest fungal pathogens on strawberry fruit. International Journal of Food Microbiology. 320
- ✓ Ortiz Sola J; Viñas I; Colas Meda P; Anguera M; Abadias M. (2020). Occurrence of selected viral and bacterial pathogens and microbiological quality of fresh and frozen strawberries sold in Spain. International Journal of Food Microbiology. 314
- ✓ Rodríguez-Bencomo J.J; Sanchis V; Viñas I; Martín-Belloso O; Soliva-Fortuny R. (2020). Formation of patulin-glutathione conjugates induced by pulsed light: A tentative strategy for patulin degradation in apple juices. Food Control. 315

2019

- ✓ Beige, B ; Goulao, LF ; Comabella, E ; Graell, J ; Lara I. (2019). Postharvest heat and CO₂ shocks induce changes in cuticle composition and cuticle-related gene expression in 'October Sun' peach fruit. Postharvest biology and technology 148, pp 200-207.
- ✓ Collazo C; Florence Ch; Aguilo-Aguayo I; Marin Saenz, J; Lafarga T; Abadias M; Viñas I. (2019). Decontamination of *Listeria innocua* from fresh-cut broccoli using UV-C applied in water or peroxyacetic acid, and dry-pulsed light. Innovative Food Science & Emerging Technologies. 52, pp. 438 - 449.



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- ✓ Diarte C ; Lai PH ; Huang, H ; Romero, A ; Casero, T ; Gatius, F ; Graell, J; Medina, V; East, A ; Riederer, M; Lara I. (2019) Insights into olive fruit surface functions: a comparison of cuticular composition, water permeability, and surface topography in nine cultivars during maturation. *Frontiers in Plant Science* 10.
- ✓ Lafarga, T; Colas-Meda P; Abadias, M; Aguiló-Aguayo, I; Bobo G; Viñas, I. (2019). Strategies to reduce microbial risk and improve quality of fresh and processed strawberries: A review. *Innovative Food Science & Emerging Technologies*. 52, pp. 197 - 212.
- ✓ Lafarga T; Gallagher E; Bademunt, A; Bobo G; Echeverria G; Vinas I; Aguiló-Aguayo I. (2019). Physicochemical and nutritional characteristics, bioaccessibility and sensory acceptance of baked crackers containing broccoli co-products. *International Journal of Food Science and Technology*. 54 - 3, pp. 634 - 640
- ✓ Lafarga T; Gallagher E; Bademunt A; Vinas I; Bobo G; Vilaró S; Aguiló-Aguayo I. (2019). Bioaccessibility, physicochemical, sensorial, and nutritional characteristics of bread containing broccoli co-products. *Journal of Food Processing and Preservation*. 43 - 2, pp. 1 - 11.
- ✓ Lafarga T; Mayre E; Echeverria G; Viñas I; Villaró S; Acién-Fernández F.G; Castellari M; Aguiló-Aguayo I. (2019). Potential of the microalgae *Nannochloropsis* and *Tetraselmis* for being used as innovative ingredients in baked goods. *Lwt-Food Science and Technology*. 115, pp. 1 - 9.
- ✓ Lafarga, T; Ruiz-Aguirre, I; Abadias, M; Viñas, I; Bobo, I; Aguiló-Aguayo, I. (2019). Effect of thermosonication on the bioaccessibility of antioxidant compounds and the microbiological, physicochemical, and nutritional quality of an anthocyanin-enriched tomato juice. *Food And Bioprocess Technology*. 12, pp. 147 - 157.
- ✓ Nicolau- Lapena I; Abadias M; Bobo G; Aguiló-Aguayo; Lafarga T; Viñas I. (2019). Strawberry sanitization by peracetic acid washing and its effect on fruit quality. *Food Microbiology*. 83, pp. 159 - 166.
- ✓ Nicolau-Lapeña I; Lafarga T; Viñas I; Abadias M; Bobo G; Aguiló-Aguayo I. (2019). Ultrasound processing alone or in combination with other chemical or physical treatments as a safety and quality preservation strategy of fresh and processed fruits and vegetables: a review. *Food and Bioprocess Technology*. 12 - 9, pp. 1452 - 1471.
- ✓ Zudaire L; Lafarga T; Vinas I; Abadias M; Brunton N; Aguiló-Aguayo I. (2019). Effect of ultrasound pre-treatment on the physical, microbiological, and antioxidant properties of calcots. *Food and Bioprocess Technology*. 12 - 3, pp. 387 – 394.
- ✓ Zudaire L; Viñas I; Abadias M; Lafarga T; Plaza L; Bobo G; Altisent R; Aguiló-Aguayo I (2019). Effect of calcium salts and antioxidant treatment on the storage quality of fresh-cut Conference pears. *International Journal of Agriculture, Forestry and Life Sciences*. 3 - 2, pp. 331 - 344.
- ✓ Zudaire L; Viñas I; Iglesias M.B; Plaza L; Abadias M; Aguiló-Aguayo I. (2019). Evaluation of *Pseudomonas graminis* CPA-7 as a biopreservation method for fresh-cut pear: Physicochemical, enzymatic, and nutritional quality. *Food Science and Technology International*. 25, pp. 271 - 281
- ✓ Zudaire L; Viñas I; Simó J; Sans S; Abadias M; Aguiló-Aguayo I. (2019). Effect of pre-harvest conditions and postharvest storage time on the quality of whole and fresh-cut calçots (*Allium cepa* L.). *Scientia Horticulturae*. 249, pp. 110 – 119.

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- ✓ Collazo C; Giné-Bordonaba G; Aguiló-Aguayo I; Povedano I; Bademunt A; Viñas I. (2018). *Pseudomonas graminis* strain CPA-7 differentially modulates the oxidative response in fresh-cut 'Golden delicious' apple depending on the storage conditions. *Postharvest Biology and Technology*. 138, pp. 46 - 55.
- ✓ Collazo C; Giné-Bordonaba G; Aguiló-Aguayo I; Povedano I; Ubach D; Viñas I. (2018). Impact of *Pseudomonas graminis* strain CPA-7 on respiration and ethylene production in fresh-cut 'Golden delicious' apple according to the maturity stage and the preservation strategy. *Postharvest Biology and Technology*. 144, pp. 36 - 45.
- ✓ Collazo C; Lafarga T; Aguiló-Aguayo I; Marin-Saez J; Abadias M; Vinas, I. (2018). Decontamination of fresh-cut broccoli with a water assisted UV-C technology and its combination with peroxyacetic acid. *Food Control*. 93, pp. 92 - 100.
- ✓ Iglesias M.B; Abadias M; Anguera M; Viñas I. (2018). Efficacy of *Pseudomonas graminis* CPA-7 against *Salmonella* spp. and *Listeria monocytogenes* on fresh-cut pear and setting up of the conditions for its commercial application. *Food Microbiology*. 70, pp. 103 - 112.
- ✓ Iglesias M.B; Echeverría G; Viñas I; López M.L; Abadias M (2018). Biopreservation of fresh-cut pear using *Lactobacillus rhamnosus* GG and effect on quality and volatile compounds. *Lwt-Food Science and Technology*. 87, pp. 581 – 588
- ✓ Iglesias M.B; López M.L; Echeverría G; Viñas I; Zudaire L; Abadias M. (2018). Evaluation of biocontrol capacity of *Pseudomonas graminis* CPA-7 against foodborne pathogens on fresh-cut pear and its effect on fruit volatile compounds. *Food Microbiology*. 76, pp. 226 – 236
- ✓ Lafarga T; Bobo G; Viñas I; Collazo C; Aguiló-Aguayo I. (2018). Effects of thermal and non-thermal processing of cruciferous vegetables on glucosinolates and its derived forms. *Journal of Food Science and Technology-Mysore*. 55 - 6, pp. 1973 - 1981.
- ✓ Lafarga T; Bobo G; Viñas I; Zudaire L; Simo J; Aguiló-Aguayo I. (2018). Steaming and sous-vide: Effects on antioxidant activity, vitamin C, and total phenolic content of Brassica vegetables. *International Journal of Gastronomy and Food Science*. 13, pp. 134 - 139.
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- ✓ Sánchez-Torres P; Vilanova L; Ballester A.R; López-Pérez M; Teixidó N; Viñas, I; Usall J; González-Candelas L; Torres R. (2018). Unravelling the contribution of the *Penicillium expansum* PeSte12 transcription factor to virulence during apple fruit infection. *Food Microbiology*. 69, pp. 123 - 135.
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- ✓ Aguiló-Aguayo I; Plaza L; Bobo G; Abadias M; Viñas I. (2017). Pome Fruit Juices. Innovative Technologies in Beverage Processing. pp. 3 – 26.
- ✓ Aguiló-Aguayo, I.; Walton, J.; Viñas, I.; Tiwari, B.K. (2017). Ultrasound assisted extraction of polysaccharides from mushroom by-products. 910702 - Lwt-Food Science and Technology. 77, pp. 92 - 99.
- ✓ Belge, B; Goulao, LF; Comabella, E ; Graell, J ; Lara I. (2017). Refrigerated storage and calcium dips of ripe 'Celeste' sweet cherry fruit: Combined effects on cell wall metabolism. Scientia Horticulturae 201 pp 182-190.
- ✓ Colás-Medà, P.; Abadias, M.; Oliveira, M.; Usall, J.; Viñas, I. (2017). Influence of fruit matrix and storage temperature on the survival of *Listeria monocytogenes* in a gastrointestinal simulation. Food Control. 73 - 1, pp. 1045 - 1057.
- ✓ Colás-Medà, P.; Viñas, I.; Alegre, I.; Abadias, M. (2017). The impact of a cold chain break on the survival of *Salmonella enterica* and *Listeria monocytogenes* on minimally processed 'Conference' pears during their shelf life. Journal of the Science of Food and Agriculture. 97, pp. 3077 - 3088.
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- ✓ Collazo, C., Abadias, M., Colás-Medà, P., Iglesias, M. B., Granado-Serrano, A. B., Serrano, J. Viñas, I. (2017). Effect of *Pseudomonas graminis* strain CPA-7 on the ability of *Listeria monocytogenes* and *Salmonella enterica* subsp. enterica to colonize Caco-2 cells after pre-incubation on fresh-cut pear. International Journal of Food Microbiology, 262, 55–62
- ✓ Giné-Bordonaba, J.; Echeverria, G.; Ubach, D.; Aguiló-Aguayo, I; López, M.L.; Larrigaudière, C. (2017). Biochemical and physiological changes during fruit development and ripening of two sweet cherry varieties with different levels of cracking tolerance. Plant Physiology and Biochemistry. 111, pp. 216 - 225.
- ✓ Iglesias M.B; Abadias M; Anguera M; Sabata J; Viñas I. (2017). Antagonistic effect of probiotic bacteria against foodborne pathogens on fresh-cut pear. Lwt-Food Science and Technology. 81, pp. 242 - 249.
- ✓ Iglesias M.B; Viñas I; Colás-Medà P; Collazo C; Serrano J.C.E; Abadias M. (2017). Adhesion and invasion of *Listeria monocytogenes* and interaction with *Lactobacillus rhamnosus* GG after habituation on fresh-cut pear. 915962 - Journal of Functional Foods. 34, pp. 453 - 460.
- ✓ Moggia, C; Graell, J; Lara I; Gonzalez, G ; Lobos, GA (2017). Firmness at harvest impacts postharvest fruit softening and internal browning development in mechanically damaged and non-damaged highbush blueberries (*Vaccinium corymbosum* L.) Frontiers in Plant Science 8.
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