CONFERENCE I

11.30-13.00 Concurrent Session 9

New Advances and Technologies for Postharvest Diseases Control

Chair: Davide Spadaro *(Disafa, University of Turin, Italy)*
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SE09 C01

POSTHARVEST LOSS MANAGEMENT THROUGH NOVEL TECHNOLOGIES - BRIDGING THE GAP BETWEEN RESEARCH AND PRACTICE

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Food loss and waste (FLW), often caused by plant pathogens in the field and after harvest, is a global challenge recognised by international governments and organisations. Reducing FLW is key to sustainably ensure nutritional food security for an increasing world population. It is a target of the Sustainable Development Goals of the United Nations, and the Farm to Fork Strategy of the European Green Deal. Losses are considered the ones that occurs from the growers to the retailers, while waste occurs when the consumer is involved, from retailers to home or other food services. Postharvest diseases affect fruit and vegetables with an infection that can occur in the field, with latent infections that develops after harvest, or with pathogen that benefits from wounding occurring during the harvest and postharvest manipulation. After harvest, the fresh produce becomes weaker and defenses declines due to ripening and softening of tissues, that allows the pathogen to infect, leading to loss of single fruit or even of the entire box, when it is including in plastic containers or woody boxes. This loss or waste has a very high economic, social and environmental value, since the fresh fruit and vegetables reach this point after being grown, picked, transported, cold stored and exposed to shelf life, that can occur in few days or even months (e.g. for apples, pears or kiwifruit). An integrated list of preharvest and postharvest technologies are important to preserve the fresh fruit and vegetables from the cultivation to the consumer home, that integrate use of decision supporting systems in the field for proper application of synthetic fungicides or alternatives (biocontrol agents, natural compounds, etc.), with a monitoring of isolates resistant to fungicides in the filed and in the packinghouses and alternation of fungicides with a different mechanism of action, both in the field and even for the few fungicides allowed for postharvest application. Harvest needs to be done when the temperatures are not too high, to prevent the stress that the fruit suffer when we have to remove the field heat. It is fundamental the keeping of cold chain in the storage rooms and even more during transportation with dedicated devices with remote control, to prevent opportunistic behavior along the food supply chain. Packinghouses should apply the proper treatment to reduce the wounding of fruit and vegetables, reduce close to zero the inoculum load and allow the fresh produce to have a slow ripening, since a faster ripening is more exposed to the infection. All treatments that can prevent the loss of water and create a barrier to gas exchange can be beneficial, and in a good bunch of fruit the use of edible (or non edible) coating is becoming increasingly important. Use of smart systems to record the onset of infections is desirable, although in this field is not easy to move from the research to the practical application. Another important issue is the cooperation of actors along the supply chain. Request of retailers of fruit and vegetables with a residue of pesticides even lower than legal threshold (maximum residue level) and of a number of residues very low (even 3 to 5) requires complex strategies in the field and in the packinghouse to reach such limits with risk to have a less protected produce, and increase of FLW. Last, but not least, an appropriate behavior of the consumer is important to contribute with own actions to FLW reduction.

SE09 C02

OVERVIEW OF POSTHARVEST DISEASE MANAGEMENT PRACTICES ON APPLE: PREVENTION, MONITORING AND CONTROL

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Postharvest apple diseases are primarily caused by fungal pathogens, as Penicillium spp. and Botrytis spp. that enter through wounds. Increasingly relevant latent pathogens, such as *Neofabraea* alba and *N. kienholzii* (bull's eye rot), *Ramularia mali* (dry lenticel rot), *Colletotrichum* spp. (bitter rot), and *Alternaria* spp. (black rot), develop in postharvest. White haze, which affects fruit quality, is linked to basidiomycetous genera such as *Entyloma*, *Golubevia*, and *Tilletiopsis*, with new species like *E. mali* and *G. mali* identified. Molecular diagnostic tools are used for pathogen detection and monitoring. Fruit microbiome analysis indicates that white haze agents are epiphytic and appear just before harvest, while *R. mali* is endophytic three months before harvest and becomes epiphytic during storage. *R. mali* and *N. alba* are found in orchard environments early in the season. Postharvest disease management strategies include the use of two *Aureobasidium pullulans* strains against white haze, which showed efficacy comparable to chemical treatments at the end of shelf-life. These strains proliferate well on treated fruit both epiphytically and endophytically. Biofumigation with thyme, savoury, and basil essential oils (EOs) at varying concentrations was tested against Botrytis cinerea, showing that thyme and savoury EOs are effective in preventing grey mould rot. Essential oils not only inhibit pathogen growth but also induce resistance in the fruit. Slow-release EO diffusers of basil, oregano, savoury, thyme, lemon, and fennel were tested against blue mould caused by *Penicillium expansum*, with lemon and oregano EOs showing the highest efficacy after 60 days of storage and an additional 14 days of shelf-life.