



TECHNICAL SESSION 3: Chemical and Non-chemical methods for disease management

Lead Papers

L(S03A)01: Non-polluting integrated control of citrus postharvest diseases

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Postharvest decay caused by fungal infections is among the most important causes of economic losses for the fresh citrus fruit sector worldwide. Major diseases include green and blue molds, caused by *Penicillium digitatum* and *P. italicum*, respectively, sour rot caused by *Geotrichum citri-aurantii*, anthracnose caused by *Colletotrichum gloeosporioides*, or brown rot caused by *Phytophthora citrophthora*. Other diseases such as Alternaria black rot, stem-end rots, gray mold, and Rhizopus or Mucor rots also can be occasionally important. Currently, postharvest treatments with conventional chemical fungicides such as imazalil, orthophenylphenol, pyrimethanil, and fludioxonil, among others, are commonly used in citrus packing houses to control these diseases and minimize their economic impact. However, their continuous use by the industry for many years has arisen important health and environmental problems related to the production of chemical residues and the proliferation of resistant pathogenic fungal biotypes. Furthermore, citrus export markets demanding zero residues or organic production are steadily increasing. Therefore, the development of safe and eco-friendly alternatives to chemical fungicides, which according to their nature can be physical, low-toxicity chemical and biological, is a very active research field worldwide and some innovative solutions have been already implemented commercially. However, due to the inherent limitations of these alternative methods, their use should be part of the so-called non-polluting integrated disease management (NPIDM) programs, a broader control strategy based on a deep knowledge of pathogen epidemiology and all factors that determine disease incidence before, during, and after harvest. The purpose of such a program is to take action on every factor at the right moment, always through non-polluting means, in order to minimize the economic losses caused by postharvest diseases.

L(S03A)02: Potential of botanicals and green synthesis of nano-particles against postharvest diseases of apple and citrus fruits

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Approximately one-third of all food and 45% to 55% of all fruit and vegetables produced worldwide are lost or wasted, corresponding to 1.2 to 2 billion tons of food loss every year. For apple fruit, estimates include 8.6% fresh apples lost at retail and 20% lost at the consumer level in the United States. In India, the Central Institute of postharvest Engineering and Technology, reported the postharvest losses of 10.39 per cent in apple. Botanicals with an array of active ingredients have the potential for the effective management of postharvest diseases. Bio-formulation comprising of six botanicals (*Bougainvillea glabra* + *Melia azedarach* + *Eucalyptus globulus* + *Roylea elegans* + *Dedonia viscosa*) and cow urine was found most effective against five major postharvest rots in apple viz., blue mould rot (*Penicillium expansum*), bitter rot (*Glomerella cingulata*), brown rot (*Monilinia fructigena*),