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A role for natural defences in the management of *Colletotrichum* rotting of ripe mangoes

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Anthracnose and blossom blight, caused by *Colletotrichum* species, are two most widely distributed and destructive diseases in mango especially in humid tropics. Anthracnose can occur during any stage of fruit development and result in both pre- and postharvest losses. Young, developing fruits from pin-head size to golf ball size are susceptible and, aborted in large numbers, when infected. *Colletotrichum* species cause quiescent infections in the immature mango fruit and the progressive anthracnose development occurs with the onset of fruit ripening. Fruit losses due to anthracnose may be reduced if fungal infections are kept in their quiescent phase for extended periods. One of the possible ways of prolonging quiescence is to maintain the natural antifungal barrier in the unripe fruit at an inhibitory level in to the post-climacteric phase.

Unripe mangoes contain constitutive antifungal resorcinols, chitinase and gallotannins in the latex/fruit peel. Their presence at inhibitory levels constitutes fruit resistance at immature stage. During fruit ripening, however, the defences gradually decline making ripe fruits susceptible to fungal rotting. Mango peel tissue responds to *Colletotrichum* challenge by producing Reactive Oxygen Species (O_2^-), H_2O_2, increased peroxidase and chitinase activity and phenols during early hours.

Unripe mangoes contain latex in a network of minute latex canals in its peel and the pedicel. Latex disappears in coincidence with ripening and the decline of fruit resistance to fungal pathogens. When latex was retained by harvesting fruit with a portion of pedicel, the incidence and severity of anthracnose, from natural infections or following artificial inoculation, were significantly reduced in the cultivar 'Willard', susceptible to anthracnose. A negative trend was observed between the pedicel length and anthracnose level in the cultivar susceptible to anthracnose. Fruit peel from which latex was retained had greater chitinase activity. The reduction of anthracnose could be due to the greater resorcinols and chitinase activity respectively in latex-retained fruit. The results indicate a direct involvement of latex in the fruit resistance and the possibility of its manipulation to protect ripe fruit from anthracnose. Pre- or postharvest elicitor treatment also reduced the incidence of anthracnose in ripe mangoes. Constitutive antifungal substances could also be useful markers in the selection of cultivars resistant to postharvest fungal pathogens.

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Mango canopy management: new approaches to old issues

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The mango tree is a large tropical tree giving in general low and irregular yields across consecutive years. Researches on canopy management have been a cornerstone to lessen, but not resolve, these problems. Mango production now faces new commercial and societal demands besides higher yields: better fruit quality, in particular sanitary and nutritional quality, and reduced impacts on the environment. These issues bring challenges for the design of canopy management strategies since these objectives are interacting and sometimes conflicting. A better knowledge of the mango tree canopy functioning, in relation to its environment, appears necessary to design appropriate canopy management practices and to deal with the necessary compromises between these objectives. The study of tree architectural development, coupled with ecophysiological researches, appears as a relevant approach to tackle these points. In this paper we draw the current trends in terms of canopy management and vigour control for the mango tree, we present the recent advances made in architectural analysis and ecophysiology, and we outline the research needs for the future. The importance of the cultivar factor is highlighted, leading to the conclusion that a unique canopy management strategy is probably utopian, and cultivar-specific strategies must be considered. Another key point is the necessary interdisciplinarity of these approaches, in order to gather and process ecophysiological, architectural and genetic data to design canopy management strategies. Finally, the complexity of the canopy functioning requires a conceptual and quantitative modelling approach to synthesise the knowledge and to support the design of management strategies.