

D-31: Differential rot development by *Colletotricum gloeosporioides*, *Phytophthora palmivora* and *Rhizopus arrhizus* in papaya fruits

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Colletotricum gloeosporioides can establish quiescent infections in immature papaya fruits by direct cuticular penetration and the progressive anthracnose lesion development takes place only after fruit ripening has commenced. *Phytophthora palmivora* can infect the fruits at any maturity stage, but the infection of immature fruits invariably requires a wound. *Rhizopus arrhizus* can cause rotting in detached papaya fruits at any stage of maturity provided, there is substantial wounding on the fruit surface. Following factors were investigated to explain differential sensitivity of these pathogens to papaya fruits: (1) The effect of papaya latex on the pectic enzymes produced by these pathogens, (2) Direct, digestive effect of papaya latex on 3 pathogens and (3) Differences of hyphal wall composition of the 3 pathogens in relation to the action of papaya latex.

C. gloeosporioides, *P. palmivora* *R. arrhizus*, used in this study were isolated from infected papaya fruits and maintained on Cooks no. 2 medium or Bean Meal Agar. Enzymes were produced by growing the pathogens separately in liquid cultures (Czapek-Dox Nutrient Solution) with crude papaya cell wall as the sole carbon source. The crude enzyme preparations were concentrated by freeze drying. Pectic enzymes were also extracted from fruit tissues rotted by the 3 fungi. Tissues were extracted with cold acetone and the resulting powder was suspended in 0.025 M phosphate buffer containing 0.2 M NaCl. Enzyme assay was done by using cup plate method and other standard procedures. Latex was collected from fresh fruits and diluted with equal volumes of sterile distilled water and shaken for 15 min. The water soluble fraction was separated by centrifugation. Different concentrations were prepared by diluting with sterile distilled water.

The time taken for 100% digestion of conidia/spore of *C. gloeosporioides*, *R. arrhizus* and zoospores of *P. palmivora* was determined. 10 µl drops of suspensions of conidia/spores of *C. gloeosporioides* and *R. arrhizus* were added to the water soluble fraction of papaya latex placed on clean glass slides. 10 µl of distilled water was added to each conidia/spores suspension, as the control. After 18 h of incubation period, the percentage spores digested or % spores germination was recorded.

C. gloeosporioides, *R. arrhizus* and *P. palmivora* produced pectin lyase (PL) polygalacturanase (PG) and proteolytic enzymes both *in vitro* and *in vivo*. The 3 fungi produced more PL than PG *in vitro*. *P. palmivora* and *R. arrhizus* produced more PL *in vivo* than PG. *C. gloeosporioides* produced more PG. Water soluble fraction of papaya latex had no effect on pectic enzymes produced by the 3 fungi *in vitro* or *in vivo*.

When conidia of *C. gloeosporioides* were exposed to water soluble fraction of papaya latex almost all the conidia and newly formed appressoria were destroyed within 45 min. But 2 days old dark appressoria were not effected. Zoospores of *P. palmivora* stopped their mortality instantaneously with the addition of latex and cellular contents of sporangia also became clumped and disorganized within 15 min, but their hyphae showed tolerance to water soluble fraction of papaya latex. The spores and the mycelium of *R. arrhizus* spores were tolerant to the papaya latex. Addition of water soluble fraction of papaya latex to spores *R. arrhizus* increased germination. Percentage germination of *R. arrhizus* increased with the increase of latex concentration.

R. arrhizus, *P. palmivora* and *C. gloeosporioides* contain chitozan-chitin, cellulose-glucan and chitin-glucan respectively in their cell walls. The difference in sensitivity of these pathogens to papaya latex may be due to the difference in their cell wall compositions.

Results of above experiments suggest that the papaya latex reacts differentially to *C. gloeosporioides*, *R. arrhizus* and *P. palmivora*. This could be due to the difference in the composition and perhaps the structure of the cell walls of the 3 pathogens. Latex is present in the tissues of unripe papaya fruits and disappears during ripening. These may explain the differential resistance of papayas to these 3 pathogens. Further this difference is not related to any inhibitory activity of latex against pectic enzyme produced by the 3 fungi.