Title UV-C-induced disease resistance in tomato fruit is a multi-component and time-dependent system

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Abstract

The induction of disease resistance in a variety of postharvest crops by ultraviolet (UV)-C radiation is well established, although the physiological and biochemical basis of the induced resistance has not been fully elucidated. Mature green tomatoes were treated with a hormetic dose of UV-C and stored for 35 days. The present study focused on the interactions between UV-C-treated tomato fruit and *Botrytis cinerea* over the storage period, in comparison with untreated control fruit, using chemical assays, electrophoresis, and ultrastructural and histochemical techniques. The resistance of UV-C-treated fruit developed gradually and was evident three days following treatment, with resistance reaching a peak level around 15 days after treatment and remaining steady thereafter until the end of storage. The evidence suggests that UV-C-induced disease resistance is a multi-component system with different dynamics and chronology. The accumulation of the phytoalexin, rishitin, accounted for early defence against infection. Ultrastructural modifications in the epicarp lead to the formation of a physical barrier hindering *B. cinerea* ingress. The reinforcement of that barrier and cell walls by simple phenolic compounds, lignin, and suberin provide additional protection against maceration by fungal enzymes. Furthermore, UV-C enhanced the levels of both constitutive and inducible β-1,3-glucanases. The lytic enzyme defences developed gradually over three days, reaching maximum levels at 15 to 20 days and remaining steady thereafter. In contrast, the phytoalexin level declined over the same time period. Although molecular defences are also induced in response to infection alone, their effectiveness is reduced by the slowness of their induction. Pre-establishment of those mechanisms by UV-C treatment arguably gives the tissue a head start in fighting the infection.