

Title Combining human and environmental friendly methods to synergistically improve postharvest disease control

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Abstract

Combining control methods can improve control efficacy, increase the spectrum of controlled pathogens and reduce the possibility of resistance development. Compatibility of control methods is essential for the success of the combined treatments: the primary treatment should not destruct the succeeding one and, preferably, improve it. In the last few years, carrot growers have begun to brush carrots prior to storage and marketing: in the present study we showed that this practice increases the appearance of black root rot, a postharvest disease caused by the fungus *Thielaviopsis basicola*. To prevent it the fungicide Iprodion is usually applied before storage, to the non organic product, and development of human and environment friendly control methods is currently needed. In the present study, this problem was selected as the success parameter for the synergistic effect of combining a physical, low-residue chemical and a biological control agent. A technology for the precise application of steam combined with application of stabilized hydrogen peroxide (TSUNAMITM) or yeast commercial product (SHEMERTM) was tested. Both the steam and the TSUNAMI alone were highly effective at reducing disease decay but caused physical or phytotoxic damages. Combined treatments of sublethal steam application followed by sublethal dosage of TSUNAMI or SHEMER, improved efficacy and disease control forming a synergistic effect compared to each of the treatments alone. The same pattern was observed by application of low dosages combination of TSUNAMI followed by water rinsing and SHEMER treatment. These experiments showed that disease-control agents with damage potential can be applied for a short period, and then washed of, if needed, and efficiently followed by application of a biological control agent. The biological pathway and mode of action are still under investigation but the synergistic effects of using sublethal treatments sequentially with a biological control agent showed a potential to reduce the use of harmful chemicals for control in postharvest fruits and vegetables.