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Treatment with chitosan enhances resistance of tomato plants to the crown and root rot pathogen *Fusarium oxysporum* f. sp. *radicis-lycopersici* â˜†

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Abstract

Chitosan, a polymer of Î²-1,4-D-glucosamine derived from crab-shell chitin was applied to tomato plants prior to inoculation with the root pathogen, *Fusarium oxysporum* f. sp. *radicis-lycopersici*. Whether chitosan was applied by leaf spraying or root coating, it was found to markedly reduce the number of root lesions caused by the fungus, and to drastically increase the formation of putative physical barriers in infected root tissues. The effect of chitosan on the induction of host cell reactions was observed at concentrations ranging from 0Â·5 to 2 mg $ml^{â^'1}$ with an optimal effect at 2 mg $ml^{â^'1}$. The enhanced protection of tomato roots to fungal attack upon application of chitosan

to leaves suggests that chitosan-induced resistance is systemic. Formation of wall oppositions such as papillae and occlusion of xylem vessels with either a network of bubble-like structures or a coating material were among the most typical features of host reactions. In addition, the accumulation of amorphous deposits, probably infused with phenolics from their electron-density, was observed in most intercellular spaces and some host cells. These deposits were often found to interfere with the walls of invading hyphae causing severe alterations. The application of wheat germ agglutinin, a lectin with N-acetylglucosamine-binding specificity, in conjunction with gold-complexed ovomucoid, to tissue sections showed that the walls of severely altered hyphal cells were labelled except in the area closely appressed to host cell walls. This suggests that extracellular chitinases accumulate in the host's cell walls but are not the primary determinants of fungal damage. The possibility that toxic compounds such as phenols and chitosan-induced phytoalexins may be responsible for the observed damage of invading hyphae is discussed.

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Abbreviations

PBS, phosphate buffered saline; PEG, polyethylene glycol; WGA, wheat germ agglutinin

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