Title Temperature and controlled atmosphere effects on efficacy of *Muscodor albus* as a biofumigant

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Abstract

The demand for non-chemical fumigation techniques is increasing rapidly. On the one hand this is to accommodate the increasing organic industry. On the other hand more and more fungicides are either no longer allowed for post harvest treatment due to toxicological risks or are no longer effective. The latter is a result of the emergence of fungicide resistant populations of storage pathogens due to repeated use of certain fungicides. Recent research has focussed on the potential for certain fungi to act as biofumigants and the volatile-producing endophytic fungus *Muscodor albus* was shown to inhibit or kill all tested postharvest pathogens in vitro and control postharvest infection of apples, peaches and citrus. Since many fruit are stored in a controlled atmosphere environment, the activity of *M. albus* against four fungi (*Botrytis cinerea, Penicillium expansum, Sclerotinia sclerotiorum and Phythophthora erythroseptica*) was investigated at three controlled atmosphere conditions (air (20.8% O_2 + 0.03% CO_2), decreased O_2 (1% O_2 + 0.03% CO_2), increased CO_2 (20.8% O_2 + 15% CO_2)) at high (20°C) and low (3°C) temperature. At 20°C, 48 h exposure to *M. albus* completely inhibited all four fungal pathogens in all atmospheres. *P. erythroseptica* was the only pathogen completely suppressed at 3°C, in all three atmospheres with a similar exposure time whereas the other fungi were only partially controlled. Growth of *B. cinerea* and *P. expansum* was decreased at 3°C in high CO_2, compared with the other two atmospheres, but efficacy of *M. albus* was also lower at 3°C in high CO_2, indicating a high CO_2 concentration might suppress growth and/or volatile production of *M. albus*. Longer exposure (96 h) improved control by *M. albus* for *S. sclerotiorum* but not for *B. cinerea* and *P. expansum*. In conclusion, *M. albus* appears to be a promising alternative for chemical fumigation but more research into temperature and atmosphere composition efficacy is warranted.