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纳他霉素采前处理对葡萄采后灰霉病的抑制效果

Inhibition efficiency of natamycin pretreatment before harvest on gray mold of post-harvest grapes

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中文摘要:

为了明确纳他霉素采前处理对葡萄采后灰霉病的抑制效能,为开发鲜食葡萄无硫保鲜技术提供方法依据,该文主要通过活体损伤接种抑菌试验及相关生物测定，研究纳他霉素对葡萄采后灰霉菌的作用效果，通过采前/采后浸果试验及相关生理指标测定，研究纳他霉素对葡萄采后灰霉病的抑制作用。研究结果表明，无论在室温25℃还是低温0℃条件下，500 mg/L的纳他霉素抑菌液可显著（P<0.05）抑制巨峰和玫瑰香葡萄表面接种的灰霉病菌生长，且可使接种菌落的菌丝、生长点及孢子的显微形态发生不利于生长繁殖的改变。无论巨峰还是玫瑰香品种，经采前浸果处理的葡萄在贮藏80 d后，霉烂率、脱粒率、失重率均低于采后浸果处理，果肉硬度均高于采后浸果处理。采用500 mg/L的纳他霉素抑菌液进行采前浸果处理，可明显抑制贮藏期间葡萄果实表面灰霉菌种群数量的增加，降低巨峰和玫瑰香葡萄贮藏期间霉烂率、脱粒率及果梗褐变指数。至贮藏结束时，经纳他霉素采前处理的巨峰和玫瑰香葡萄表面灰霉菌数量极显著（P<0.01）低于对照，且分别较对照减小73.66%和78.71%；经纳他霉素采前处理的巨峰和玫瑰香葡萄霉烂率分别较对照减小40.77%和50.36%，脱粒率分别较对照减小43.93%和43.20%，果梗褐变指数分别较对照减小50.86%和48%。此外，500 mg/L的纳他霉素抑菌液对整个贮藏期内葡萄果穗乙烯生成速率的增加起到抑制作用，可在一定程度上降低葡萄果梗中苯丙氨酸解氨酶、多酚氧化酶和过氧化物酶的活性，并通过直接或间接诱导葡萄果实中几丁质酶和β-1, 3葡聚糖酶活性的提高，从而增强对采后灰霉病的抗性。综上所述，适宜纳他霉素采前处理有利于控制鲜食葡萄贮藏期间灰霉病的发生，提高果实品质，在鲜食葡萄贮藏保鲜领域具有较大的应用潜能。

英文摘要:

Abstract: Gray mould caused by Botrytis Cinerea is one of the most harmful diseases to grape production and has become an obstacle to grape storage. Natamycin is a natural antimycotic polyene commonly used to prevent yeast and mould contamination of daily food. However, there is no conclusive report on the possible effect of this antibiotic on post-harvest gray mold for grapes. In this paper, the effects of natamycin on grape Botrytis Cinerea were studied through artificially inoculated experiments and related bioassay. Inhibition potentials on post-harvest gray mold for grapes were further studied through pre-harvest dipping treatments and related physiological analysis. Results showed that, at both room temperature and low temperature conditions, growth of Botrytis Cinerea inoculated on fruit surfaces was obviously inhibited by 500-mg/L natamycin antimicrobial. The inhibition rate of the 'Kyoho' and 'Muscat' grape reached 95.23% and 87.84%, respectively. The inhibition ratio under low temperature was higher than that at room temperature, which achieved highly significant levels ($p<0.01$). The microscopic morphology of mycelium, terminal growing points and spores were also changed into unfavorable growth. Mycelium edges became rough, separation was not clear, terminal growing points wilted, and spores became malformed. For both of the two varieties, mildew rate, abscission rate, and weight loss rate of pre-harvest dipping treatment were lower than that of post-harvest dipping treatment. Fruit hardness of pre-harvest dipping treatment was higher after being stored for 80 days. The increase of the Botrytis Cinerea population on fruit surfaces was significantly suppressed by the pre-harvest dipping treatment of 500 mg/L natamycin antimicrobial. Compared to control, Botrytis Cinerea population on 'Kyoho' and 'Muscat' grape fruits were reduced by 73.66% and 78.71% respectively after pre-harvest dipping treatment of natamycin at the end of storage. The mildew rate, abscission rate of fruit, and browning index of stem were also reduced during storage period. Compared to control, the mildew rate of 'Kyoho' and 'Muscat' were reduced by 40.77% and 50.36%, the abscission rate of fruit were reduced by 43.93% and 43.20%, and the browning index of stem were reduced by 50.86% and 48% respectively when stored for 80 days. In addition, the ethylene (ETH) generation rate of grape clusters was inhibited by pre-harvest dipping treatment of 500 mg/L natamycin antimicrobial, and the activity of phenylalnine ammonialyase (PAL), polyphenol oxidase (PPO), and peroxidase (POD) in the stem were reduced to some extent. Chitin and β-1, 3-glucan are main structural components of fungal cell walls. Chitinases and β-1, 3-glucanases produced in plant tissue have the abilities to degrade Chitin and β-1, 3-glucan, which will help eliminate pathogenic fungus. Furthermore, activity of chitinases and β-1, 3-glucanases in grape fruit were largely induced by natamycin treatment, directly or indirectly, so as to increase the resistance to postharvest grey mould. In conclusion, pre-harvest treatment of natamycin can greatly help control grey mould and improve the quality of table grapes during storage. Findings of the present study would be helpful in designing management measures to reduce incidence and severity of mildew, abscission, and browning of different grape varieties. The findings also demonstrated the potential for using natamycin in controlling natural infections of grape postharvest pathogens. These findings can be employed by grape suppliers to provide qualitatively and quantitatively better produce to the local and/or export markets and release great application potential in the field of keeping table grapes fresh.

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