

Synergistic inhibitory effect of 1-methylcyclopropene (1-MCP) and chlorine dioxide (ClO₂) treatment on chlorophyll degradation of green pepper fruit during storage

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Abstract

Degreening indicates the ripening and senescence process of green pepper fruit, which mainly results from chlorophyll degradation. To date, however, the effect of 1-Methylcyclopropene (1-MCP) alone or in combination with chlorine dioxide (ClO₂) on the chlorophyll degradation pathway of green pepper at the molecular level remains scarce. In this study, green peppers were treated with 1 μL L⁻¹ 1-MCP, 30 μL L⁻¹ ClO₂ alone and 1 μL L⁻¹ 1-MCP plus 30 μL L⁻¹ ClO₂, respectively and stored at 20 °C for 12 d. The results showed that 1-MCP + ClO₂ combination was superior in inhibiting color changes, decreasing the respiration rate, and exhibiting chlorophyll content as compared with 1-MCP or ClO₂ alone. Further study on the expression of genes related to chlorophyll degradation pathway revealed that pheophytinase (*PPH*), pheophorbide *a* oxygenase (*PAO*) and red chlorophyll catabolite reductase (*RCCR*) were suppressed by all treatments. The efficiency of the combined treatment (1-MCP + ClO₂) was better than that of 1-MCP or ClO₂ alone. While the expression of chlorophyllase (*CLH*) was not affected by ClO₂, but was significant suppressed by 1-MCP and 1-MCP + ClO₂. Therefore, our results indicate the different regulatory roles of 1-MCP and ClO₂ on the chlorophyll degradation pathway and provide an efficient method to preserve green pepper.