

Title 1-MCP application before continuous ethylene storage suppresses sugar accumulation in the UK-grown potato cultivar 'Marfona'

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Abstract

It has previously been shown that ethylene application at $10 \mu\text{l L}^{-1}$ can successfully inhibit sprouting and therefore promote the longer storage of potatoes, but in combination with low temperatures can cause the increase in sugar content. The blocking of ethylene perception by 1-methylcyclopropene (1-MCP) may be expected to have a deleterious effect on potato storage in terms of sprouting; however sugar tuber accumulation might be reduced. In this study, the effect of both 1-MCP and ethylene on biochemical composition, respiration rate and sprouting in the UK-grown potato cultivar 'Marfona' was investigated. Potatoes were harvested and slowly cured from 15 to 6°C over two weeks. Tubers were then exposed to $\pm 1 \mu\text{l L}^{-1}$ 1-MCP for 24 h. After the 1-MCP treatment the tubers were placed in trays and stored in the presence or absence of continuous ethylene ($10 \mu\text{l L}^{-1}$) at 6°C at Sutton Bridge Crop Storage Research Unit (SBCSR) (Lincs., UK) for 30 weeks. Ethylene-treated tubers that did not receive the 1-MCP treatment contained higher levels of total sugars than air-treated potatoes. In contrast, there were no significant differences in sugars between ethylene and air-treated tubers that had received a prior 1-MCP treatment. Additionally, the ethylene-treated tubers that did not receive 1-MCP had significantly higher sucrose, glucose and fructose content than those that received 1-MCP. Respiration rate of tubers was significantly higher in both ethylene and air-treated tubers that received 1-MCP. Surprisingly, there were no significant differences between treatments regarding total number of sprouts measured after thirty weeks storage. The results suggest that a 24 h $1 \mu\text{l L}^{-1}$ 1-MCP exposure before storage did not affect the total sprout number of tubers, but that the action of ethylene was significantly suppressed in terms of sugar accumulation of tubers.