Rural Industries Research & Development Corporation

Summary of full report

Delaying postharvest senescence of cut flowers using nitric oxide

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May 2003

RIRDC Publication No 03/51 RIRDC Project No UNC-16A

Executive Summary

Nitric oxide (NO) is a highly reactive, toxic gas that occurs naturally in the environment as a byproduct of lightening strikes and from anthropogenic sources such as combustion processes.

Recently, NO has been found to be an important bioactive molecule in mammalian physiology, where it acts as a signalling agent in a diverse range of physiological processes including blood pressure regulation, blood clotting, the transmission of neural impulses and the generation of immunological responses. NO performs similar roles in other more phylogenetically distant animal species, including both vertebrates and invertebrates.

In plants, nitric oxide has recently been linked to a range of physiological processes including cell growth, seed germination, phytopathological stress and plant senescence. It is this latter characteristic that forms the keystone of the investigations in this report.

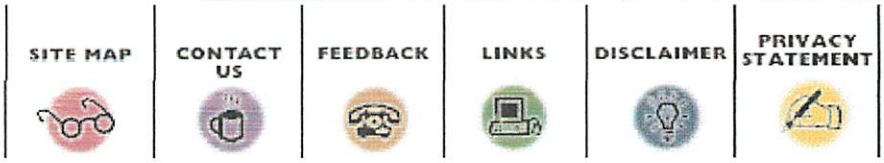
Previous investigations undertaken by our research group have demonstrated that fumigation with NO gas can delay senescence in selected fruits, vegetables and cut flowers. We have also showed that water-soluble chemicals releasing NO gas into solution can extend the postharvest life of a number of species of commercially important exotic cut flowers. Importantly, these studies found that nitric oxide was effective on both ethylene sensitive and ethylene insensitive flower species suggesting that the mode of action of NO differs from current commercial treatment protocols such as silver thiosulfate (STS) and 1-methylcyclopropene (1-MCP) that exclusively target the effects of endogenous and exogenous ethylene.

The aim of this study was to assess the impact of a single solid NO donor compound, 2,2'-(hydroxynitrosohydrazino)-bisethanamine, (DETA/NO) on the postharvest life of selected native cut flowers. Seven flower species (paper daisy, ptilotus, kangaroo paw, isopogon, grevillea,

Geraldton wax and waratah) were investigated. Of these, four (ptilotus, kangaroo paw, grevillea and waratah) responded to pulse treatment with mid range concentrations (10–1000 ppm) of DETA/NO. In three of these cases (ptilotus, kangaroo paw and waratah), the extension in postharvest life was greater than that observed for the current industry standard treatment, STS.

Most significantly, the DETA/NO treatment produced changes in the senescence pattern of each flower species that was not observed in the corresponding STS treatment. This included reductions in the occurrence of stem wilt and flower head wilt (in the case of ptilotis and kangaroo paw), and decreased incidence of mould growth in the case of waratah.

The results from this brief study suggest that DETA/NO is effective in counteracting some of the undesirable postharvest characteristics that afflict certain species of native cut flowers. However, a more extensive long-term study is required to gain a comprehensive understanding of the actions of NO donor compounds on Australian native flowers.



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