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ETHYLENE EFFECTS ON ROSES -- GROWERS MAY NEED TO USE STS

Michael S. Reid and Richard Y. Evans
Department of Environmental Horticulture, University of California, Davis

For many years, researchers have known that roses, like many other cut flowers, are sensitive to high concentrations of ethylene. As early as 1931, Zimmerman and his associates at the Boyce Thompson Institute showed that treatment of rose plants with ethylene caused defoliation, yellowing of leaves, and "blasting" of flowers. The concentrations that they used were, however, somewhat higher than are commonly encountered in commercial practice and these responses are not commonly observed. Recent research has suggested no important role for ethylene in the postharvest life of cut roses. STS, a chemical which dramatically improves the life of cut carnations, normally has little effect on cut roses and is not presently recommended for use with roses.

Because cut roses are becoming more widely handled in supermarkets, where they are exposed to ethylene produced by ripening fruits and other produce, we recently have been reexamining the response of rose flowers to the relatively low concentrations of ethylene that might be expected in supermarket warehouses and retail display areas.

Rose flowers cut at normal commercial maturity were obtained from local producers, and transported cool to Davis, where they were held at 35°F and used within 24 hr. Cultivars used included 'Sonia', 'Royalty', 'Cara Mia', 'Golden Wave', 'Golden Fantasy', 'Golden Times', 'Prive', 'St. Louis', 'Lovely Girl', 'Candia', 'Jack Frost', 'Lavande', 'Chantilly Lace', 'Lady Diana', and 'Excitement'.

To examine the effect of different ethylene concentrations, flowers were trimmed and placed in vases containing deionized water. The vases were put in large glass tanks ventilated with air containing different concentrations (0 to 1 ppm) of ethylene gas. Ethylene concentrations were monitored daily by gas chromatography.

To examine the effect of STS on the ethylene response, flowers were trimmed and placed in 0.5 mM STS, prepared as described in "Preparation and Use of STS for Cut Roses" (see page 3). The flowers were permitted to take up different volumes of solution to provide the desired amounts of STS in different flowers.

To our surprise, we discovered that roses are very sensitive to ethylene gas. Depending on the variety that we tested, ethylene caused the flowers to pop (e.g. 'Golden Fantasy'), prevented opening altogether (e.g. 'Lovely Girl'), caused petals and leaves to fall off (e.g. 'Candia') and caused abnormal flower shape during opening (e.g. star-like opening of 'Royalty'). These effects could be seen after exposing the flowers for only one day to ethylene concentrations as low as 20 parts per billion (Fig 1). (20 parts per billion is 20 volumes of pure ethylene in 1,000,000,000 volumes of air, the equivalent of dividing 1 jigger of scotch among 5,000,000 glasses of soda!) Ethylene at this concentration is commonly found in supermarkets, and floral distribution personnel in at least one large supermar-

CONTENTS

ket operation have already observed abnormal opening of roses.

STS pre-treatment was a very effective means of overcoming the consequence of exposing roses to ethylene. Treatment of three-leaved stems with between 0.5 and 1 umol Ag^+ was sufficient to completely overcome the effects of 0.5 ppm ethylene (Fig. 2). Rose flowers seemed tolerant of high concentrations of silver ion. Applications of 2 umol Ag^+ per stem caused no phytotoxicity in the cultivar 'Royalty'.

To minimize the damage that ethylene may cause to cut roses, we suggest adoption of at least some of the following recommendations.

1. Minimize exposure to ethylene: The ethylene problem is aggravated by the presence of many common sources of ethylene pollution. The most important of these are ripening rooms and ripe produce (apples, bananas, avocados, tomatoes), and internal combustion engines (diesel trucks, automobiles and propane-powered fork-lifts). Wherever possible, cut roses should be isolated from such sources of ethylene.

2. Ventilate holding and storage spaces: Adequate ventilation of handling and storage spaces (1 air exchange per hour) will reduce the effects of occasional releases of ethylene. Ventilation air should be drawn from above the building - fans at street level can easily suck in fumes from motor vehicles.

3. Maintain proper storage temperature: Roses should be held at 33-35°F. At this temperature, they will respond much more slowly to polluting ethylene.

4. Use a postharvest treatment with STS. STS, the silver thiosulfate complex, is widely used to delay wilting of carnations and prevent shattering of flowers and leaves from sensitive potted plants like Christmas cactus and seedling geraniums. STS is not expensive when used correctly (at the present world price for silver, materials for the proper application to roses would cost less than 1 cent per hundred roses). To prevent damage to foliage and petals, it is essential to apply STS correctly. Several companies provide preparations of this material which can be used to treat roses. To apply STS to roses, use the short-term method suggested for carnations, but use 1/4 the time, or 1/4 the recommended concentration of STS. Alternatively, you could prepare an STS solution yourself (see "Preparation and Use of STS for Cut Roses").

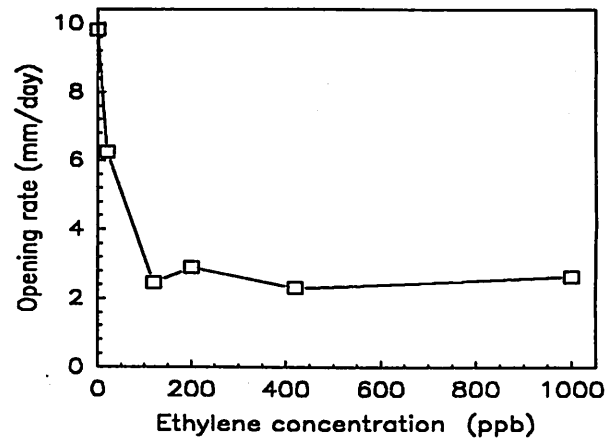

Figure 1. Opening rate of cut 'Lovely Girl' rose flowers as a function of ethylene concentration.

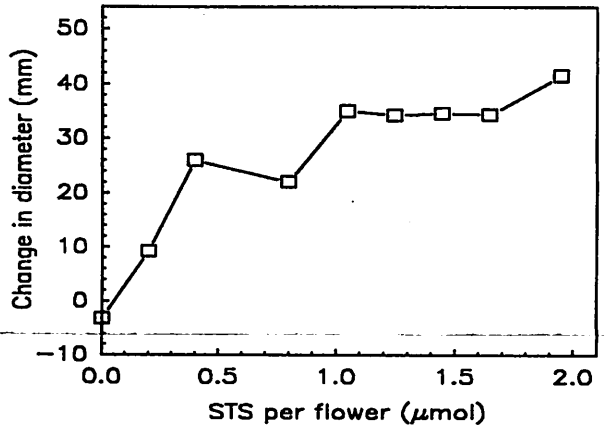

Figure 2. Change in diameter of cut 'Lovely Girl' rose flowers exposed to 1 ppm ethylene as a function of STS concentration.

5. The ultimate solution to the problem of ethylene effects on rose opening is suggested by the observation that some cultivars are not markedly affected by exposure to low concentrations of ethylene. Selection of rose cultivars in future breeding programs should include elimination of those whose flowers are sensitive to ethylene.

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Richard Evans
Tom Byrne
Michael Reid
Editors