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Keeping Roses "Tight" With Ethylene Oxide

a possible breakthrough in increasing the longevity of cut flowers is indicated by USDA experiments

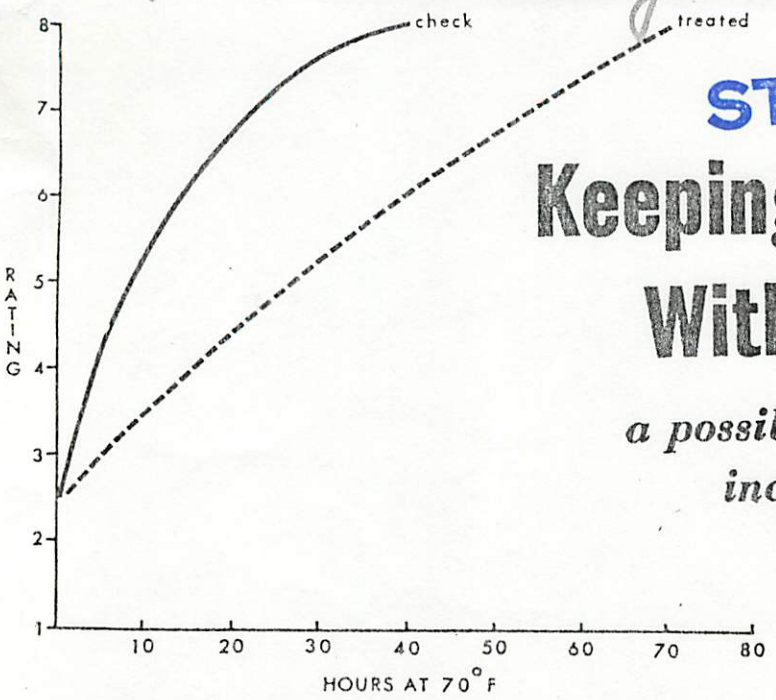

Figure 1. The rate of opening of Better Times roses as influenced by ethylene oxide. Treated roses were in an atmosphere containing 0.25 per cent ethylene oxide for 20 hours.

Better Times buds have been delayed in popping open in a series of experiments by USDA scientists at Beltsville, Md. Using ethylene oxide as a treatment, the authors effectively delayed the rate of maturation of Better Times roses without injury.

The treatment was just as effective with Golden Sceptor and White Butterfly. Other beneficial side effects were better color and longer retention of petals after the buds were completely open.

More Research Needed

Although the results are promising, considerably more research must be performed before these treatments can take their place as practical technique. Still, it appears that this may be the major breakthrough the industry has been seeking to increase the life of cut flowers.

Enhancing the longevity of cut flowers has long been one of the aims of the florist industry. Much attention has been given to the many environmental factors which influence keeping quality and practices have been recommended at the grower, wholesaler and retailer levels. These recommended practices have had some beneficial effects but there is still much room for improvement.

Ethylene and Ethylene Oxide

The formation of ethylene has been associated with senescent metabolism. The finding of Lieberman and Mapson[1] in 1962 that ethylene oxide inhibited ethylene production and ripening of intact fruit was a very significant discovery.

These investigators, in a number of experiments, retarded the ripening of green tomato fruits by holding them for 16 to 22 hours in an atmosphere containing 0.75 per cent ethylene oxide. The treated fruit then ripened normally at 68°F. after a delay of 5 to 21 days, depending on the ripeness of the fruit at the start of the experiment.

Freshly cut Better Times roses[2] were held for 20 hours at 60°F. in an atmosphere containing 0.25 per cent ethylene oxide. After treatment the roses were removed from the chambers, the chambers flushed daily with water, and the roses returned to the sealed chambers for 2 additional days at 60°F.

Keeping the roses in sealed chambers for 2 additional days made the initial treatment more effective. Measurement of ethylene oxide by gas chromatographic procedures indicated that after the initial 20-hour treatment the roses emitted the gas for approximately 3 days. The emitted gas presumably was responsible for the added effects of the 2 additional days in the chambers.

40 Hours vs. 70 Hours

After the 2 additional days at 60°F. the roses were removed from the chambers and placed at 70°F. for evaluation. The roses were evaluated on the basis of the degree of opening since this phenomenon is associated with maturation. (Figure 3)

The effect of the treatment on longevity is shown in Figure 1. After 40 hours at 70°F. the untreated roses were completely open, whereas those roses that were treated did not com-

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1 Lieberman, M., and L. W. Mapson. 1962. Inhibition of the Evolution of Ethylene and the Ripening of Fruit by Ethylene Oxide. Nature 196: 660-661.

2 The authors are grateful to Gude Brothers and Co., Washington, D. C. for supplying the roses used in these experiments.

Figure 2. The effect of ethylene oxide on the keeping quality of Better Times roses after 40 hours at 70°F. Right—untreated roses. Left—Treated roses in an atmosphere containing 0.25 per cent ethylene oxide for 20 hours.

pletely open until 70 hours. The appearance of the untreated and treated roses after 40 hours at 70°F. is shown in Figure 2.

It is quite evident that this ethylene oxide treatment effectively delayed the rate of maturation of the Better Times roses without injury. The treatment was just as effective with Briarcliff and almost as effective with Golden Scepter and White Butterfly roses.

Problems to be Overcome

Other beneficial side effects from the treatment were better color and a longer retention of the petals once the flowers were completely opened. Concentrations of ethylene oxide above 0.3 per cent were injurious. The buds turned brown and failed to open. At this writing, roses have been the only cut flowers tested but many other cut flowers will be included in future trials.

Although the results of treating roses with ethylene oxide have looked promising in several experiments we must caution that this is still preliminary research. Many problems lie in the way before practical consideration can be given to the use of ethylene oxide for delaying the maturity and increasing the keeping quality of cut flowers.

For example, time and rate studies for the best application must be resolved for each variety of cut flower studied. An engineering problem will eventually arise for the construction of chambers and for the most efficient and practical method of obtaining the desired atmospheres.

A serious drawback may be the narrow effective range of the gas above which injury occurs. Care must also be exercised in handling the gas because at very high concentrations it can be toxic to humans.

The problems are many. They will require a great deal of research and understanding, but the discovery by Lieberman and Mapson that ethylene oxide retards ripening and simultaneously inhibits the production of ethylene by fruit may be the major breakthrough the florist industry has been seeking for the finding of a method of increasing the keeping quality of cut flowers.

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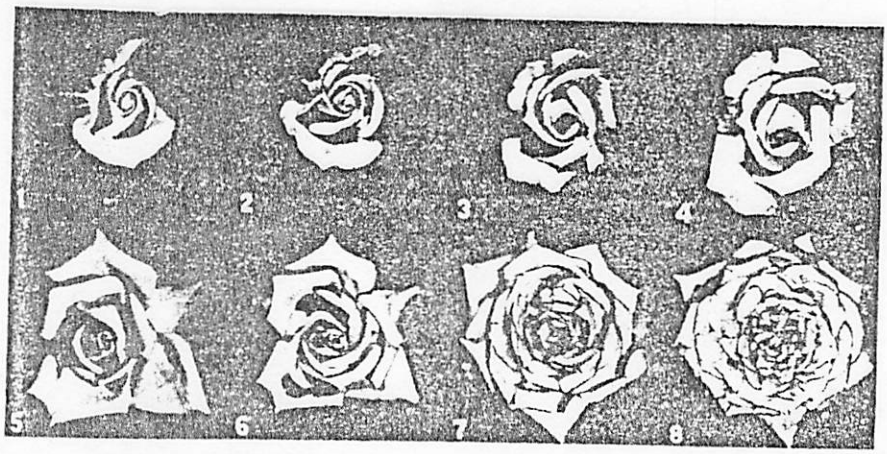

Figure 3. Values assigned to roses on the basis of opening for evaluating keeping quality.