Ethylene Pollution — It Even Happens In Denmark

Roy A. Larson

I was discussing the ethylene pollution problem some American poinsettia growers were encountering and Lars Hoyer, the scientist studying the keeping quality of pot plants at the Institute of Glasshouse Crops in Arslev, Denmark, related similar instances in Denmark. Some people who are well acquainted with international floriculture consider growers in Denmark and The Netherlands to be, generally, the most progressive in the world, so it was almost reassuring to know that they also can have the trouble here. Glasshouses, not plastic, dominate the floriculture scene in Denmark, but their houses are tight enough to allow ethylene pollution if there is a

(continued on page 8)

Ethylene Pollution—*(continued from page 7)*

source, such as a faulty heater. One Danish grower had a heater which developed an opening in the burning chamber and fumes went out into the greenhouse. Air samples were taken in the greenhouse and they revealed the following:

Pollutant	Normal greenhouse area air sample (ppm)	Air sample taken from near faulty heater (ppm)
Oxides of nitrogen (NO_1NO_2)	Trace	2.75
Ethylene (C_2H_4)	0.02	0.80
Sulfur dioxide (SO_2)	-	1.00
Carbon dioxide (CO_2)	1,000	10,000

Several plant species in the greenhouse were seriously affected.

Lars primarily has studied effects of ethylene under post-greenhouse conditions, such as during shipping in darkness, or under home or office conditions. He can duplicate such conditions in a specially constructed room at the Institute (His work will be discussed in a future issue of the Bulletin). He has worked with Hibiscus, a popular pot plant in Denmark and used quite generously in temporary plantings throughout Tivoli Gardens in Copenhagen. Hibiscus is quite sensitive to ethylene. Buds and flowers fall off at very low concentrations, especially if plants are in darkness for 3 or 4 days during shipping. Leaves are somewhat more resistant. The older leaves drop first (Figure 1), confirming the effect of age on ethylene sensitivity as mentioned in the other article on ethylene in this issue. STS (silver thiosulphate) has not been satisfactory in Lars' experiments, as the flower buds turned yellow even at low STS concentrations and failed to open (Figure 2).

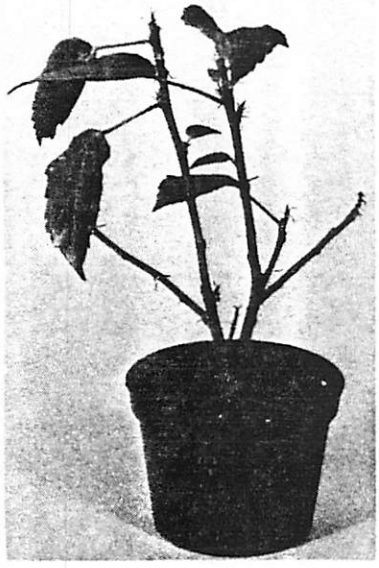

Figure 1. Hibiscus rosa-sinensis plant placed in darkness for 24 hours, then exposed to 3.5 ppm ethylene in darkness for 72 more hours. (Photo by Lars Hoyer).

Figure 2. Hibiscus plant treated with STS 11 days before being placed in the dark for 72 hours at 64°F, at an ethylene exposure of 1 ppm. Note light-colored buds. (Photo by Lars Hoyer).

Lars has rated some floricultural crops for ethylene sensitivity, and in descending order they are:

Capsicum annuum 'Janne'
Hibiscus rosa-sinensis
Begonia elatior - hybrid 'Sirene'
Begonia elatior - hybrid 'Nixe'
Saintpaulia ionantha - 'Eva'
Solanum capicastrum

He has found 0.05 ppm ethylene for 72 hours to be a destructive as 5 ppm for only 24 hours, emphasizing the importance of duration of ethylene pollution.

Impatiens are not included in his list but his results with that crop are interesting as well as complex. Flowering plants which are placed in the dark with ethylene, simulating shipping conditions, and then placed back in the greenhouse will lose their flowers and not resume flowering. Control plants, also placed in darkness but without ethylene, will drop their flowers but will resume flowering when placed in the greenhouse (Figure 3). What the grower sees when the flowering impatiens leave the greenhouse might well be a totally different product from what the consumer gets.

Figure 3. Impatiens plants in an ethylene experiment. Plant in flower on the left was kept in the greenhouse, without ethylene exposure. The other plants, all in flower, were placed in darkness for 24 hours, after which they were exposed to 0, 0.5 and 2.0 ppm ethylene during 72 more hours of darkness. The plant, second from left, which was in darkness but without ethylene exposure, resumed flowering when moved back to the greenhouse. Plants exposed to 0.5 or 2.0 ppm ethylene remained vegetative. (Photo by Lars Hoyer).

There is a great need for more research on this topic of post-greenhouse effects on keeping quality of flowering pot plants. Frank Marousky and Brent Harbaugh at the University of Florida research center in Bradenton did some fine research on simulated shipping conditions in the late 1970s and early 80s. Terril Nell, also at the University of Florida, but at Gainesville, has studied this aspect of floriculture before and during his tenure as a D.C. Kiplinger Chair holder, and was to report on his work at the Ohio Florists' short course in Columbus in July, 1987. We conducted several experiments on the effects of sleeving poinsettia plants, with the resultant drooping of the leaves and bracts (epinasty), but that has been the extent of our ethylene work in floriculture at N.C. State University. Obviously more investigations are needed, both during and after the greenhouse production phase.