

the infected areas. The disease is a bad one. It destroys the flowers but affects no other parts of the plant.

Every precaution is being taken by the Florida State Plant Board to prevent its spread into Florida.

## FACTORS AFFECTING THE KEEPING QUALITY OF CUT FLOWERS

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For many years methods have been sought for prolonging the life of flowers after they have been cut from the plant. This information is needed by those who use flowers in the home and by those handling cut flowers commercially. Several individuals (1, 2, 3, 4, 5, 6, 7) have done work which gives information on the keeping qualities of cut flowers.

Cut flowers usually carry enough stored energy in the stems to develop completely and, therefore, do not depend upon food produced by foliage to keep them alive. The factor that usually limits their length of life is lack of water for the stem, foliage and flowers. Loss of water may be too great due to low humidity, high temperature and air circulation or the end of the stem becomes plugged, preventing enough water from being taken up by the stem to supply the top.

Most of the work in the past on factors influencing the keeping quality of cut flowers was based on the reduction of bacterial decomposition of the stems submerged in water. Disinfecting chemicals, cutting of the basal portions to eliminate clogging of the conducting vessels and clean containers were used. Ratsek (5) showed that copper containers aided in keeping qualities, and ascribed it to the disinfecting action of copper.

### The Effect of Copper

Laurie (3) reported on work done at Ohio State on the effect of copper on

the life of cut flowers, as supplied by copper containers, copper wire, copper shavings, copper shot and brass shot. The results indicate that the prolongation of the life of cut flowers as affected by copper varies with the kind of plant used. One group included those which kept 1 to 2.7 days longer than the controls. In this group were such flowers as asters, calendula, snapdragon, clarkia, annual chrysanthemum, stocks, pansy, marigold, daffodil, godetia, nemesia, salpiglossis and Boston yellow daisy. The second group showed no difference in keeping quality between controls and copper containers. In this group may be placed schizanthus, rudbeckia, myosotis, feverfew, centaurea, penstemon, leptosyne and others. In only one case did copper prove detrimental and that was the carnation in which the keeping time was reduced one day.

### Cutting Stems Under Water

Dorner (1) found that flowers cut under water lasted longer, presumably due to the elimination of air from the conducting vessels. Laurie (3) reported that the effect of cutting stems under water as compared with those cut in the air also varies with the plant used. Plants aided by being cut under water were snapdragon, carnation, sweet pea, aster, annual chrysanthemum, marigold and Boston yellow daisy, while calendula and stocks showed no difference in effect. Anatomical studies of the stems showed a direct correlation in this respect between stems with large conducting vessels and those with small, the

ones with large vessels being benefitted less by the under water cutting.

### Absorption of Water by Cut Flower Stems

It is commonly believed that flowers keep longer in deep water than in shallow water. This is supposedly based on the assumption that absorption takes place along the stem. Tests were conducted (3) in which flower stems were placed in different depths of water ranging from  $\frac{1}{2}$  inch to 10 inches. These tests showed that all cut flowers tried kept as well in shallow as in deep water; in many instances shallow water treatment increased the keeping qualities by 2 or 3 days. In this group were such flowers as snapdragon, carnation, pansy, aster, Boston yellow daisy, annual chrysanthemum, daffodil, salpiglossis, godetia, coreopsis, delphinium, cosmos and hunnemania. These results are explained on the basis that less surface is exposed to bacterial decomposition in the water and that absorption takes place from the base of the stem.

Post (4) states that stems absorb water freely when it is near the temperature of the room. Cold water is not as readily absorbed by stems so it is better to place freshly cut stems in fresh water which is at a temperature of about 70°F.

Poinsettias, dahlias and poppies keep better if the cut ends of the stems are heated over a fire or if the lower one or two inches is placed in boiling water until the tissue is killed. In the case of poinsettia, the probable explanation of why these treatments improve their keeping quality is that the heating coagulates the milky latex, preventing it from oozing over the stem and plugging the water conducting vessels. The killed stems conduct water even better than the living tissue.

### Use of Chemicals

The use of chemicals to increase the keeping qualities of cut flowers is aimed at the reduction of bacterial activity, increase in transpiration, lowering the rate of respiration and providing the most suitable pH and osmotic pressure. Many chemicals have been tried but only a comparatively few have proven of value. Some that have shown some effect on reducing the rate of respiration are hydrazine sulfate, phloroglucinol and resorcinol. Sodium amytol was effective on sweet peas, supposedly because of its coagulative action on proteins. From the studies at Ohio State (3) they suggest several formulas which may be useful in the actual keeping quality of flowers.

A. Dissolve 1 ounce of hydrazine sulfate in 1 quart of water and use this as a stock solution. To another quart of water, add 2 teaspoonfuls of the hydrazine sulfate stock solution, 2 grams of manganese sulfate and 1 tablespoonful of sugar. This formula is particularly good for roses and carnations.

B. Dissolve  $\frac{1}{4}$  teaspoonful boric acid in 1 quart water. This is useful on carnations.

C. A 10-15 percent sugar solution prolongs the life of China asters.

D. To 1 quart of water, add  $\frac{1}{4}$  teaspoonful of potassium aluminum sulfate (commercial alum),  $\frac{1}{4}$  teaspoonful sodium hypochlorite (clorox), 1 pinch ferric oxide (iron rust) and 2 teaspoonfuls sugar. This solution is especially useful on cut roses and carnations.

Recent work by Hamner of Michigan State College has shown that one of the amino acids, amino N-Hydroxyl-B-alanine produced by the B. F. Goodrich Chemical Co., Cleveland, Ohio, is very effective in preserving red roses. This chemical not only prevents red roses

from fading but it also delays opening of the bud, and permits a slower, more natural opening without undesirable reflexing of the petals as would be the case with commercial preparations.

There are commercial chemical products on the market for increasing the keeping qualities of cut flowers. Two well known ones are Floralife and Bloomlife. They appear to help in the keeping of some kinds of cut flowers, but are not so effective with others; however, they are especially valuable for roses. Vitamin B<sub>1</sub> has been ineffective in prolonging the life of a wide range of flowers, as has salt and aspirin.

#### Use of Cold Storage

Cold storage has been used for many years, particularly by commercial florists, to prolong the life of cut flowers. As a general rule most cut flowers respond favorably to cold storage though there are some exceptions. The best temperature at which to keep cut flowers is not the same for all flowers.

When cut at the proper stage of development cold storage will insure a reasonably long life for flowers after their removal from storage. It is recommended that the flowers not be crowded in the containers because of danger of mechanical injury and the decay that may result from poor ventilation. In most cases water should not be spilled on the flowers as it may discolor them.

Rose, Wright and Whiteman (6) give considerable information on the cold storage of cut flowers. The temperature groups and the flowers recommended for storage at these temperatures by them are given below:

Group 1—35° F. — Chrysanthemums

Group 2—35° F. to 40° F.—Roses and carnations.

Group 3—40° F.—Calla, dahlia, China-aster, sweet bouvardia, heath, forced irises, and lily-of-the-valley.

Group 4—45° F. to 50° F.—Orchids and gardenias.

Group 5—50° F.—Cut poinsettia.

Group 6—Should not be stored at temperatures lower than 40° F.—Clarkia, stocks, candytuft, delphinium (hardy or perennial larkspur), cornflower, feverfew, snapdragon, blue laceflower, English daisy, calendula, gaillardia, sweet violet (*Viola odorata*), and lupine.

Group 7—All have flowers whose petals shed quickly, almost regardless of temperature. Cannot be held lower than 40° F. nor for longer than 3 or 4 days without injuring the keeping qualities of the flowers after removal from storage—Columbine, stevia, babysbreath, delphinium (annual larkspur), baby primrose, sweet pea and forget-me-not.

Group 8—Statice and strawflowers may be kept at 35° F. for 3 to 6 weeks or they may be dried with the retention of their original color and shape. Strawflowers are usually dried.

Group 9—Garden phlox, common foxglove and common white foxglove are not usually satisfactory for storage but may be held for 3 or 4 days at 40° F.

Humidity is an important factor affecting the life of cut flowers, whether they are kept in the home at room temperature or in commercial cold storage, because the length of life of most flowers is reduced by too low a humidity. A relative humidity of approximately 80 percent is satisfactory for all of the flowers discussed above.

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## INSECT CONTROL ON ORNAMENTAL PLANTS OF THE HOME GARDEN

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### Introduction

The present interest in ornamentals has resulted in a growing demand for information on the control of the insects and other pests attacking them. Requests for this information come from nurseries, custom spray operators and home gardeners. Very little research work has been done in the field of pest control on ornamentals. Although the Florida State Plant Board carries on an intensive inspection and quarantine program covering nurseries this organization does not attempt to do any research work. About two years ago the Florida Agricultural Experiment Station established a project on the control of pests of ornamentals and this is a report of some of the results obtained.

Until recently no one paid much attention to the problems of the nurseryman or the home gardener because there was no satisfactory method of estimating monetary losses of ornamentals due to insect depredations and the magnitude of these losses was not fully appreciated. We still do not have a satisfactory method of estimating these losses but we are beginning to realize that the depredations caused by insects and mites have a definite assess-

able value depending on the ornamental and its location.

Just a few years ago gardeners found all there was to know about pest control tucked away in a few pages of most any book on gardening. All of the insects were lumped into two categories—sucking insects and chewing insects. The recommended control measures were just as simple—nicotine sulfate for the sucking insects and lead arsenate for the chewing insects. I suspect that those days are gone. Nurserymen, florists and home gardeners are now entering a new era of insect control which will require more specific knowledge about insect pests and the application of insecticides for their control.

### Insect Pests

Tests have been made to control the major insect pests of many of our favorite ornamentals. Treatments have been made under variable conditions with sufficient frequency to justify making new recommendations for the control of the common pests of azaleas, camellias, crotons, gardenias, hollies, hibiscus, oleander, and roses. Insecticides have also been tested for the control of some pests of a number of other ornamentals although it is felt that further testing is desirable before making any recommendations for their control. The plants in this category include arbor vitae, cedar, slash pine, boxwood, hydrangea, magnolia, several varieties