Colorado Flower Growers Association Inc.

IN COOPERATION WITH COLORADO STATE UNIVERSITY

Doris Fleischer, Executive Secretary

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Effects of Preharvest Environment on Carnation Cut Flower Life

by

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It is generally thought that preharvest conditions of high light intensity and cool temperatures produce carnations with best potential cut flower life. These conditions are inducive to the accumulation of sugars in the flower stems. Odom (11) found that dry matter and total soluble solids remained high in carnations when the average light intensity was high, but these fractions were reduced by several consecutive cloudy days. Knappenberger (9) found that the keeping life of carnations correlated closely with the sugar content in their stems at harvest. He was not able to find a positive correlation between sugar content and light, but did find two periods beginning in February and June when sugar content decreased with increasing light. He also found a negative correlation between sugar content and temperature in June in an uncooled greenhouse. Earlier in the spring, sugar was not correlated with temperature, possibly because air temperature was seldom if ever in the excess range. Knappenberger postulated that high light in still air was indicative of plant temperature and attempted to explain the negative relationship between light and sugar accumulation as possibly being due to excess plant temperatures.

Mastalerz (10) found that reduced light intensity or increased temperature prior to harvest decreased the life of chrysanthemums following storage.

Schmidt (12) grew carnations at 48, 50, 52 and 54 degrees F and found no differences in their keeping life due to night temperature. He did find a variation of 25 per cent in the mean cut flower life with different sampling dates from January to May. Hanan (3) obtained similar results with carnations grown at steadily controlled

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Ed. note: Although this research was completed before the use of greenhouse cooling, fall, winter and spring environments in greenhouses at present are quite comparable to the conditions under which this work was done. Completion of the requirements for the Master's Degree by Mr. Fairchild has recently released this paper for publication.

day temperatures of 60, 65, 70 and 75 degrees. The different day temperatures produced equal flower keeping life, although differences between one sampling date and another were as much as 30 per cent. Both of the above workers measured cut flower life in an accurately controlled room.

Nutrition

With a few exceptions, mineral nutrition seems to play a minor role in cut flower life, unless the nutrients are in excess. Mastalerz (10) concluded that nitrate levels had no effects on the appearance or life of carnations or chrysanthemums. The soil nitrate level did not correlate with the respiration rate of these flowers following harvest, or in storage. Holley (4) also found that nitrate levels did not affect cut flower life of carnations. Potassium or calcium hunger was shown to reduce the life of cut carnations (6), but sodium did not affect it. Present work at Colorado State University by Peterson shows that extreme calcium hunger causes sleepiness and extremely poor flower life of carnations.

Irrigation of carnations at different soil moisture tensions (1, 5) did not affect the life of the flowers. Caparas (2) found that thorough application of water at each irrigation gave greater uniformity in the life of individual blooms. He postulated that flowers produced on plants in perennial "dry spots" in the bench were physiologically older at harvest, having taken longer to open. Caparas also found that constant sub-irrigation and a resulting under supply of soil oxygen reduced cut flower life by 10 per cent. Apparently aeration of the soil between irrigations and the resulting good root growth are essential to best keeping life.

White (13) found that an increase in soluble salts in the soil reduced yield and grade of White Sim without seriously affecting keeping quality.

Miscellaneous factors

The time of day the flower is cut has been shown to affect some flowers, and influences the stored food supply in carnations (11). However, Knappenberger (8) found that it caused no appreciable difference in carnation cut flower life. The stage of development when a flower is cut is recognized by growers and research workers alike as having a big influence on the life of the flower. Any delay in cutting past the earliest stage possible (10) reduces the life of the flowers. Age of plant from which the flowers are cut also affects their post harvest life, with the longest lived flowers coming from plants in their second, and later crops (7). Following pollenation of almost all flowers the useful life of the petals goes quickly. Most carnation varieties have been selected for their lack of pollen, hence this is not usually a problem.

Proceedure

Although much of the trouble caused by poor keeping quality can be attributed to oversupply during dull marketing periods and to mishandling of the flowers after they are cut, it has been strongly suspected that day to day environment also leads to considerable variation in the potential life of flowers. In an effort to survey this problem, the keeping life of William Sim carnation flowers was measured during two crop years. Light, temperature, and humidity were recorded and every effort was made to keep these environmental factors within the range normally used in commercial greenhouses.

Young plants were transplanted from a nursery bed into one greenhouse bench on May 5, 1953. One month after planting, a schedule was started whereby approximately 1/5 of the breaks were pinched each week for 5 weeks. This gave a reasonably steady yield from September to May. The plants were pruned down gradually in May and June of 1954, which resulted in a steady crop from October to March of the second year.

The first year flowers were cut daily and placed in warm water in a 36°F cooler until the afternoon of the following day. They were then moved to a basement room, placed in clean bottles of fresh water for the duration of the measurement. Slight changes in proceedure the second year included the use of 100 ppm chlorine in the water and hardening in a 36°F cooler for 24 hours instead of 32. The keeping life was the number of days in the keeping room required for the flower to lose its turgor and begin closing less one day. The room used for measurement of keeping life varied slightly in temperature from week to week, however the extremes for an entire season were approximately 65 to 70 F. Relative humidity was measured at 60 to 65%. The number of flowers used daily varied with the cut but was almost always 9 or more.

A continuous record of incident light was measured by a Weston photo-electric target and recorded on a Foxboro dynalog. Temperature and humidity were recorded in the greenhouse near plant height, and in the keeping room by Foxboro hygrothermographs. Outdoor temperatures were obtained from the U. S. Weather Bureau.

Results

From September, 1953, to May of 1954, the mean keeping life of William Sim carnations averaged above 7 days (Fig. 1). The overall fluctuation was from above 6 days on two dates in October and November to about 9 days, except in late May, when keeping life increased to over 10 days. Periods of good keeping included the first two weeks in October, late November and early December, the first half of January, mid March, and late April through May. Periods when keeping life was inferior included late October and early November, the last three weeks in December, February and early March, and the first half of April.

From October, 1954, to March, 1955, cut flower life fluctuated between 7 and 8 days until early December (Fig. 2). It increased sharply at that time and remained from just under 9 days to over 10 days until the termination of the experiment in March.

Simple, multiple and partial correlations were attempted between average cut flower life and light, temperature, and humidity prior to harvest. Summations of light and temperatures for one, two, three, and four days prior to harvest were also compared to keeping life. A number of simple correlations between keeping life and light or temperature were significant for brief periods. However, at another time of the year the correlations reversed and became negative and significant. At still other times there were no correlations obtainable.

Multiple correlations between keeping life and a combination of light, temperature, and humidity for two periods indicated that all factors were contributing to keeping life but not any one of these factors alone was responsible. No significant partial correlations were obtained.

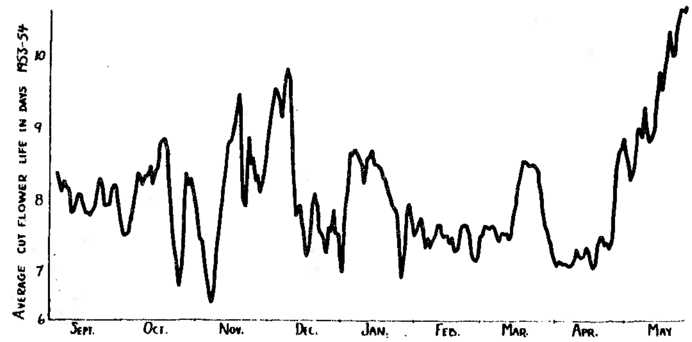

Fig. 1 Daily life of William Sim flowers for the 1953-54 crop year.

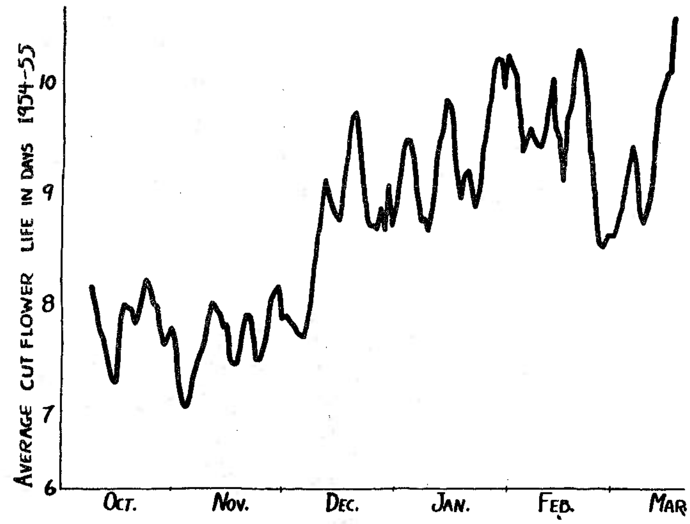

Fig. 2 Daily life of William Sim flowers for the 1954-55 crop year.

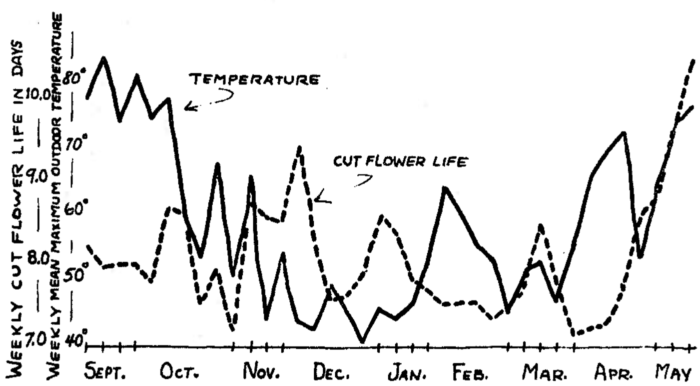

Fig. 3 Comparison of mean weekly cut flower life and mean maximum outdoor temperatures for 1953-54.

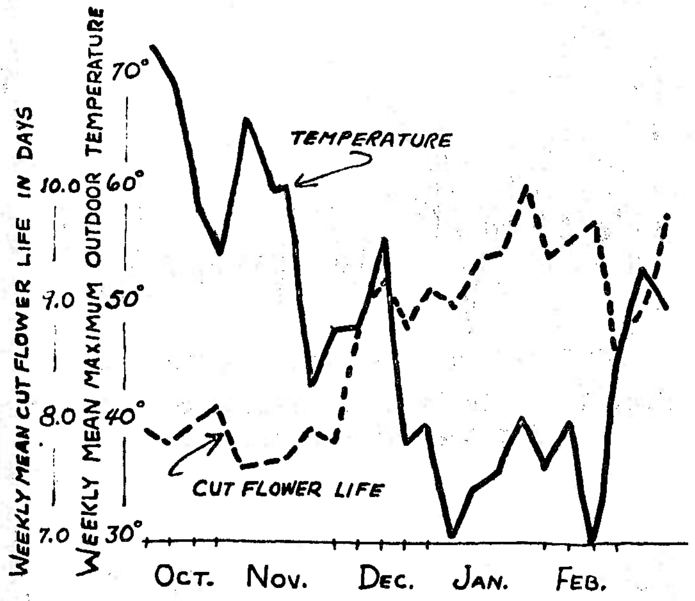

Fig. 4 Comparison of mean weekly cut flower life and mean maximum outdoor temperatures for 1954-55.

What all this means is that in spite of measuring three environmental factors and cut flower keeping life, little association can be placed on their relationships. Greenhouse temperature was a "rough" measurement of air temperature. Probably leaf temperature should have been measured instead.

Comparison with outdoor mean maximum temperatures gave much more information. With a few exceptions, which are expected, cut flower life varied inversely with outdoor maximum temperature (Figs. 3 and 4). The exceptional periods were October and early November, 1953; March, 1954; and the first three weeks in May, 1954. The first two periods were intermediate in mean maximum temperature; the last was warm, but not hot, and light intensity was high. The outdoor maximum temperatures essentially indicate the bright warm periods and the darker cool periods in the greenhouse, especially if forced air cooling is not used.

The authors believe this may be the most important information to come from this investigation. Unseasonally warm weather anytime of the year will probably reduce the life of cut carnations. Every attempt should be made by the grower to cool his plants on hot days and to regulate his plant temperatures accurately.

Size of cut

Small (3-9), and medium (10-15) sized cuts were found to keep significantly (7½%) longer than large (16 and up) cuts during the second year. There were no differences due to size of cut the first year. The number of flowers cut daily depends on weather conditions-- large cuts follow bright days and small cuts follow dark days. Unusually large cuts seem to follow a bright day after one or more dark days. These flowers may be physiologically older having required a longer period for opening.

No differences in keeping life could be found which were due to time of cutting following irrigation. Flowers cut just before watering kept equally as well as those cut the day after irrigation.

Discussion and Summary

Variations in cut flower life of carnations due to preharvest environment are common. These variations rise and fall gradually over a period of several days or weeks.

Some extremely erratic variations in cut flower life were found during the 1953-54 year when the weather was also extremely erratic. Outdoor temperatures fluctuated widely during late fall. Late January and February were hot. The year 1954-55 can be considered nearer normal for Colorado. During this period keeping life seldom varied more than 10 to 15 per cent from one week to the next.

In general, the outdoor maximum temperature is linked with potential keeping life of carnations. When the temperature is high, keeping life is likely to be impaired unless the grower exerts additional effort in cooling his greenhouses. When the temperature is moderate or low, cut flower keeping life should be good.

Light, although an important factor for plant growth, was not found to adversely affect cut flower life when either extremely low, or very high in intensity.

No difference in keeping was found between flowers cut just before watering and those cut the morning following irrigation.

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Annual Horticulture Show at CSU on October 24

Students in Horticulture at Colorado State University annually stage exhibits of fruits, vegetables, nursery products and flowers. This year they will arrange them around a musical motif, since the theme of this show is "Horticulture in Hi Fi."

The show is open to the public from 1 to 7 P.M., when the exhibits are dismantled and prepared for auctioning. Other features of the show are the election of Horticulture Queen by visitors, a floral arrangement contest among the campus sororities, and educational exhibits prepared by groups of students.

The auction is always a highlight of the show and attendance at this has increased yearly. All exhibits which are saleable are auctioned by Austin and Austin of Fort Collins, at no charge to the Hort Club. These people have generously donated their services year after year and they certainly put on a show. Proceeds of the auction defray costs of the show and help to send CSU's Floricultural Judging Team to the National Contest, which this year will be held at Oklahoma State University.

The Horticulture Club would like to take this means of thanking Colorado Growers for contributing so generously of their products to make all of our shows successful. You are invited to see this year's show on October 24.

Presented at the 56th Meeting of the American Society for Horticultural Science --- Abstract

Lepard, Paul E. and O. Wesley Davidson, Rutgers University. Adaptation of Plants to Culture Under Weak Light by Means of Soil Moisture Stress. Experiments were run to determine the rate at which several greenhouse crops could be adapted to withstand increasing soil moisture stress without evidence of permanent wilting. When Philodendron cordatum and Pothos aureus were used as test plants, it was shown that by maintaining the plants under moisture stress conditions, growth can be reduced while foliage color and general appearance remain attractive. At 15 atmospheres moisture tension the plants produced approximately one-half as much linear growth as they did at the "moderately dry" soil moisture condition of 2 atmospheres. Average internodal lengths of the former treatment were approximately one-third of those in the latter. When a group of representative foliage plants was grown under artificial light intensities of 25, 100, and 200 ft. can, and 4 soil moisture levels, it was shown that growth could be controlled approximately in proportion to the degree of moisture stress. The linear growth of the plants maintained at the highest stress condition, (15 Atmos) was reduced to approximately 60 per cent of that of plants kept at higher moisture levels. The internodal length of plants grown under high moisture stress was such as to give a desirable compact type of growth.

Your editor,
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