Colorado Flower Growers Association

IN COOPERATION WITH COLORADO STATE UNIVERSITY

Doris Fleischer, Executive Secretary

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Some Effects Of Postharvest Handling On Petal Burn Of Carnation

by Howard W. Hopkins and W. D. Holley

Effects of growing temperatures, concentration of potash in the soil solution and source of potash on marginal burning of carnation petals were reported in Colorado Flower Growers Bulletin 153. In evaluation of the petal burn in these first experiments, advanced stages sufficient to render the flowers unsalable were counted (stages A, B, and C in Chart, page 2).

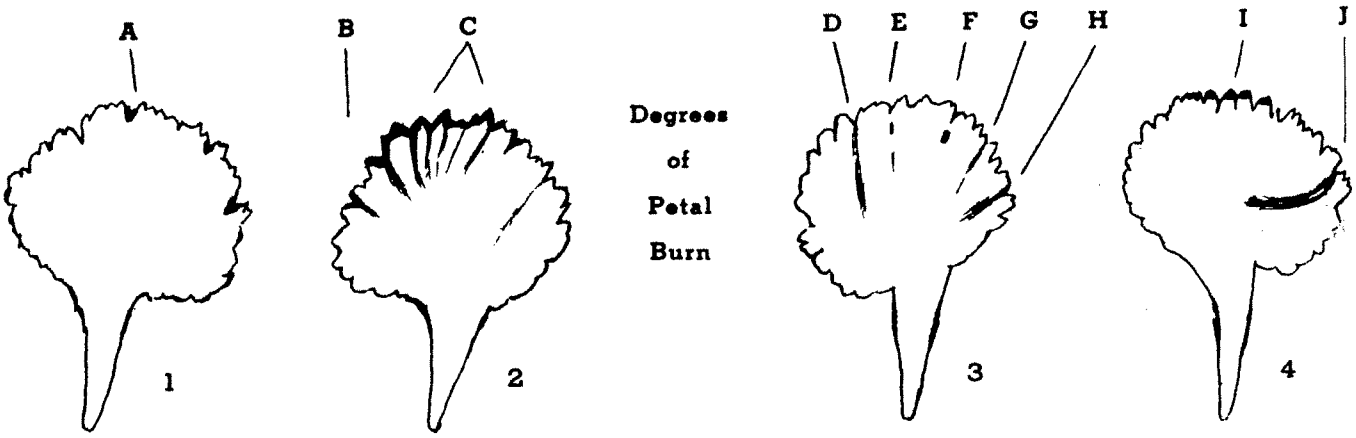
In the postharvest handling work reported here, earlier stages of petal burn (F, G and H) were counted. While these earlier stages are definitely petal burn, they do not necessarily render the flowers unsalable. An estimated 75 to 85% of the flowers on which early stages of petal burn were observed in these experiments would have been salable and would not have been considered burned in most marketing channels.

These handling tests were conducted from September to December, 1962. Flowers of Red Gayety grown in one house especially for the tests were cut daily except for specific tests. While many phases of handling were screened for their influence on petal burn, the following points summarize the most important contributing factors found to date:

1. Air movement across flowers greatly increased petal burn.
2. Flowers that were cut in early morning developed more petal burn than those cut at 4:30 to 5:00 PM.
3. Flowers allowed to open on the plant developed more petal burn than those cut in tighter stages of opening.

Air Movement Across Flowers

A 16-inch 1200 rpm fan was used in the keeping room to develop petal burn during the 1961-62 investigation of temperature and nutrition effects. When flowers were placed directly in this air stream, those susceptible to petal burn were found to develop this within a 24-hour period.



Petal burn so serious that the carnation is unsalable (2) includes continuous areas of blackened or "burned" petal margins. This burned area (C) develops progressively, starting as A in the valleys of the serrations, progressing to B and then to C. A purple streak may or may not precede A, as in D. Petal burn may also start as a dark spot (E), develop to a lesion (F), then to a hole in the petal (G), and finally work out to the edge of the petal to form a slit (H).

Another type of petal burn caused by mechanical injury is illustrated in (4). Note the position of the damage is across the tips of the petals (I) instead of continuous across tips and valleys (C). Another mechanical damage in the form of an irregular tear (J) compares to the straight opening (H) that develops along the veins of the petal.

For experimental purposes, a carnation has been considered burned when it has reached the stages of A or F. Petals such as (4) were not considered burned since they were damaged mechanically. A petal burned as A or F may or may not develop to the advanced stage (2). About 75 to 85 percent of the carnations considered burned in these experiments would have been salable, i.e., would have reached stages 1 and 3 only. In other words, 15 to 25 percent of those discarded as burned were not salable.

On September 5 and again on September 11, 1962, flowers were placed in water in the keeping room at approximately 70°F and 45% relative humidity. Half of these flowers were placed in front of the fan and the other half placed away from the fan with no air movement. The number of flowers developing petal burn after 4 days is shown in Table 1.

Table 1. Number of flowers developing petal burn in 4 days when subjected to different rates of air movement.

Date of test	In front of fan	No air movement
Sept. 5	23 of 44	2 of 44
Sept. 11	52 of 84	10 of 84
Total	75 of 128	12 of 128
Percent burning	58.5	9.4

Numerous tests during the balance of September indicated that a high percentage of flowers could be burned by blowing dry air across them in the keeping room. Petal burn was so prevalent in these tests that use of the fan was discontinued after September. Air movement across the flowers while they are still on the plants, while they are being hardened in coolers, or at any other point in handling may contribute to the petal burning problem. The use of fans over the plants while they are under moisture stress from dry soil or low humidity is suspected of increasing petal burning. The handling or grading of flowers in windy places, especially when the humidity is low, should also increase burn.

Morning vs. Afternoon Cutting

From November 12 to 18, flowers cut at the same stage of opening at 8 AM and 5 PM were compared for their tendency to develop petal burn. Since opening was occurring during the day, it was possible to cut flowers at both 8 AM and 5 PM on a given day, but if flowers were cut at 5 PM, there were none open the following morning. The flowers were cut, placed directly in petalife solution in the keeping room and examined for petal burn 24 hours later. Only 8% of the flowers cut in late afternoon developed petal burn while 55% of those cut in early morning developed burn within 24 hours (Table 2).

Table 2. The number of flowers developing petal burn from comparable morning and afternoon cuts.

	November						
Cut	12	13	15	16	17	18	Total
AM	16 of 40		30 of 39	15 of 31			61 of 110
PM	2 of 39	4 of 28		2 of 41	3 of 25	2 of 29	13 of 162

Degree Of Opening Of Flowers On The Plant

Over the years it has been noted that growers who allow their carnations to open on the plant lose appreciable cut flower life compared to those flowers harvested in tighter stages. Another observation is that the Monday cut usually has more petal burn than cuts made later in the week. The Monday cut normally contains those flowers ready to cut on both Sunday and Monday.

Instead of cutting the flowers they were tagged when ready to cut for one or two days and cut the following day with those untagged flowers ready for harvest at that time. With some variation, this procedure was repeated 5 times in late October and early November. The effects of stage of opening at harvest on number of flowers developing petal burn within 24 hours are shown in Table 3. All flowers were cut at 8 AM and placed in petalife directly in the keeping room at 35 to 45% relative humidity. Significantly more flowers developed petal burn when left on the plants 1 or 2 days after they were ready to harvest. Still tighter cutting is being tested as a means of reducing the susceptibility of carnation flowers to petal burn.

Table 3. Effects of stage of opening on number of flowers developing petal burn within 24 hours.

	Days left on plant after normal cutting stage			
Test	2	1	1+0	0
1	20 of 25		18 of 70	
2		13 of 45		3 of 20
3	27 of 33	13 of 29		16 of 40
4		19 of 36		11 of 32
5		16 of 40		6 of 25
Total	47 of 58	61 of 150	18 of 70	36 of 117
Percent burned	81	41	26	31

The effects on petal burning of many other practices used in handling the flowers after harvest have been investigated from September 1962 to the present. Among these are:

1. Effects of time left exposed out of water in grading room, boiler room, or other locations,

2. Effects of hardening flowers for various times in several solutions, warm and cold,

3. The use of warm or cold water, and warm and cold preservative solutions in the keeping room, and

4. Comparisons between flowers moved directly from a 33° storage to a 70° room, those warmed in intermediate steps from 33° to 70°, and flowers placed directly in the keeping room after cutting.

While none of these practices were indicated as major contributing factors to petal burn, some of them were found to influence the percent of burning. If these are incorporated in the chain of practices, they could be expected to decrease the percent of flowers burned and the degree of burning on individual flowers.

Exposure Of Flowers To Drying

How long can carnations be left out of water and still take up water? Is there a relationship between time out of water and petal burn? To answer these questions, Red Gayety carnations were hardened 24 hours at 33°F and laid out to dry for various lengths of time in a draft-free room at 70°F and 35% R.H. As each time period elapsed 5 flowers were picked at random, the ends cut and placed in warm petalife solution. These flowers were placed in the same area where flowers were drying and observed for water uptake, petal burn and senescence. The periods carnations were out of water were 4, 7, 22, 26, 47, 50, 72, and 77 hours.

Results:

1. After 4 hours of drying time all flowers took water with no petal burn.

2. After 7 hours all flowers took water, but 4 of 5 flowers developed petal burn after 85 hours, and one flower closed.

3. After 22 hours all flowers took water with no petal burn.

4. After 26 hours all flowers took water, one flower burned, and there was slight loss of color.

5. After 47 hours all flowers took water with no petal burn. There was a distinct loss of color. In the remaining part of the experiment all flowers appeared progressively older and lighter in color.

6. After 50 hours of drying time all flowers took water, however, 2 closed within the next 48 hours. There was no petal burn on any of the flowers.

7. After 72 hours all flowers took water, one closed in 24 hours, and 4 flowers developed petal burn.

8. After 77 hours only one flower took water, two took enough water to revive then closed, while 3 flowers showed petal burn.

Three things were evident under the conditions of this experiment:

1. Petal burn did not result from excessive time out of water except possibly

in the flowers dried for unreasonable periods.

2. The longer the flowers dried the harder it was for them to take up water, resulting in early senescence of the flowers.

3. Even though the flowers took water after excessive drying the aging process continued during the drying period and flowers were progressively older with the longer periods of drying.

Hardening In Coolers — Filling With Water

Flowers hardened overnight in water in 33° storage usually, but not always, burned less than those cut from plants and placed directly in the keeping room. Warming the flowers to intermediate temperatures before placing them in the 70° room delayed the appearance of the petal burn but did not lessen it. The temperature of the water flowers were placed in for overnight hardening was not an important factor. The use of petalife solutions while the flowers were in the storage did not reduce petal burn; however, petalife solutions in the 70° room reduced petal burning slightly.

Temperature Of Water Or Petalife Solution In The Keeping Room

When flowers were placed in strong air currents earlier in the fall, the use of warm water in the keeping room had little or no beneficial effects in reducing petal burn. With minimum air movement, slightly less petal burn developed when flowers were placed in either warm water or warm petalife solution. The December 1 test indicates the degree of difference one might expect when warm petalife solution is compared to cold petalife in the keeping room. Eighty-two flowers were hardened in water overnight and half were placed in warm petalife, the other half in cold. Thirty percent of those in warm petalife developed petal burn in 24 hours while 57 percent of those in cold petalife showed burn in the same period.

Summary

The period when carnations are most susceptible to marginal burning of the petals coincides with the period when light and temperature are lowest (CFGA Bulletin 153). Flowers from plants grown coldest developed the most petal burn. The movement of dry air across the flowers after harvest caused maximum development of petal burn. Circulation of dry air across the flowers while they are still on the plants is probably just as efficient in causing petal burn, especially when plants are under moisture stress because of dry or cold soil.

Further findings reported in this paper are:

1. The flowers cut in late afternoon developed much less petal burn than those cut in early morning.

2. Flowers allowed to open on the plant burned more than those cut in tighter stages of opening.

3. Flowers that were hardened overnight in water in a 33° cooler before removal to the keeping room developed slightly less petal burn than those cut from the plants and placed directly in 70°F.

4. Warm preservative solution was of little or no value in the hardening room, but was slightly beneficial in reducing petal burn when used in the 70° keeping room.

Living Flowers That Last

This is a comprehensive manual covering all the major factors involved in improved lasting quality of fresh plants and flowers in use. It is composed basically of the talks given by the participants at a Symposium on the subject listed in Columbia, Missouri, January 28-30, 1963.

The nine chapters are divided into two main sections, the first dealing with the effects of pre-harvest environment and cultural methods on the keeping quality of cut flowers and plants, and the second dealing with post-harvest treatment of fresh flowers for maximum lasting quality.

Authors and research workers who have contributed material for this manual include A. F. DeWerth; D. S. Geddis, Jr.; W. D. Holley; Paul R. Krone; John W. Mastalerz; Philip E. Parvin; Marlin N. Rogers, and C. E. Williamson. Marlin Rogers acted as Editor.

This manual will be of interest to all commercial flower producers, wholesalers, and retailers, and also to research workers, floriculture students, and many advanced amateurs.

It is available for purchase for $1.50 from:

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