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DETERMINING THE DESIRES OF SUPERMARKET CUT FLOWER CUSTOMERS: A SIX YEAR EVALUATION PART 1: ESTABLISHING A CUT FLOWER PROGRAM

K.L. Goldsberry, Nancy Baker, and Megan Michaels[1]

A three part, multiple year marketing study begins with this article. Supermarkets, as with any market, should have high quality with additional information on care and handling for long cut flower life. Consumer education is required.

Obtaining a "true picture" of the U.S. cut flower consumers, their purchasing habits, desired flower colors, types of products and how they use them is a difficult task. Hutchison and Robertson (1) coordinated a research project which had pre-determined categories of hired consumers divided into groups by sex, age, and income. The plant materials used in the evaluation were divided into groups by flower types, price level, and form of product (fancy arrangement to loose bunches).

The study was conducted in a large room and the products to be evaluated displayed. The results of the Hutchison-Robertson evaluation provided some insight to the desires of the particular groups, but not what "John Q. Public" might want. One major conclusion obtained from their project was the desire to have roses mixed with carnations or pompon chrysanthemums rather than the "traditional" all-rose package.

Joe Howland's advertising class (2) interviewed consumers and florists in Reno, Nevada. Some of the information to be presented in this series will substantiate their findings, and also provide some additional information.

In 1978, a program in cooperation with two local supermarkets was undertaken to determine if their customers were receptive to having fresh cut flowers available as a commodity in their stores. A second objective was to educate the consumer regarding plant material names, flower use and product knowledge. One supermarket was located in the older part of the city where many senior citizens and office workers shopped. The other store was in the newer portion of the city.

A series of consumer/mass market surveys were planned to determine if cut flowers were a viable commodity in Fort Collins supermarkets. The first survey was conducted in the spring of 1980, and the results based on the flowers purchased at the two stores.

Fort Collins, Colorado, with Colorado State University, a division of Hewlett-Packard, the Woodward Governor Company and a nearby Kodak, has been considered the "melting pot" of America, regarding residents of the community. More than two-thirds of the approximately 100,000 residents are composed of people who moved into the area during the last 15 years. In fact, Fort Collins was considered the fifth fastest growing city in the United States prior to the recent recession.

A second survey in 1982, included a third small supermarket located in an older portion of the city which contained mostly single family houses. The questions used on the 1982 survey forms were similar to those asked in 1980. Additional information was used to try and determine the consumers' attitude toward the purchase of cut flowers in a supermarket versus obtaining them from a florist shop. The size and value of the bunches was also evaluated.

The third survey form contained a combination of questions from survey one and two. Five supermarkets were involved which represented the grocery shopping "homes" of approximately 50 percent of the Fort Collins area population.

[1]*Professor, Department of Horticulture, Colorado State University, and former student marketing managers who conducted the surveys as part of their senior problems.*

1978-1980 Program

The management of the two family owned supermarkets were approached regarding the possibility of providing an assortment of cut flower bunches each Monday, Wednesday, and Friday morning to determine how receptive their customers would be to the availability of fresh flowers. The flowers were sleeved in clear plastic, displayed in the produce department in plastic buckets containing preservative and sold to the stores on consignment.

The flowers used in the program were produced as a result of research and teaching programs in floriculture at Colorado State University. Because of changes in programs, there was not a continuous supply of the same plant materials throughout the year, and one type of flower was more readily available one year than the next.

The price of the bunches to the stores were based on the November wholesale prices of individual flowers on the October Denver market. Once the price was established, it was not varied throughout the year. Six roses in a bunch were priced at $1.50 wholesale ($1.95 retail); 6 standard or 4 spray carnations or combinations of each, $1.30 wholesale ($1.69 retail); mixed bunches consisted of all combinations of carnations, roses, snapdragons, iris, spray chrysanthemums, stock or any other cut flower grown in class projects, $1.50 wholesale ($1.95 retail). These were 1978 prices, developed in cooperation with the store management and used as a base for the consumer surveys.

Two years of data **(Table 1)** showed that December and January were months when the supermarket customer used fewer flowers.

Table 1: Number of flower bunches sold by two supermarkets during two 2-year evaluation periods, 1978-1980.

	1978-79	1979-80
October	—	341 (18)
November	368 (27)*	568 (61)
December	307 (3)	460 (20)
January	250 (30)	122 (49)
February	442 (8)	204 (2)
March	460 (5)	—
April	455 (11)	—
May	650 (11)	—
June	351 (9)	—
July	169 (9)	—

( )* number of bunches returned.

The 1978-79 data, **Table 1,** also showed the supermarket sale of flower bunches decreased rapidly in early summer.

A total of 1367 bunches were sold from November through February 1978-79 and 68 returned (4.97 percent), while in 1979-80, 1354 bunches were sold and 132 returned (9.74 percent).

1980 Survey Results

Postage prepaid questionnaires were stapled to 300 bunches of flowers distributed to the two supermarkets during the first week of April 1980. Seventy three cards (24.3%) were returned and analyzed using an SPSS statistical package.

Simple bunches of 6 roses or standard carnations, 3 roses and 3 standard carnations, 3 standard carnations and two stems of spray (miniature) carnations, 3 roses and two stems spray carnations, 4 stems of spray carnations or 5 stems of snapdragons were used. No package of preservatives, greens or instructions were provided in the bunches. Fresh flowers, less than 24 hrs old were used and never allowed to stay past the second delivery date.

Flower condition at the time of sale?

Most people (99%) felt the flowers were in good condition when they were purchased. However, two customers were not happy with their roses. Within two days the heads drooped and one bunch of snapdragons was reported to have dropped some of the florets when it was placed in a vase.

It became apparent, in the first year of the cooperative program with supermarkets, that quality control at the time of bunching was very important. Quality material had to be used or the products would deteriorate rapidly in the marketplace. Secondly, since flowers are plant products, the produce people are automatically put in charge. They had to be educated as to where to store the flowers over night, plus how to answer questions from the consumer. No written directions were at the display or in the packages. Since the program was developed on a consignment basis, we had the opportunity to evaluate the condition and type of bunches returned.

Where did you display the flowers?

The 1980 survey revealed that most people used the flowers in the home. Some indicated they split the bunch and also took a portion to their office. Others were purchased for meetings, etc.

Home	Office	Other
83%	12%	6%

Of those who purchased flowers to be used in the home, the tendency was to place them in the living and dining rooms. Many people (27%) indicated they split the bunch and displayed it in more than one area. Flowers were specifically purchased for use in the dining (22%), living (19%) and kitchen (12%) areas of the home. An indication as to which rooms in the home would receive flowers when the bunch was split was determined from the answers to the following question: ***In which room were the flowers displayed?***

Living Room	Kitchen	Bedroom
47%	27%	15%
Family Room	**Dining Room**	**Other**
17%	46%	5%

The responses to other questions were:

How often do you receive or purchase "Sunshine Fresh" flowers?

The majority of people apparently buy Sunshine Flowers either biweekly or monthly. The question was incorporated to help determine trends in future surveys.

Weekly	Biweekly	Monthly	Rarely
17%	29%	32%	22%

Did you use a flower preservative and recut the stems?

The "Care" instructions attached to the questionnaire suggested the use of a preservative and to recut the stems. The survey revealed:

Do you use floral preservatives regularly?
Yes - 29% No - 71%

Did you use a floral preservative for your "Sunshine Fresh" flowers?
Yes - 35% No - 65%

Did you recut the stems on these flowers?
Yes - 96% No - 4%

Apparently more people are aware of the need to use preservatives for roses than carnations.

Did you use a preservative this time?

Roses	Yes - 43%	No - 57%
Carnations	Yes - 24%	No - 76%
Snapdragons	Yes - 35%	No - 59%

What was the vase life of your "Sunshine Fresh" flowers?

Data revealed that 92% of those who displayed roses recut the stems. The vase life for all roses, with or without preservative, was apparently satisfactory.

Days	
4-7	8-11
42%	25%

Standard carnations stems were recut by 93% of those surveyed and the average vase life for all flowers with and without preservative was:

Days			
0-3	4-7	8-11	12-15
10%	55%	20%	15%

All of the people who received spray carnations indicated they recut the stems. The vase life for all flowers with and without preservative was:

Days			
4-7	8-11	12-15	Longer than 15
16%	50%	25%	9%

Snapdragon stems were recut by all of those using that plant material. The vase life of the flowers treated with and without preservative was:

Days			
3-4	7-8	8-11	12-15
12%	24%	41%	18%

The supermarket consumers were very receptive to having fresh flowers available on a specific schedule. An indication of their purchasing habits throughout the year allows a supplier to develop production schedule with the proper peaks and valleys.

In past marketing studies, importance of record keeping, and monitoring the feelings of consumers, supermarket managers, bunching employees and delivery people was apparent. Everyone received some education, and the project was a starting point has become evident for learning more about supermarket cut flower sales.

Consumer comments were valuable and many of the ideas were incorporated in the following years: *"I would rather buy Sunshine Fresh flowers than purchase flowers at a florist. They last longer and look better for a nice price."; "Very nice, but greenery like leather leaf etc. makes a bouquet complete when (enclosed with flowers) arranging for your home or business."; "Now I treat myself (and family) to beautiful cut flowers instead of the candy and junk foods I used to buy. A trimmer me and lovely table arrangement. Thank you."; "The flowers are always lovely and last longer than flowers I have bought at other stores or even at florist shops. I truly hope you will continue to have the flowers. Thank you for the quality."*

Next Month Part II: Flower Prices and Convenience, Greatest Benefit of Supermarket Purchases.

References

1. Hutchison, N.R. and J.L. Robertson. 1979. Consumer Demand Analysis for roses. J. Amer. Soc. Hort. Sci. 104 (3):303-308.
2. Howland, Joseph. 1984. Lessons Learned From Market Research. So. Flor. and Nurseryman. Sept., 1984.

UNITS FOR CO_2 CONCENTRATIONS

Joe J. Hanan

Expressing CO_2 concentrations in parts per million does not take into account Colorado's high altitude. The result is a failure to take maximum advantage of Colorado's unique climate and less money in the till.

The usual expression for CO_2 concentration is parts per million (ppm), percent volume (%) or micrograms per liter ($\mu g\ l^{-1}$). These units are relative, not absolute, and do not take into account the fact that atmospheric pressure at this elevation (one mile above sea level) is much less than at sea level. As most well know, the lowered pressure reduces exhaust fan capacity, combustion efficiency in heaters and boilers, and causes health problems for people sensitive to low oxygen — especially above the timberline (about 9000 feet). Now 325 ppm (the usual CO_2 concentration) at one mile high is the same as 325 ppm at sea level, but, as pointed out above, higher altitude means less air, and the absolute concentration of each gas in the air is reduced proportionately. The number of gas molecules per unit volume is less as elevation increases until the point is reached where life cannot be supported and you go to a space suit.

There are several ways to express absolute gas concentrations:

1. millimoles per cubic meter (mmol m^{-3}),
2. milligrams per cubic meter (mg m^{-3}),
3. millibars (mb),
4. Pascals (Pa), or
5. dynes per square centimeter (dynes cm^{-2}).

The last three are pressure units (e.g. pounds per square inch or psi) — what the physical chemist calls "partial" pressure — since, if the gas behaves ideally, the pressure of one gas in air is independent of the pressures of all other gases in air (e.g. oxygen, nitrogen, pollutants, etc.).

The total atmospheric pressure at sea level can be expressed as:

1. 14.7 pounds per square inch (psi),
2. 29.9 inches of mercury,
3. 760 mm mercury,
4. 1013.3 millibars, or
5. 101337.1 Pascals.

This pressure, measured by a barometer, varies with location and weather. However, when a scientist speaks of "standard conditions" (STP or NTP), he uses the units given above. At Fort Collins, we generally assume the total barometric pressure, or station pressure, as 635 mm mercury or 846.6 millibars, 846600 Pascals, or 24.8 inches mercury. This is about 16% less than at sea level. It means that, in a natural convection gas burner, one will get about 840 BTU from a cubic foot of gas compared to 1000 BTU at sea level, and the rating capacity of an exhaust fan must be reduced 1.2 times in order to obtain the actual air flow with fan-and-pad cooling.

What does this pressure difference due to elevation mean in terms of the actual CO_2 a grower may have available inside his greenhouse when he is ventilating? By using some high school physics, the absolute concentration of 335 ppm CO_2 at sea level and 32°F (STP) is 33.9 Pascals. At Fort Collins' or Denver's altitude and 32°F, however, the actual CO_2 concentration is 26.6 Pascals. We have been using this reporting method in our computer system at CSU. Employing the factory calibration for percent CO_2 on our gas analyzer, we have been getting lower concentration readings when the greenhouses are ventilating. We plan to do further calibration and checking on the ranges we are observing. We know, under Colorado conditions in the winter, CO_2 levels can go below 100 ppm (7.9 Pascals at Denver versus 10.1 at San Diego). A grower in Colorado who fails to employ CO_2 injection under non ventilating conditions in Colorado will significantly reduce his climatic advantage, reduce yield and quality, and make less money.

THE BETTER WAYS OF BEATING BOTRYTIS

J.T. Fletcher

***The Grower* Magazine (British) 103(16):19-21**

Botrytis Cinerea is probably the most common fungal pathogen of protected crops causing a rot of leaves, stems, fruit and flowers. The familiar grey mould symptoms can be seen in most crops in most seasons.

Epidemic levels of this pathogen can be prevented by maintaining an environment which is unfavourable for botrytis to develop and this means keeping the relative humidity within the crop at a level below 93%. All factors which encourage a high humidity such as frequent overhead watering, no ventilation, use of thermal screens and a constantly wet soil surface, will contribute to producing conditions favourable for botrytis development.

The easiest and most effective way to control botrytis is to heat and ventilate the crop but this is now so costly that it is infrequently practised. For this reason growers have become increasingly dependent upon the use of effective fungicides.

There are a number of fungicides available for the control of botrytis although they are not all recommended for use on all protected crops (see Table 1). Since the early 1970s, the industry has used the carbendazim fungicides very successfully and more recently the dicarboximide group has become widely used.

In addition to these there are others that have been on the market for many years including chlorothalonil, dicloran, dichlofluanid, tecnazene and thiram. So the grower has a wide choice of materials, many unrelated, and in different mode of action groups (see Table 1). Unfortunately because of fungicide resistance the situation has changed dramatically during the past few years reducing the choice, especially on some crops, to very few fungicides.

Fungicide resistance

ADAS survey work in 1980 showed that whereas resistance was then fairly commonly found to the carbendazim group it was almost nonexistent to the other main group, the dicarboximides. A recent re-examination of the situation shows a dramatic change (see Table 2).

Whereas carbendazim resistance has increased from 31% to 52% dicarboximide resistance has increased from less than 1% to 66%. What is even more worrying is the fact that a third of the isolates tested were resistant to both the major groups.

Disease control failures were widespread in the mid 1970s when various pathogens developed resistance to the carbendazim fungicides. With botrytis the sensitivity to this group of fungicides changed from completely sensitive to resistant in one step with almost no intermediate stages.

The highly resistant botrytis populations were not controlled by the carbendazims and the industry changed to other materials, largely the dicarboximides, which arrived on the market at about this time.

The loss of sensitivity to the dicarboximides has not resulted in such a dramatic change in disease control. It has been shown that the resistant populations will produce

Table 1: Fungicides recommended for botrytis control

	Crop						
	Tomato	Cucumber	Lettuce	Celery	Pepper	Aubergine	Orns
Dicarboximide	Rovral Ronilan	Rovral Ronilan	Rovral Ronilan	Ronilan	Rovral	Rovral	Rovral Ronilan
Carbendazim	Benlate Derosal Bavistin Focal	Benlate Bavistin	Benlate	Benlate Derosal	Bavistin	—	Benlate Derosal Bavistin Focal
Chlorothalonil	Repulse Bravo Thiram	Repulse Bravo —	— — Thiram	Repulse Bravo Thiram	— — —	— — —	Repulse Bravo Repulse
Dithiocarbamate	Zineb	—	Zineb	Zineb	—	—	Bravo
Others	Elvaron *Tecnazen —	— *Tecnazen —	— *Tecnazen +*dicloran	— — —	— — —	— — —	— *Tecnazen —

*available as a smoke
+available in mixture with thiram as Turbair Botryticide

Table 2: Botrytis cinerea isolates showing resistance in 1984

Crop	iprodione		iprodione and benomyl	benomyl		not resistant
Carnation	5		0	0		0
Cucumber	10		0	2		0
Cyclamen	2		31	13		13
Chrysanthemum	13		9	13		7
Lettuce	37		25	6		17
Pot plants	0		25	7		3
Peppers/aubergines	0		0	10		4
Tomato	98		80	45		33
Total	165		170	96		77
Per cent 1984	32.5		33.5	18.9		15.1
		66.0%			52.4%	
Per cent 1980	0.7		0	30.7		68.6

disease symptoms especially if sprays of dicarboximide fungicides are continued.

In 1980 an examination of resistant isolates showed them to be not very virulent, disappearing from the population when dicarboximide application ceased. Some of the 1984 isolates are of this type but many of them are capable of growth at high concentrations of these fungicides and some have been shown to be as virulent as the sensitive isolates.

This pattern has already been well documented in Spain and Israel where botrytis control with the dicarboximides has become very difficult.

Avoiding the Problem

The best way to avoid botrytis problems is to grow crops in an environment not conducive to the development of the disease. This is expensive and often difficult and most growers will still need the help of effective fungicides.

Carbendazim resistance with disease control failures is now commonplace and we have a clear warning that dicarboximide resistance, also with disease control failure, is likely to become widespread if these fungicides continue to be intensively used. Unfortunately there are no effective fungicide mixtures available at present; a dicarboximide plus a material from another mode of action group (excluding the carbendazims) would be well worth having.

In order to prevent resistance increasing and becoming more severe it is important to minimise the use of dicarboximide materials in order to retain their effectiveness. Programmes for the major protected crops with this in mind are suggested (see Table 3). The situation is particularly acute for lettuce growers.

As long as fungicides are used sensibly there is no reason why fungicide resistance cannot be delayed or prevented. Once resistance has arisen it is very much more difficult to implement an effective programme. Wise action now, especially with the dicarboximide fungicides, could prevent expensive disease control failures in the future.

Table 3: Suggested fungicide spray programmes

Tomato	Cucumber	Lettuce	Celery	Ornamentals
ELVARON from second truss in flower and fortnightly or according to conditions until picking	ROVRAL or RONILAN	Thiram for first 2/3 weeks	BRAVO or REPULSE	see footnote
ROVRAL or RONILAN	BRAVO or REPULSE	ROVRAL or RONILAN	Thiram	
*ELVARON	FUMITE TCNB smoke generators	TURBAIR BOTRYTICIDE and/or FUMITE TCNB smoke generators	RONILAN	
Continuing in sequence if necessary *If ghost spot is a problem Elvaron should be used more frequently	Continue in sequence with a suggested maximum of two applications of dicarboximides preferably well separated	Continue in sequence with a suggested maximum of two applications of dicarboximides preferably well separated	Should be possible to limit the dicarboximide sprays to once only	

For ornamentals read the label to make sure that the product is recommended for a specific crop and then alternate materials from different mode of action groups keeping the numbers of dicarboximide sprays to a minimum.

Carbendazim sprays may be inserted in the above programmes but should not be used more than once per crop. Where biological control is being practised they may be deleterious.

Fungicidal paints of Benlate/Actipron can be used to treat stem lesions.

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