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thesis entitled

CONSUMER PERCEPTIONS AND GARDEN PERFORMANCE
OF SELECTED FLOWERING PLANTS

presented by

Elizabeth H. Moore

has been accepted towards fulfillment
of the requirements for

M.S. degree in Horticulture

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Major professor

Date 12/6/08

CONSUMER PERCEPTIONS AND GARDEN PERFORMANCE OF SELECTED FLOWERING PLANTS

By

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A THESIS

Submitted to
Michigan State University
in partial fulfillment of the requirements
for the degree of

MASTER OF SCIENCE

Department of Horticulture

2000

ABSTRACT

CONSUMER PERCEPTIONS AND GARDEN PERFORMANCE OF SELECTED FLOWERING PLANTS

By

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The U.S. wholesale market for pot plants was valued at $701 million in 1998, and is second in size to bedding plants, valued at nearly $2 billion. The market for bedding plants is growing rapidly while the pot plant market is growing more slowly. Customers who purchase indoor flowering pot plants may have specific expectations about them including their indoor life being finite with no opportunity for outdoor use. If we position selected perennials as indoor pot plants, we could potentially stimulate sales. Methods of identifying plant performance and customer perceptions of potentially new products are through consumer research and garden performance studies. We surveyed 239 visitors in 1999 and 200 visitors in 2000 to the Detroit, Michigan, flower show in April of both years, to determine their perceptions of traditional indoor flowering pot plants and traditional outdoor perennials. Behavioral and demographic questions were asked to better characterize the sample. Participants recognized perennials as belonging outdoors in the garden, while accepting some perennials for both indoor and outdoor use. In 1999 and 2000, we evaluated the garden performance of 11 species of forced herbaceous perennials that exhibited desirable pot plants characteristics. Ten of the 11 species showed good garden performance despite forcing. Consumer data, as well as garden performance data, provide evidence that give marketers an opportunity to advertise these plants as a quality product when positioning them as "new" pot plants.

DEDICATION

To my dad, Wayne P. Hyman.
Here's to the endless pursuit of excellence.

ACKNOWLEDGEMENTS

The author would like to thank Dr. Sam Carter and Jill Hardy for their assistance with preparation of the survey and statistical analysis. Thanks are also due to Erin Nauseida, Emily Clough, Beth Fausey, Christina Kettling, Patty Elliot, Jim Heilig and Kathy Kelly for their assistance with growing, planting and distributing surveys. Many additional thanks are due to Jim Heilig and Nina Kassarjan for getting dirty in the garden and entering data. I would like to give special recognition to Kathy Kelly and Jill Hardy, for their constant support and motivation. Thanks also to Dr. Art Cameron and Dr. Norm Lownds for their assistance in the organization and implementation of the garden trials. Special thanks to Dr. Bridget Behe for securing contacts and helping organize, carry out and analyze all of the research as well as providing an assistantship, through the generous grant money provided by the American Floral Endowment, throughout the course of this M.S. degree. Enough recognition cannot possibly be given to Wayne and Linda Hyman for their years of love, motivation, patience and constant support of my seemingly unending education. Acknowledgment, love and thanks to my husband Douglas, who has shown endless and selfless support. Finally, glory and honor to God above, from whom all good things come.

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INTRODUCTION

In 1983, Hewlett-Packard set out to create an affordable desktop laser printer for the office market. Until this point, laser printers were used only with mainframe computers, not desktops, and were priced in excess of $100,000. Business printers were mainly daisy-wheel, or dot matrix and produced very poor quality image. Why did Hewlett-Packard set out to create a laser printer for the office market? Simple- as Dick Hackborn, HP's executive vice president for desktop computers said, "We realized we had an emerging technology converging with an unmet user need" (Huey, 1991). So, how does this apply to the floriculture industry?

In the past few years researchers at MSU have been developing protocols that allow for the year-round programming of flowering- an emerging technology. Growers now have the ability to flower many species of herbaceous perennials for sale virtually any time of the year. Very few have begun to take advantage of the opportunities this technology provides. These businesses can be considered the early adopters of innovation. These growers are the ones who "appreciate the architecture of the product and why it therefore has a competitive advantage" over current products established in the market (Moore, 1991). However, many commercial producers have not taken advantage of this opportunity. Moore describes the difficulty in moving a product from an early adoption phase of market growth to mainstream market growth by describing a group he calls Pragmatists (1991). Pragmatists tend to make incremental and predictable progress. Risk has a negative connotation and a product must have proven reliability before they are willing to accept it. In fact, much of the current growers'

attitudes can be summed up in this excerpt from a letter to the editors of *Greenhouse Grower* magazine from Rhonda Jones (2000):

> "Forced plants, especially perennials...do not provide the customer with what they really want- material that will thrive and bloom for years in their yards. ...If misled consumers place these forced plants in their gardens, the plants will most certainly have a difficult time becoming acclimated to the harsh, non-greenhouse environment. By some miracle, if the forced plants do manage to survive in the consumer's yard, they will probably not bloom at the same time during the next growing season."

The idea that forced perennials, as flowering potted plants, should not be sold limits future growth of the floriculture industry. The hypothesis that forced plants do not perform well in the garden has never been tested. The floriculture industry can easily overcome these limitations through researching both products and consumers. Research can prove that products are reliable and low risk. Consumer perceptions of flowering pot plants can be measured through consumer market research. Garden performance of forced perennials can be tested in garden performance trials. The floriculture has the potential to create a market for year-round blooming herbaceous perennials and really make that cash register ring.

Flowering Plants Market. The flowering plant market can be divided into two segments: (1) garden or bedding plants (including annuals and perennials), and (2) potted flowering plants. Typically garden plants are sold exclusively for outdoor use and flowering pot plants are sold exclusively for indoor use.

These two sectors of the floriculture industry are growing at very different rates. Bedding plants have grown from a wholesale value of $180 million in 1980, to $1.3 billion in 1994, to $1.8 billion in 1998 (USDA, 1999). When adjusted for inflation (CPI, 2000) growth was 406% growth in 18 years, or an average 23% increase annually

year. Growth for flowering pot plants has not been as dramatic. Wholesale sales have grown from $210 million in 1980, to $662 million in 1994, to $701 million in 1998, which equates to 69% (adjusted for inflation) (CPI, 2000) growth in 18 years or 4% growth annually (USDA, 1999). Plants such as African violet (*Saintpaulia ionantha* H. Wendl.), flortists' azalea (*Rhododendron sp.* L.) and kalanchoe (*Kalanchoe blossfeldiana* Poelln.) have experienced little to negative growth in five years (all subsequent percentages adjusted for inflation). African violet production has gone from a wholesale value of $27 million in 1994 to $22 million in 1998 (26% decrease, 6.5% annual average) and azalea production has decreased from a wholesale crop value of $53 million in 1994 to $42 million in 1998 (28% decrease, 7% annual average decline). Kalanchoe, however, has grown slightly from $11 million in 1994 to $17 million in 1998 (40% growth, 10% annual average). These figures indicate that the flowering pot plant market is beginning to stagnate, while the bedding plant market is robust and growing.

Product Life Cycle. Products pass through four distinct stages (introduction, growth, maturity and decline), where each stage requires different strategies to promote sales (Kotler, 1997). Sales begin and profits are minimal to non-existent in the introduction phase, while during the growth stage there is rapid market acceptance and sales. Products like bedding plants can be classified in this category, as indicated by 23% annual growth. The maturity stage is a period characterized by slower sales and little growth because the market has become saturated with the product. The flowering pot plant market may have reached this stage as indicated by its 4% annual growth rate. The decline period of the product life cycle is manifested by a decline in sales and

profits. If marketers spur product rejuvenation at this point, then the cycle begins again. The introduction of some garden plants, such as perennials, to the market as flowering pot plants may help to start rejuvenation of the waning flowering pot plant product life cycle.

By rejuvenating products, businesses can regain lost market share and generate more profit (Berenson, *et. al.*, 1994). Berenson outlined five steps for successful product rejuvenation: (1) understand reasons for product decline, (2) determine if the environment will support rejuvenation, (3) examine what the product communicates to consumers, (4) explore potential segments, and (5) determine possibilities of creating value to consumers. These steps can be directly applied to the flowering plant market. Consumer research can not only help determine what flowering plants communicate to consumers, but also help to define market segments. Finally, garden performance trials can help determine if "new" types of flowering pot plants, such as forced perennials, are quality products that are valuable to the consumer. Therefore, the two areas of study are required for development of forced perennials as flowering pot plants are consumer research and garden performance trials.

Consumer Research. Surveying consumers to foster product rejuvenation and development is a regular practice in many industries. One market research method that could potentially help the floriculture industry understand how consumers perceive flowering plants is perceptual mapping. Through the use of multidimensional scaling (MDS), researchers can form a spatial map that represents the market, or a perceptual map (Kotler, 1997). A perceptual map that showes how consumers generally think

about flowering plants would facilitate communication regarding flowering plants and positioning new products.

Perceptual maps are based on paired comparison data and estimate a spatial representation of products and positioning options (Bair & Gaul, 1999). In other words, a survey could ask consumers to compare flowering plants and the data would provide the information to develop a map of how consumers think about those plants. This information could help develop a product rejuvenation market strategy, such as pricing and promotion.

A perceptual map can be defined as "an attempt by a researcher to determine the perceived relative image of a set of objects" (Hair, 1992). Knowing what interests the consumer about a product gives that marketer an opportunity to influence purchase habits (Simonson, 1992).

Inviting consumers to be involved in the process of creating products gives a business or industry invaluable input. This input gives businesses an opportunity to fine tune things in the final stages of product development so as to ensure that a desirable product is placed in the market (Dickenson & Wilby, 1997). To date, there is no MDS information published with regard to flowering pot plants.

Another asset to consumer research is developing market segments. Different market segments have different needs, and therefore, require different marketing strategies. An example of marketing for different needs is Quidel Corporation's pregnancy testing products. Quidel's 'RapidVue' testing product is priced at $6.99 and is marketed to women who do not wish to be pregnant, while the 'Conceive' testing product is priced at $9.99 and marketed to "hopeful mothers" (Koselka, 1994). The

product is identical, and yet it is given different names and prices. Segmentation scenarios help define product attributes that should be targeted to different groups of consumers and who will value and spend more for them.

One useful segmentation scenario for gardeners divides them into four groups: Dabblers, Decorators, Cultivators and Masters (Waldrop, 1993). Dabblers spent little time (5 hours/week) and money ($130/year) on gardening and were interested primarily in yard maintenance, but they comprise 60% of the gardening market and therefore require attention. Decorators spent more time (7.5 hours/week) and money ($240/year) in the garden than Dabblers, and were considered the best market for flowering plants because two-thirds of their time was spent on ornamental gardening. Cultivators spent more time (11 hours/week) but less money ($140/year) in the garden than Decorators and were interested primarily in vegetable gardening. Master Gardeners were the most "committed" of the four groups, spending an average of 15 hours/week and $271/year in their gardens. This information indicates that Decorators, who comprise 19 % of all gardeners (11.5 million people), are the gardeners most likely interested in decorative flowering pot plants and that this is the segment of gardeners on which consumer studies and market strategies should be focused.

Garden Performance. The ability to program perennials gives growers the potential to offer blooming plants to consumers year-round (Carlson, 2000). Growers may offer these plants for one-time in home use, sold in the same fashion as poinsettias or florist mums. Growers may also offer programmed plants for both indoor and outdoor use, which may provide a perceived added value to consumers. However, the potential to market perennials for dual (indoor/outdoor) use, helping rejuvenate the

flowering pot plant market, brings into question the garden performance of programmed perennials. Does programming plants to flower at a time different from natural flowering cause any detrimental effects in the garden?

Some private and public enterprises are now performing trials on perennials in order to quantify garden performance of bedding plants. Since 1933 All-America Selections has coordinated garden performance trials on annual bedding plants. These trials were organized for several purposes. The first purpose was to establish whether or not certain annual bedding plants, which were not already on the market, performed well every year. A second purpose was to understand any special needs or disease problems that annuals may have. Third was the establishment of non-biased information about plant characteristics (AAS, 2000). Identical plants are issued to several test sites throughout a range of climates in the U.S. every year, and this culmination of bedding plant information provides a dependable source of both growing information and identity for the customer. If a bedding plant consumer can see that a plant is an All-America Selections winner, then he/she understands that the plant has been proven to perform in the garden under all sorts of climates (Hancock, 1998).

While there have been 67 years of national annual bedding plant testing, there has not been consistent nation-wide perennial testing. Dr. Allen Armitage has been conducting perennial trials at the University of Georgia since 1983 (Armitage, 1996). However, this kind of information has not moved far beyond academic circles, and these trials have not been replicated in multiple climates.

Other herbaceous perennial trials include trials at Pennsylvania State University, Michigan State University, and a British organization known as Blooms of

Bressingham North America. Penn State says that the purpose of their trials are for "facilitating the introduction and development of superior cultivars" (Shumac, 1998). Michigan State has conducted replicated perennial trials since 1996 under the direction of Ann Hancock. Blooms of Bressingham began garden performance trials at the University of Washington in 1997 to establish plants that are "well-suited for the climate, soils and growing conditions found in this part of the country" (UW, 1998).

Researchers at all of these trials rate plants on overall plant vigor and disease resistance. In addition to overall vigor and disease resistance, Dr. Armitage's trials rate plants based on their "floriferousness" and "plant fullness". At Penn State, plants are also rated by their garden value. Ann Hancock uses flower uniformity and display impact to rate plants in the trials along with the other standards (Hancock, 1998). At University of Washington, the Blooms of Bressingham trials are rated on flower color quality as well as vigor and appearance ratings. None of these trials, however, evaluate the performance of forced perennials. In fact, to date, there is little to no data published on the garden performance of forced herbaceous perennials.

Areas of study required for development of forced perennials as flowering pot plants are consumer research and garden performance trials. Current demographic information about gardeners, such as Decorators, suggests that this type of product would be of value to millions of floral product consumers. With sufficient testing and market strategy development, forced perennials as potted plants could easily rejuvenate the floral pot plant market.

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CHAPTER 1

CONSUMER PERCEPTIONS OF SELECTED FLOWERING PLANTS: 1999

Acta Horticulturae

Accepted for publication: 1 May, 2000

Consumer Perceptions of Selected Flowering Plants

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Received for publication 29 March, 2000. Accepted for publication 1 May, 2000 in Acta Horticulturae. We gratefully acknowledge the financial support of the American Floral Endowment and the cooperation of the Michigan Horticultural Society in facilitating this consumer research. We would also like to acknowledge Forrest S. Carter and Tomas J. Page, Jr. for sharing their expertise in the organization of the experiment and analyzation of the data.

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Marketing and Economics

Additional index words. paired comparisons, perceptual map

Abstract. The USA wholesale market for pot plants, valued at $701 million in 1998, is second to bedding plants, and growing at less than one-percent annually. The outdoor market for bedding plants is nearly $2 billion (U.S.) and growing eight-percent annually. Customers who purchase indoor flowering pot plants may have specific expectations about them, and may feel they will not perform well in the garden. Michigan State researchers have developed protocols to program over 30 herbaceous perennials to flower on a specific date. Some of these perennials exhibit characteristics for marketing as pot plants followed by good garden performance. One method of identifying how customers perceive these potentially new products is through the development of perceptual maps. Perceptual mapping shows how customers implicitly categorize products, leading marketers to identify new market opportunities or ways to position and price similar products. We surveyed 239 visitors to the Detroit, Michigan, flower show in April 1999, to determine their perceptions of 5 traditional indoor flowering pot plants and 9 traditional outdoor perennials. Their similarity / dissimilarity perceptions were recorded on a 7 point scale and squared Euclidean distances were calculated to develop maps. Major dimensions identified were an indoor/outdoor dimension, a bold/pastel color dimension, and a flower form dimension. This provided evidence that participants recognized the perennials as belonging outdoors in the garden, giving marketers an opportunity to advertise this advantage when merchandising them as pot plants. Color is regarded as an important aspect in the purchase of any flower, and was identified here as another

classification dimension. Since different customer segments may perceive plants differently, we developed separate perceptual maps for several consumer groups.

Sales of new or redesigned products can profitably rejuvenate the product life cycle. Introducing new or redesigned products to the market poses interesting challenges for marketers. How will the new products be priced and to what are they most comparable? How will customers perceive the new product and how can it be most profitably priced? Initial marketing strategies can be developed to build interest in the new product, create awareness, and generally promote the product and its uses. Market research conducted prior to product launching can give businesses a better understanding of customers' perceptions relative to the new product, and an idea of which product features to begin to promote. This type of research often probes issues such as consumer perceptions and preferences among product concepts. Results from this type of research can facilitate further product development, and eliminate potentially unprofitable product development.

Industries ranging from automotive to clothing regularly survey consumers to develop new products. In the floral industry, much less research is conducted. Anecdotal evidence suggests that if a plant is flowering in the marketplace, it will sell. Researchers have little conclusive evidence that indicates which product types or features, beyond color, the consumer is seeking or most willing to purchase. There is insufficient research to show how consumers perceive flowering plants, relative to each other. This kind of information would be useful in developing new types of flowering plants, and positioning them in the marketplace.

Annual flowering plants, purchased for installation in the exterior landscape, have a U.S. market value of $1.8 billion (USDA, 2000). This category grew an eight-percent last year. Herbaceous perennials comprise a portion of bedding plant production, and are

typically purchased for exterior landscape installation. While the USDA keeps no accurate statistics on the size or value of the perennial market, we conservatively estimate its value at $32 million. In 1988, the U.S. Census Bureau estimated the perennial market value at $31.9 million. Wholesale value of flowering plant sales was $701 million in 1998, and up 3% over the last five years. While this product category is not increasing at the rate of bedding plant category growth, perhaps new plant introductions could spur this on.

One market research method that could potentially help the horticulture industry understand how consumers perceive flowering plants is perceptual mapping. Through the use of multidimensional scaling (MDS), researchers can form a spatial map that represents the market, or a perceptual map (Kotler, 1997). Maps are based on paired comparison data and estimate a spacial representation products and positioning options (Baier & Gaul, 1999). Carmichael (1996) conducted a study using MDS to identify the most effective language in business communications. A perceptual map gives a marketer the ability to see in a two-dimensional space how the consumer thinks about products. If similar kinds of maps can be created with selected flowering plants, horticulture marketers would better understand floral consumers' perceptions.

A perceptual map can be defined as "an attempt by a researcher to determine the perceived relative image of a set of objects" (Hair, 1992). Knowing what interests the consumer about a product gives that marketer an opportunity to influence purchase habits (Simonson, 1992). Previous research shows that consumers migrate to certain products and brands they know. For example, red poinsettias have traditionally been associated with Christmas, and red plants have the dominant market share. Yet, novelty poinsettia

colors have risen in sales within the past few years since their introduction (Stickel, 1994). When consumers purchase multiple products in a certain category for an extended period, in this case poinsettias, they tend to want to try new items (Simonson, 1992). This provides a great opportunity for growers to up-sell their products, buying additional complimentary products which may be more profitable. For instance, a novelty poinsettia or amaryllis may compliment the traditional red poinsettia purchase.

Inviting consumers to be involved in the process of creating products gives the business invaluable input. This input gives businesses the opportunity to fine tune things in the final stages of product development so as to ensure that a desirable product is paced on the market (Dickenson & Wilby, 1997) . To date, there is no MDS information published with regard to flowering plants.

Materials and Methods

Our hypothesis was that consumers would recognize some plants as traditional, indoor-pot plants and others as outdoor garden perennial plants. We supposed that as a consumer's gardening experience or investment increased this delineation would become more explicit. They may, therefore, appreciate the value added if some traditional garden plants could be first used indoors as a flowering pot plant.

For this study, we selected fourteen flowering plants. Five were traditional potted flowering plants: *Saintpaulia ionantha* H. Wendl. (blue-purple), *Chrysanthemum sp.* L. (pink-lavender), *Kalanchoe blossfeldiana* Poelln. (yellow), *Rhododendron sp.* L. (salmon pink), and *Hydrangea macrophylla* Thunb. (pink). Nine were non-traditional potted flowering plants: *Achillea grandifolia* L., *Aquilegia* x *hybrida* 'Blue Bird' Siebold &

Zucc., *Campanula carpatica* 'Blue Clips' Jacq., *Coreopsis verticillata* 'Moonbeam' L., *Echinacea purpurea* 'Magnus' Moench, *Lavandula angustifolia* 'Hidcote Blue' Mill., *Leucanthemum* x *superbum* 'Snowcap' L., *Rudbeckia fulgida* 'Goldsturn' Ait., and *Salvia* x *sylvestris* 'May Night' L. These plants were selected for their diverse flower colors, flower forms, and use in Michigan gardens (USDA zone 5).

A complete factorial design was created in order to compare all 14 plants to each other. This design resulted in needing to ask consumers to make 91 comparisons. We divided the 91 comparisons into four surveys to reduce fatigue. Each survey contained 23 or 24 comparison questions, and additionally included a repeat of the first pair at the end of the survey form to serve as an anchor in analyses. In order to avoid order effect, pair-comparison questions were interspersed with demographic questions.

Photographs of the plants in flower were used in order to maintain consistency over time. Eight pairs of photographs were displayed on a black 3' x 3' foam board, and three boards were displayed together. Boards were rotated every hour so that every fourth hour the same display order was given.

We measured consumer perceptions using a semantic differential scale, which consisted of bipolar adjective pairs that anchor either end of a set of numbers (Kotler, 1997). We asked consumers to evaluate perceived similarities in pairs of flowering plant photographs. When bipolar adjective pairs were most similar, they received a rating of 7, and when they were most dissimilar received a rating of 1. A rating of 4 identified a pair perceived as neither similar nor dissimilar. Pair ratings were used to create a spatial map of how consumers perceived flowering plants. By transforming the consumer judgements of similarity into distances represented in a multidimensional space, the objects in

question were visually clustered on a grid. The two-dimensional space gave two axes by which objects were distinguished from one another (Hair, et. all, 1992).

The survey form consisted of one standard page printed in two columns, landscape style, folded in half. Both sides of the page were printed so as to make four pages (one title page and three questionnaire pages). The Michigan State University Committee on Research Involving Human Subjects approved this methodology in accordance with U.S. federal law and university policy.

We selected Detroit as a site to administer the survey because Detroit's population has a close match to the overall demographics of the nation and is a viable test market (Waldrop, 1992). Detroit has an annual flower show, which appeared to be an appropriate venue to intercept consumers with a range of interests in flowers and plants. On April 9 & 10, 1999, 239 completed responses were collected at the Bloomfest Flower Show in Detroit, Michigan at Cobo Hall Exhibition Center.

We incorporated 9 gardening behavioral questions and 5 demographic questions throughout the survey. The gardening behavioral questions addressed issues relating to gardening experience and habits: (a) were participants Master Gardeners, (b) how many hours per week did they spend gardening, (c) how many plants did they purchased for indoor display in 1998, (d) how many years they had been gardening, (e) what was the approximate size of their properties, (f) how much had they spent on perennial and annual plants in 1998, and (g) what percentage of their property was devoted to vegetable gardens, flowering gardens, and lawn. Demographic questions captured participant's gender, age, income level, family status, and education level.

Completed surveys were coded and then entered into a computer spreadsheet (Excel 97) for statistical analysis (SPSS 8.0). The statistical analysis of the paired comparisons was done using a multidimensional scaling program using ALSCAL (SPSS-PC), where paired-comparison means were put into a similarity matrix, and then put through the ALSCAL computer program. This program measured the Euclidean distances of the pairs in order to create the perceptual map.

Results

Of the 239 surveys completed, the lowest number of paired comparisons completed per version was 53, and the largest number was 66. The average length of time participants took to complete the survey was seven minutes.

Dollars Spent v. Time in the Garden. Participants gave a large range of responses when asked how much they spent on annual plants in 1998. Answers ranged from $0 to $400 (US), however the modes were $50 (14.4%) and $100 (14.4%). Similarly, when asked about perennial plant expenditures in 1998, the mode was $100 dollars (16.3%). However, the second most frequent response was $200 dollars (10%). We concluded that our sample spent more money on perennials than annuals. Perennials tend to be more expensive than annuals, mainly due to production intensity.

Participants were first asked to quantify how many hours per week they spent in their gardens in a typical spring month. The mean was 3.3 hours, while the most frequent response was one hour (28.5% of the population). The second most frequent response was 2 hours (20.3% of the population). The number of hours spent gardening was mildly associated to the total amount of dollars spent on flowering garden plants (annuals and

perennials) (R^2= 0.173, p=0.02). Typically people who spent less time in the garden spent less money on flowering plants. People who reported spending between $5 and $200 (US) on flowering plants said they spent an average of 10.3 hours per week in the garden. The participants who spent $201 to $400 (US) on flowering plants reported spending an average of 13.3 hours per week in the garden.

While time spent in the garden was mildly related to the amount of money people spent on flowering plants, gardening experience was not. There was no relationship between years of gardening experience and dollars spent on flowering plants (R^2= 0.122, p=0.09). The average years of gardening experience among participants were 6 to 10. The mode was ten years (13.8%).

Gender, Education, Household, Income and Age. Of the participants who responded to our question of gender, 74.8% of the sample were female, while 25.2% were male. Participants had completed a mean of 15.4 years of formal education, or equivalent to a U.S. bachelor's degree; 57.3% of the participants had completed 16 or more years of education. The U.S. average is 25%, so these participants are more educated than the average U.S. citizen (Mitchell, 1998). Households included typically a mean of 2 persons (43.1%) who were married with dependants (36.4%). The mean income range for participants in 1998 was $50,001 to $75,000 (US). The mean age was between 49 and 50 years, while the largest age group was 47 years (4.6%).

Property and Usage. The average property size of participants was 40,292 $ft.^2$ (less then one acre), or 3743 m^2. The participants were asked to divide their property according to how the land was used: lawn, flower garden and vegetable garden. On

average, 28.5% of the property was used for flower gardening, 57.5% was used for lawn, and 9.9% was used for vegetable gardening.

General Trends. The perceptual map has a grid with two axes or dimensions, by which the two most significant attributes of the objects cluster. These dimensions are determined subjectively due to the manner in which the objects cluster within the space of the map. There were distinct plant clusters defined in the map (Figure 1). Along the X-axis, the first cluster was within the range of –2.0 to –1.0 and included rhododendron, saintpaulia and hydrangea. Similarities among the plants in this cluster were indoor usage and form. These plants are traditionally used as indoor potted plants. The second cluster on the X-axis was within range –0.5 to 0.5. The two plants in this group were chrysanthemum and aquilegia. Not only were these plants similar in color, but also they were similar in height. The third X-axis cluster fell within range 0.5 to 1.5. These plants are traditionally used outdoors and are usually 12+ inches (31+ cm) tall.

While the Y-axis showed no definite patters when examined alone, when combined with the X-axis clusters there were some very definite patterns. The first noticeable group (first X cluster and Y-axis range 0.5 to –1.0) was comprised of plants with similar form and usage (indoor cluster). Campanula fell outside this cluster, which may be attributed to its traditional use in the U.S. as an outdoor plant. The next noticeable grouping (middle cluster) was chrysanthemum and aquilegia (second X cluster and Y-axis range 0.5 to 0.0). These two plants have a similar height, and are both used outdoors, however chrysanthemum is also used as an indoor plant. This cluster suggests the sample group had no preformed opinion that these two plants are exclusively for outdoor use. The middle cluster shows that there is a willingness to accept these types of plants for

either indoor or outdoor use. The cluster in the upper right quadrant (third X cluster and Y-axis range 0.5 to 1.5) were similar in appearance in that they were all cool colors and were similar in height and form (spike/tall cluster). The cluster in the lower right quadrant (third X cluster and Y-axis range 0.0 to –1.5) was comprised of ray and disk type plants also with similar height and form (ray/disk cluster). While usage in these last two clusters is a dominant theme, form seems to be equally important with outdoor plants.

Female Perspective. The predominance of female participants, along with the fact that women make the majority of retail flowering plant purchases (Gallup, 1999), prompted us to create a perceptual map base on their responses (Figure 2). Clusters in the female sample (n=116) were very similar to those in the general sample. The same types of clusters exist in figure 2 as in figure 1, however the boundaries of the indoor (-1.0 to 0.5, -2.0 to -1.0), spike/tall (0.5 to 1.5, -0.5 to -1.0), and ray/disk (0.0 to 1.5, 0.5 to 1.5) clusters are different, and there was no middle cluster. Aquilegia fell between chrysanthemum and the tall/spike cluster. One observation, which may explain this difference, is that along the negative side of the Y-axis, only cool color flowers clustered. This suggests that among women color may be just as important as form. Another difference was that only saintpaulia and campanula fell into the lower left quadrant, again suggesting that color is important.

Gardening time and Dollars. Maps were created for two of the expenditure sub-samples mentioned earlier. Both maps contain some of the general clusters contained in the previous maps. The map of participants who reported spending $5 to $200 (U.S.) on flowering plants (Figure 3) revealed an indoor cluster (-2.0 to -1.0, -1.0 to 1.0), a middle cluster (-0.5 to 0.0, 0.0 to 0.5), a tall/spike cluster (0.5 to 1.0, 0.0 to 1.5), and a ray/disk

cluster (0.5 to 1.5, -1.5 to 0.0). The map of participants who reported spending $201 to $400 (U.S.) on flowering plants (Figure 4) contained an indoor cluster (-2.0 to -1.0, -1.0 to 1.0), a tall/spike cluster (0.5 to 1.5, 0.5 to 1.0), and a ray/disk cluster (0.5 to 1.5, -1.5 to 0.0). Some of the most obvious differences in the two maps were distances between plants in the indoor clusters, the position of aquilegia, and the distances between plants in the tall/spike clusters. The distances between plants in the indoor cluster in Figure 3 are close together. For example, campanula and saintpaulia nearly overlapped, while in Figure 4 the two plants were spread much farther apart. This suggests that the people who spent less on flowering plants tended to differentiate between indoor plants less than those who spent more. The position in which aquilegia fell in the two maps also suggests that there is a difference in the way that these sample groups perceived the plants. In Figure 3 aquilegia clusters with chrysanthemum, suggesting that this group of people was more willing to accept the plant for either indoor or outdoor use. In Figure 4 aquilegia clusters with the tall/spike cluster, suggesting that this sample group considered the plant for outdoor use only.

Discussion

The main re-occurring clusters throughout all of the maps were indoor, tall/spike, and ray/disk. The most consistent dimensions were usage and form. Also, chrysanthemum consistently fell in the center of the usage axis for every map. This suggests that participants had strong associations between usage and form. The short, full plants consistently mapped out on the left (indoor) side of the x-axis, while the taller plants mapped out on the right (outdoor). If these two dimensions (usage and form) are

purchase factors for consumers, then marketers could easily promote plants based on these categories. In figure 2, color was an important classification factor for women when they thought about the plants in the survey. This may be just as important of a purchase factor when female consumers are purchasing potted indoor plants.

Expenditure and time spent in the garden, mildly correlated, were important in how members of the sample chose to associate the plants. The participants who spent more time and money associated the aquilegia very closely with the tall/spike cluster. This indicates that these people had stronger pre-determined associations with outdoor plants than the participants who spent less time and money.

In all of the maps campanula consistently clustered with the indoor plants and in figures 2 and 3 it clustered with saintpaulia. The expression "form follows function" might be reversed in this situation in that the form of a plant may suggest to the consumer the plant's function. The trends seen in these maps may be an indication of two things: (1) that consumers are willing to accept flowering plants with short, full form as potted indoor plants, and (2) that consumers simply are not aware that some of these plants are garden perennials.

We confirmed our hypothesis that customers would recognize and differentiate between traditional indoor potted plants and outdoor bedding plants. With a mild correlation between time and money spent in the garden, we saw this distinction become clearer as the time/money spent increased.

In marketing perennials as "new" potted plants we should emphasize the value-added attribute of enjoying a perennial in the home before potentially planting it in the garden. This attribute is more recognizable as the time/money expenditure increased

meaning that at least some consumers may have the desire and ability to pay more for a plant they can enjoy in both locations.

Additionally, marketers have a great opportunity to reposition some outdoor potted plants for indoor uses with virtually no product competition. We recognize, as did our participants, that the chrysanthemum is a plant with potentially two uses: indoor and outdoor. Aquilegia fell closest to chrysanthemum, indicating that plant as one that may be among the first to market with a dual use. A creative marketer may be able to capitalize on this repositioning, especially for the Mother's Day market. It is close to the last frost-free date for most major U.S. cities. In theory, a customer could purchase a programmed perennial for Mother's Day and plant it safely in the garden in approximately two weeks.

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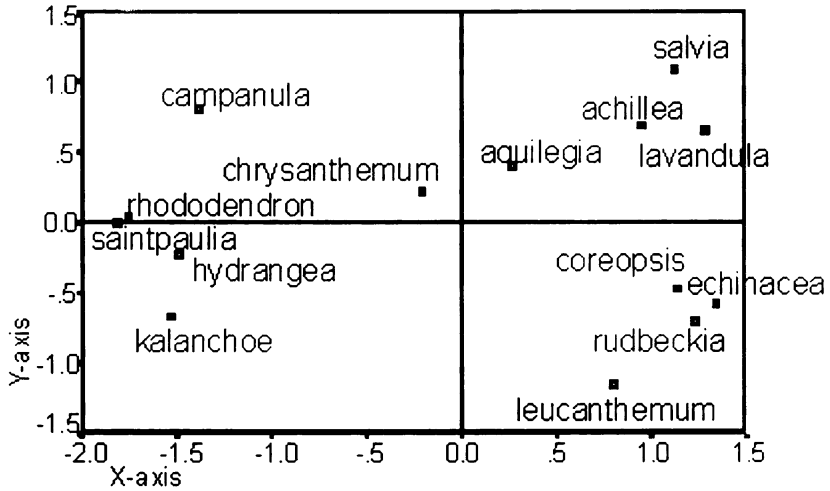

Figure 1. Perceptual map of 14 flowering plants as determined by paired comparison ratings of the total survey sample

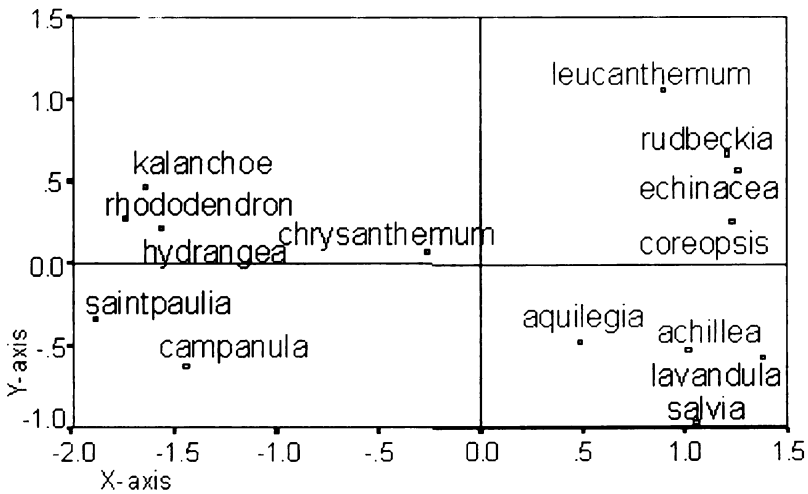

Figure 2. Perceptual map of 14 flowering plants as determined by paired comparison ratings of the female survey sample

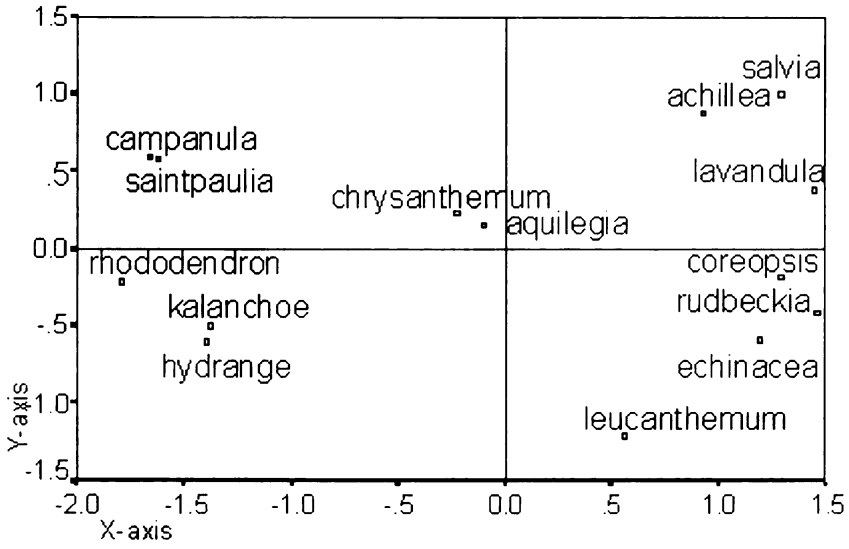

Figure 3. Perceptual map of 14 flowering plants as determined by paired comparison ratings of the survey sample who spent $5 to $200 on bedding plants in 1998.

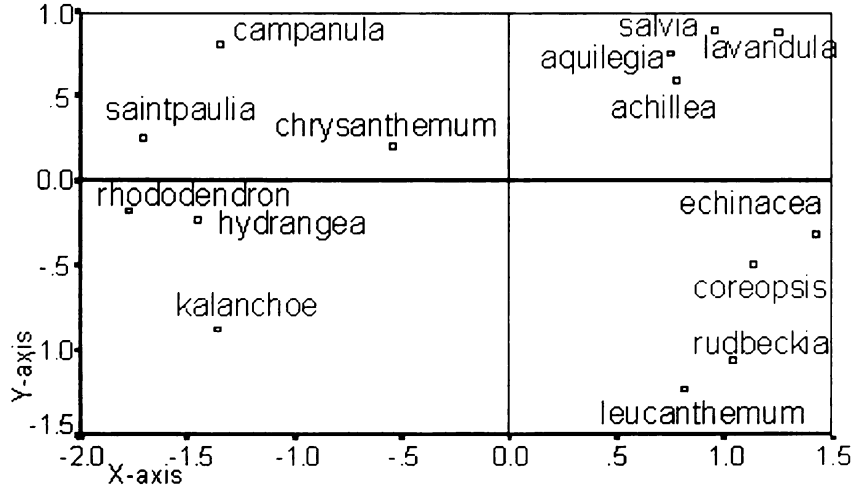

Figure 4. Perceptual map of 14 flowering plants as determined by paired comparison ratings of the survey sample who spent $201 to $400 on bedding plants in 1998.

CHAPTER 2

CONSUMER PERCEPTIONS AND PREFRENCES OF SELECTED FLOWERING PLANTS: 2000

Consumer Perceptions and Preferences of Selected Flowering Plants

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Received for publication _____. Accepted for publication _____. We gratefully acknowledge the financial support of the American Floral Endowment and the cooperation of the Michigan Horticultural Society in facilitating this study.

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Marketing and Economics

Additional index words. perceptual map, color, marketing

Abstract. The U.S. wholesale market for flowering pot plants, valued at $701 million in 1998, is second to bedding plants. The outdoor market for bedding plants (nearly $2 billion) is growing rapidly while the pot plants market is growing at a slower rate. Customers who purchase indoor flowering pot plants may have specific expectations about them, including that plant life indoors is a finite number of weeks with no opportunity for outdoor use. They may believe the plants will not perform well in the garden. If we position selected perennials as indoor flowering pot plants, we could create a new use, potentially stimulating sales. One method of identifying how customers perceive these potentially new products is through the development of perceptual maps. Perceptual mapping shows how customers implicitly categorize products, leading marketers to identify new market opportunities or to position and price products. We surveyed 200 visitors to the Detroit, Michigan, flower show in April 1999, to determine their perceptions of 3 traditional indoor flowering pot plants and 6 traditional outdoor perennials. The similarity / dissimilarity perceptions were recorded on a 7 point scale and squared Euclidean distances were calculated to develop a map. Major dimensions identified were an indoor/outdoor dimension, a color dimension, and a flower-form dimension. We also asked preference questions based on usage and color to determine the most valuable features of flowering plants. The map, as well as preference data, provided evidence that participants recognized the perennials as belonging outdoors in the garden, giving marketers an opportunity to advertise this advantage when positioning them as "new" pot plants.

Sales of redesigned products can profitably re-start the product life cycle. However, launching redesigned products into an existing market creates challenges for marketers. Several issues, such as pricing, customer reception and profitability need to be addressed, as these changes must be considered along with product changes. For example, how should redesigned products be priced in comparison to older products? Will customers perceive a benefit from the product's new design, and will pricing make the product profitable? What are the features of the product that add most to its value? Gaining a better understanding of customers' perceptions and preferences relative to the product can help anticipate how changes should be made. Research can also give marketers promotional ideas. Consumer research usually probes issues involving preferences and perceptions among product concepts, such as color, form and usage. Using this type of consumer research can help marketers define which products would or would not be profitable as well as provide insightful information on preferred product features that should be included in redesigned products.

Surveying consumers to foster product development is a regular practice in many industries. However, in the floral industry, businesses tend to live by the unspoken rule, "if the plant is flowering, it will sell," in lieu of conducting consumer research. Resultantly, we have little conclusive evidence that indicates which product features are most valuable to the consumer. For instance, what prompts a customer to purchase a plant as a gift versus purchasing a plant for home decoration? This type of information would be useful in developing new types of flowering plants, and positioning them in the market place.

Flowering Plant Market. In 1980, the total wholesale floriculture market was valued at $953 million. In 1994 the value increased to $3.2 billion and in 1998 $3.9 billion. This growth equates to an average of 10% annual growth over 18 years, and an average of 3% annual growth over the last four years (all growth adjusted for inflation) (CPI, 2000). Two very significant groups in the floriculture market are bedding plants and flowering pot plants. Bedding plants have grown from a wholesale value of $180 million in 1980, to $1.3 billion in 1994, to $1.8 billion in 1998 (USDA, 1999). Growth was 406% over 18 years, or an average 23% increase annually (Fig. 1). Growth for flowering pot plant sales has not been as dramatic. Wholesale sales have grown from $210 million in 1980, to $662 million in 1994, to $701 million in 1998, or 69% growth in 18 years or 4% growth annually (Fig. 2) (USDA, 1999). If just the most recent four years are examined, bedding plants have grown at an annual average of 6.5%, while flowering pot plants have decreased at an annual average decrease of 1%. For example, plants such as African violet (*Saintpaulia ionantha* H. Wendl.), flortists' azalea (*Rhododendron sp.* L.) and kalanchoe (*Kalanchoe blossfeldiana* Poelln.) have experienced limited to negative growth in the most recent five years (all subsequent percentages adjusted for inflation). African violet has declined in value from $27 million in 1994 to $22 million in 1998 (26% decrease, 6.5% annual average decline) and azalea has decreased in value from $53 million in 1994 to $42 million in 1998 (28% decrease, 7% annual average). Kalanchoe, however, has grown slightly from $11 million in 1994 to $17 million in 1998 (40% growth, 40% annual average). Growth of flowering pot plants is slowing

The Product Life Cycle. Products pass through four distinct stages (introduction, growth, maturity and decline), where each stage requires different strategies to promote sales (Kotler, 1997) (Fig. 3). When a product is first launched into the market sales growth is very slow and profits are minimal or non-existent. During the growth stage of the life cycle, rapid market acceptance and sales spur substantial profit generation. Products like bedding plants with 28% annual growth indicates this stage. The maturity stage is a period characterized by slower sales growth because the market has become saturated with products and substitutes (Kotler, 1997). Flowering pot plants may have reached this stage, exhibiting much slower annual growth (9.4%) when compared to bedding plants (28%). Finally, in the decline period, profits and sales both decline. If marketers spur product rejuvenation at this point, then the cycle begins again. The introduction of some garden plants, such as perennials, to the market as potted flowering plants may help start rejuvenation of the waning potted flowering plant life cycle.

Multidimensional Scaling. One market research method that could potentially help the horticulture industry understand how consumers perceive flowering plants is perceptual mapping. Through the use of multidimensional scaling (MDS), researchers can form a spatial map that represents perceived relationships among products in a market, or a perceptual map (Kotler, 1997). Maps are based on paired comparison data and estimate a spacial representation of products and positioning options (Baier & Gaul, 1999). Carmichael (1996) conducted a study using MDS to identify the most effective language in business communications. A perceptual map gives marketers the ability to see in a two-

dimensional space how consumers think about products. If similar kinds of maps can be created with selected flowering plants, horticulture marketers would better understand floral consumers' perceptions and better position "new" products.

A perceptual map can be defined as "an attempt by a researcher to determine the perceived relative image of a set of objects" (Hair, 1992). Knowing what interests the consumer about a product gives that marketer an opportunity to influence purchase habits (Simonson, 1992). Previous research shows that consumers migrate to certain products and brands they know. For example, red poinsettias have traditionally been associated with Christmas, and red plants have the dominant market share. Yet, novelty poinsettia colors have risen in sales within the past few years since their introduction (Stickel, 1994). When consumers purchase multiple products in a certain category for an extended period, in this case poinsettias, they tend to want to try new items (Simonson, 1992). This provides a great opportunity for growers to up-sell their products, buying additional and complimentary products which may be more profitable. For instance, a novelty poinsettia or amaryllis may compliment the traditional red poinsettia purchase.

Inviting consumers to be involved in the process of creating products gives the business invaluable input. This input gives businesses the opportunity to fine tune things in the final stages of product development so as to ensure that a desirable product is paced on the market (Dickenson & Wilby, 1997). To date, there is no MDS information published with regard to flowering plants.

Color. One very important feature of flowering plants is bloom color. This is often a deciding purchase factor for consumers. Behe, *et. al*, (1999) found that

color was the most important purchase factor when consumers were buying geranium (*Pelargonium* x *hortorum* L.H. Bail.). In the sample tested, Behe found that flower color was 2.9 times as important as price when testing purchase factors.

Recently, yellow flowers have been increasing in demand in gardening. Read (1999) stated that "garden stores are stocking more choices of yellow flowers and perennials than ever before." However, according to the Color Marketing Group (CMG), a group of 650 designers and marketers who determine color trends, "blue will become the most important color of the next decade" (CMG, 2000). This is very important information for floriculture because the industries represented in the forecast include interior and exterior home decoration. In fact, blue flowering plants have become so popular recently, USA Today published an article extolling the virtues of using blue in the landscape (Sell, 1999). Selling blue flowering potted plants and bedding plants may help to increase sales for floriculture business in the next few years.

With no perceptual information available relative to consumers and flowering plants, we wanted to develop a perceptual map to provide marketers with some fundamental information on which to base future marketing studies and decisions.

The objectives of the study included the determination of several preferences, including usage and color, as well as the development of a perceptual map. Our hypothesis was that consumers would recognize some plants as traditional, indoor-pot plants and others as outdoor garden perennial plants and that these usage associations would appear as dimensions on the perceptual map. We also supposed

that as a consumer's gardening experience and enjoyment increased, their in investment in lawn and garden would also increase.

Materials and Methods

We chose nine flowering plants based on their differences in usage association, form, color and use in Michigan gardens (USDA zone 5). Six plants were traditional outdoor garden plants: *Aquilegia* x *hybrida* 'Blue Bird' Siebold & Zucc., *Campanula carpatica* 'Blue Clips' Jacq., *Delphinium grandiflorum* 'Blue Mirror' L., *Oenothera fruiticosa* var. Youngii-lapsley L., *Oxalis crassipes* 'Rosea' Urb. and *Sedum spectabile* 'Brilliant' Boreau. Three plants were traditional potted flowering plants: *Kalanchoe blossfeldiana* Poelln. (yellow), *Rhododendron sp.* L. (salmon pink) and *Saintpaulia ionantha* H. Wendl. (blue-purple). Plants were photographed to be shown in pairs.

Photographs of the plants in flower were used to maintain consistency over time, and were displayed on three black 91cm x 91cm foam boards. Two boards contained eight pairs of photographs, and the third board contained four pairs of photographs as well as individual photographs of the nine plants. Boards were rotated every hour such that every other hour the same display order was given. Rotation enabled us to quantify any order effect.

We created a complete factorial design in order to compare all 9 plants to each other, resulting in our needing to ask consumers to make 38 comparisons. We divided the 38 comparisons into two surveys to reduce participant fatigue. Each survey contained 20 comparison questions, and additionally included a repeat of the

first pair at the end of the survey form to serve as an anchor in analysis. In order to reduce boredom, paired-comparison questions were interspersed with demographic, habit, and preference questions.

Consumer perceptions were measured using a semantic differential scale, which consists of bipolar adjective pairs that anchor either end of a set of numbers (Kotler, 1997). We asked participants to evaluate perceived similarities in pairs of flowering plants. When bipolar adjective pairs were most similar, they received a rating of 1, and when they were most dissimilar received a rating of 7. A rating of 4 identified a pair perceived as neither similar nor dissimilar. Pair ratings were used to create a spatial map of how participants perceived flowering plants. By transforming participants' judgements of similarity into distances represented in a multidimensional space, the objects in question were visually clustered on a grid. The two-dimensional space gave two axes by which objects were distinguished from one another (Hair, *et. al*, 1992).

The survey form consisted of one standard legal size page printed portrait style. Both sides were printed so as to make two pages. The Michigan State University Committee on Research Involving Human Subjects approved this methodology in accordance with U.S. federal law and university policy.

We selected Detroit as a site to administer the survey because Detroit's population has a close match to the overall demographics of the nation and is a viable test market (Waldrop, 1992). Detroit has an annual flower show, which appeared to be an appropriate venue to intercept consumers with a range of interests in flowers and plants. On April 7 and 8, 2000, 200 completed responses were

collected at the Bloomfest Flower Show in Detroit, Michigan at Cobo Hall Exhibition Center.

We incorporated 8 gardening behavioral questions, 7 demographic questions and 13 plant preference questions throughout this survey. The gardening behavioral questions addressed issues relating to gardening experience and habits: (a) the number of hours per week they spent gardening, (b) the number of plants they purchased for indoor display in 1999, (c) dollars spent on their lawns and gardens in 1999, (d) a rating of how friends saw their gardening experience, (e) a rating of how friends saw their gardening enjoyment, (f) the percentage of their property devoted to vegetable gardens, flower gardens and lawn and (g) dollars spent on perennial and annual plants in 1999. Demographic questions captured participant's gender, age, education level, income level, family status and property size. Preference questions addressed indoor/outdoor usage preference among the nine plants as well as which of the nine plants were preferred for (a) use in an outdoor garden bed, (b) decoration in the home, (c) preferred flower color and (d) use as a gift.

Completed surveys were coded and entered into a computer spreadsheet (Excel 97) for statistical analysis (SPSS 8.0). The statistical analysis of the paired comparisons was done using a multidimensional scaling program, ALSCAL (SPSS-PC), where paired-comparison means were put into a similarity matrix, and then subjected to the ALSCAL computer program. This program measured the Euclidean distances of the pairs in order to create the perceptual map.

Results

Of the 200 surveys completed, the numbers of paired comparisons completed per version were 94 and 106. The average length of time participants took to complete the survey was ten minutes.

Gender, Age, Education, Income and Household. Of the participants who responded to the question of gender, 78.2% of the sample were female, 21.3% were male. Participants had completed a mean of 15.4 years of formal education, or the equivalent to a U.S. bachelor's degree; 56.1% of the participants had completed 16 or more years of education. The U.S. average of people with a bachelors degree or higher is 25% (Mitchell, 1998), so these participants were more educated than the average U.S. citizen. Households included typically a mode of 2 adults (63.4%) and a mode of 0 children (61.7%). The mean income range for participants in 1999 was $50,001 to $75,000. The mean age was between 47 and 48 years, while the largest age group was 54 years (6.4%).

According to the National Gardening Survey (1999), those gardeners who participate in flower gardening were 59% female, with 52% between the ages of 30 and 49, 65% were college educated, 20% earned $50,000 to $75,000. Forty-one percent were married with children. Our results were very similar. Our survey sample was largely female, in their late forties, over half were college educated and had a mean 1999 income range was $50,000 to $75,000. However, our average participant household makeup was two adults and no children. This information indicates the participants sampled in this survey were similar to the national average.

Property and Usage. The median property size of participants was 1394 m^2 (less than one acre), while the mode (6.3%) was 4047 m^2 (one acre). The participants were asked to divide their property according to how the land was used: lawn, flower garden, and vegetable garden. On average, 60% of the property was used for lawn, 31.3% for flower gardening, and 9.8% for vegetable gardening.

Gardening Enjoyment and Experience. Participants were asked to rate themselves on a scale of 1 (not experienced/enjoyable) to 7 (very experienced/enjoyable) on their levels of gardening experience and enjoyment. A rating of 4 was average. The mean for experience was between 4 and 5, indicating that participants considered themselves to have an average to slightly above average level of gardening experience. The mean for gardening enjoyment was between six and seven, indicating that participants considered themselves to derive high levels of gardening enjoyment. Experience and enjoyment levels were correlated with each other ($r=0.479$, $p=0.000$). Experience level also mildly correlated with hours spent in the garden ($r=0.187$, $p=0.120$), age ($r=-0.184$, $p=0.013$) and bedding plant

expenditure (r=0.197, p=0.011). Chi-square testing revealed that significantly more participants who rated themselves as more experienced (p=0.0001) and experienced more enjoyment (p=0.0001) were female. Enjoyment level correlated with hours spent in the garden (r=0.247, p=0.000).

When the male sample was compared to the female sample, male participants rated themselves lower in both enjoyment and experience than female participants. The mean response for experience was between four and five for males and between five and six for females. The mean response for enjoyment was between five and six for males and between six and seven for females. Similarly, Hardy (1999) found that gardeners who experienced high gardening enjoyment and considered themselves plant-experts were mostly female.

Dollars and Time Spent in the Garden. Participants gave a large range of responses when asked how much they spent on their lawns and gardens in 1999. Answers ranged from $0 to $25,000. The most frequent response was $500 (17.1%), while the second most frequent response was $300 (12.7%).

More specifically, participants were asked how much they spent on annual plants in 1999. Answers ranges from $0 to $3000, however the mode was $100 (21.9%) and the second most frequent response was $50 (12.9%). Similarly, when asked about perennial plant expenditures in 1999, the mode was $100 (13.5%). The second most frequent response was also $50 (11.2%).

Total bedding plant expenditure (annuals and perennials) for 1999 was slightly correlated with income (r=0.202, p=0.013) and property size (r=0.269,

p=0.002). There was also a correlation with total lawn and garden expenditure (r=0.448, p=0.000).

Participants were asked to quantify how many hours per week they spent in their gardens in a typical spring month. The mean was 13.5 hours, while the mode was 10 hours (17.3%). The number of hours spent gardening was associated with the number of adults living in the household (r=0.302, p=0.000). Typically, people who spent less time in the garden had fewer adults in the home, spent less on bedding plants and lawn and garden, and had lower levels of gardening experience and enjoyment.

Indoor/Outdoor Usage. Participants were asked to identify usage for each of the nine plants. Usage choices were indoor, outdoor or both indoor and outdoor. In every question regarding usage of the traditional outdoor plants, the majority of participants equated those plants with outdoor usage (Table 1). However, there were large groups of the sample that said they were willing to consider Campanula and Oxalis for both indoor and outdoor use. When asked about the traditional indoor plants, responses were not as definite (Table 1). In the case of Saintpaulia, the vast majority of participants identified it for strictly indoor use. Slightly more participants identified Kalanchoe and Rhododendron for outdoor use than for indoor use, however, the majority identified those plants for dual use.

Plant Preference. This series of four questions asked participants to identify the most preferred among all nine plants for each of the given situations. When asked about plants for use in an outdoor garden bed, the top three responses were Aquilegia (25%), Sedum (18%) and Campanula (14%). When asked about plants

for use for decoration in the home, the top three answers were Saintpaulia (32%), Kalanchoe (20%) and Rhododendron (20%). However, the fourth and fifth most frequent responses were Campanula (9%) and Oxalis (8%). The top three responses when asked about preferred flower color were Aquilegia (blue with white center) (18%), Campanula (blue) (18%), and Rhododendron (dark pink) (18%). In total, 52% of the sample preferred plants with flowers that had a blue hue (Aquilegia, Campanula, Saintpaulia and Delphinium). Finally, when asked about plants for use as a gift, the three most popular responses were the traditional indoor plants; Saintpaulia (25%), Rhododendron (18%) and Kalanchoe (13%).

General Trends. The perceptual map is depicted as a grid with two axes or dimensions. These dimensions are the two most significant attributes of the objects. These two dimensions are determined subjectively due to the manner in which objects cluster with the space of the map. There were distinct plant clusters defined in the map (Fig. 4). Along the X-axis, the first cluster was within the range of –1.88 to –0.72 and included Rhododendron, Sedum, Kalanchoe and Saintpaulia. Three of the four plants are traditionally used indoors. The second cluster along the X- axis was within range 0.19 to 0.29. The two plants in this group were Oxalis and Campanula. These plants were not similar in color, but slightly similar in form and both are traditionally for outdoor usage. The third X-axis cluster falls within range 1.2 to 1.56 and included Delphinium, Aquilegia and Oenothera. Similarities among the plants in this cluster were outdoor usage and form.

The Y-axis appeared to define color groups within the map. Within the range of 2.0 to 0.0 were contained plants with blue and red hues, while within range 0.0 to –2.0 there were yellow hue plants and one red hue plant. Kalanchoe and Oenothera fell within $^{3}/_{100}$ of each other (-0.63 to –0.66) indicating a very strong yellow association along the Y-axis. Sedum fell into the negative Y-axis range, however, it was such a pale pink that it might have been perceived as white.

When combining the X-axis clusters with the Y-axis clusters, there were definite groups that appeared. The most distinct group (third X cluster, Y-axis range 0.72 to 0.64) was comprised of plants with similar form, usage and color. More specifically the two plants in this group were Aquilegia and Delphinium, which have similar heights, branching structures, flower color and are both used outdoors (upper right cluster). Oenothera did not cluster but fell alone in the lower right quadrant of the map (1.21, -0.66) (lower right cluster). The next noticeable grouping (middle cluster) was Oxalis and Campanula (second X cluster, Y-axis range 0.29 to 0.01). Due to their closeness to the center of the axes (less than 0.5 X and less than 0.5 Y) these plants suggest the sample group had very little preformed opinion that these two plants were exclusively for outdoor use. The middle cluster shows that there is a willingness to accept these types of plants for dual use. Rhododendron and Saintpaulia (upper left cluster) loosely clustered in the upper left quadrant (first X cluster, Y-axis range 0.64 to 0.62). These plants are slightly similar in form and usage; however, rhododendron falls much closer to the center of the X-axis indicating it is frequently perceived for use outdoors. Kalanchoe and Sedum

(lower left cluster) loosely grouped in the lower left quadrant (first X cluster, Y-axis range –0.63 to –1.6). These plants are very similar in form, but not usage or color; both are succulent plants. Over one quarter of the sample showed a willingness to use Sedum and Kalanchoe both indoors and outdoors (Table 1). This cluster may indicate several things; the association of form may be stronger than usage or color and the succulent form may indicate usage.

Discussion

The main map associations could be characterized as (a) indoor/outdoor, (b) height, and (c) succulent plants. The most consistent dimensions were usage and form. Also, campanula and oxalis fell in the center of the usage axis. This suggests that participants had strong associations between usage and form. The shorter, fuller plants consistently mapped away from the middle (dual use) to the left (indoor) side of the x-axis, while the taller plants mapped out on the far right (outdoor). If these two dimensions (usage and form) are purchase factors for consumers, then marketers could easily promote plants based on these categories. Color was somewhat of a classification factor. Yellow, most specifically, formed a group along the y-axis. This may be just as important a purchase factor when consumers are purchasing flowering plants.

In the preference data, blue was definitely the dominant color. This is consistent with the idea that blue is the new decorating color trend. For the next decade, growers can use this feature to promote products, such as campanula, as more valuable.

Not only is campanula blue, but it also has no strong pre-determined usage. This plant should be promoted as a more valuable product because of its features. Campanula could easily be produced as a pot crop and sold for use as both bedding plants and decorative potted plants. This would benefit growers who are looking for ways to improve sales of potted flowering plants while maintaining sales of bedding plants.

In the map, campanula and oxalis clustered together toward the center, and directly in between the indoor and outdoor groups. Both plants were considered usable indoors and outdoors by at least 41% of the sample. The plants were also preferred for use as decoration in the home by a total of 17% of the sample. This is further support for the potential use of some traditionally outdoor herbaceous perennials as potted crops. These plants have the shorter, fuller form of the indoor plants and the ability to successfully grow in a pot or as a bedding plant.

The expression "form follows function" might be reversed in this situation in that the form of a plant may suggest to the consumer the plant's function. The trends seen in the map may be an indication of two things: (1) that consumers are willing to accept flowering plants with short, full form as potted indoor plants, and (2) that consumers simply are not aware that some of these plants are garden perennials.

We confirmed that the people who enjoy gardening more and are more experienced, spend more money and time in the garden. With a mild correlation between time and money spent in the garden, we saw this distinction become clearer as the time/money spent increased. While this seems to make perfect sense, businesses often ignore who the customer is and what they want. These

relationships indicate that there are segments within the plant market, and perhaps niche marketing would be the best way to sell dual use plants. For example, women tended to enjoy gardening more as well as have more experience than men. Promoting plants among women, through occasions such as Mother's Day, might be the best way to market "new" potted flowering plants.

In marketing perennials as "new" potted plants we should emphasize the value-added attribute of enjoying a perennial in the home before potentially planting it in the garden. Considering the differences among consumers with different enjoyment and experience levels, some may have the desire and ability to pay more for a plant they can enjoy in both locations.

Additionally, marketers have a great opportunity to reposition some outdoor potted plants for indoor uses with virtually no product competition. We recognize, as did our participants, that campanula and oxalis are plants with potentially two uses: indoor and outdoor. Campanula fell closest to the center, indicating that plant as one that may be among the first to market with a dual use. A creative marketer may be able to capitalize on this repositioning, especially for the Mother's Day market. It is close to the last frost-free date for most major U.S. cities. In theory, a customer could purchase a programmed perennial for Mother's Day and plant it safely in the garden in approximately two weeks.

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Table 1. Survey sample responses to usage preference of 3 traditional indoor and 6 traditional outdoor flowering plants. Usage choices were indoor, outdoor or both indoor and outdoor.

Species	Traditional Usage	Sample Responses		
		Outdoor Use	Indoor Use	Both Indoor and Outdoor
Aquilegia	Outdoor	79%	6%	15%
Campanula	Outdoor	52%	6%	42%
Delphinium	Outdoor	82%	5%	13%
Kalanchoe	Indoor	28%	20%	52%
Oenothera	Outdoor	79%	4%	17%
Oxalis	Outdoor	52%	7%	41%
Rhododendron	Indoor	20%	14%	66%
Saintpaulia	Indoor	4%	75%	21%
Sedum	Outdoor	69%	4%	27%

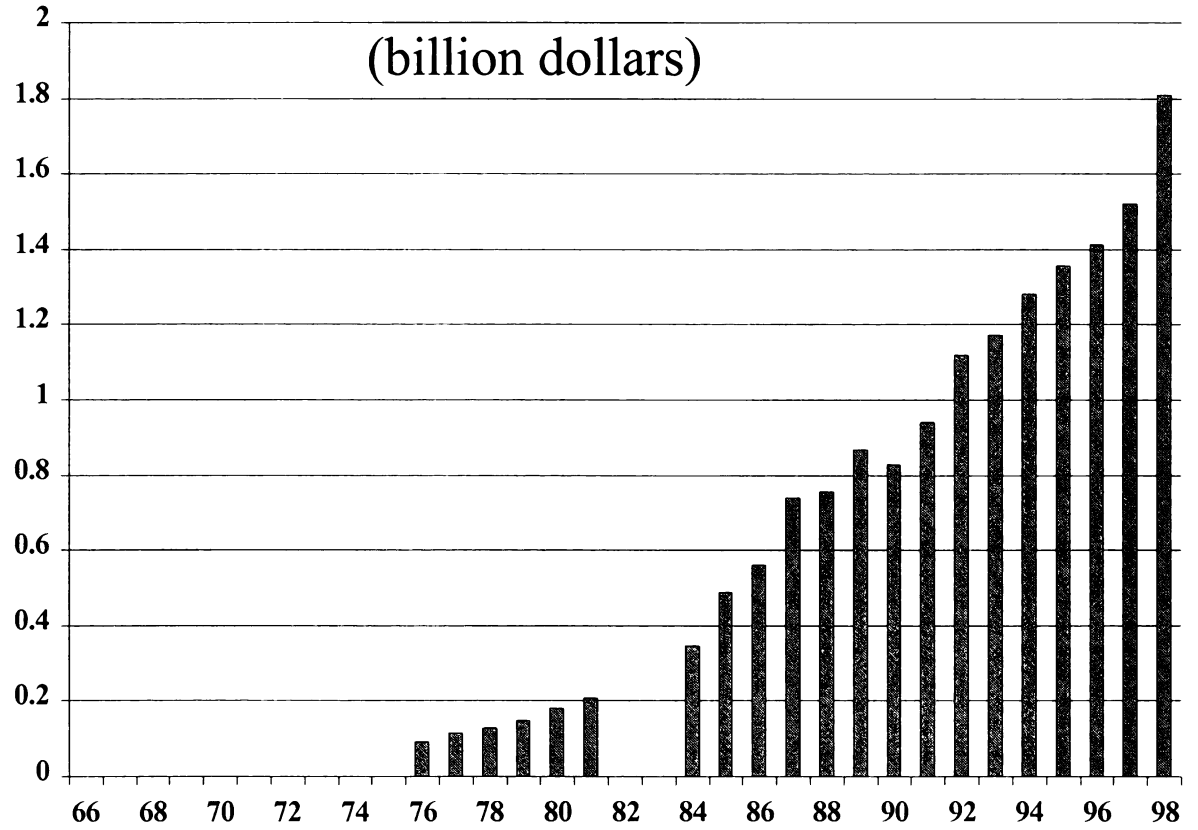

Figure 1. Annual U.S. wholesale values of bedding plants as recorded by the USDA from 1966 to 1998.

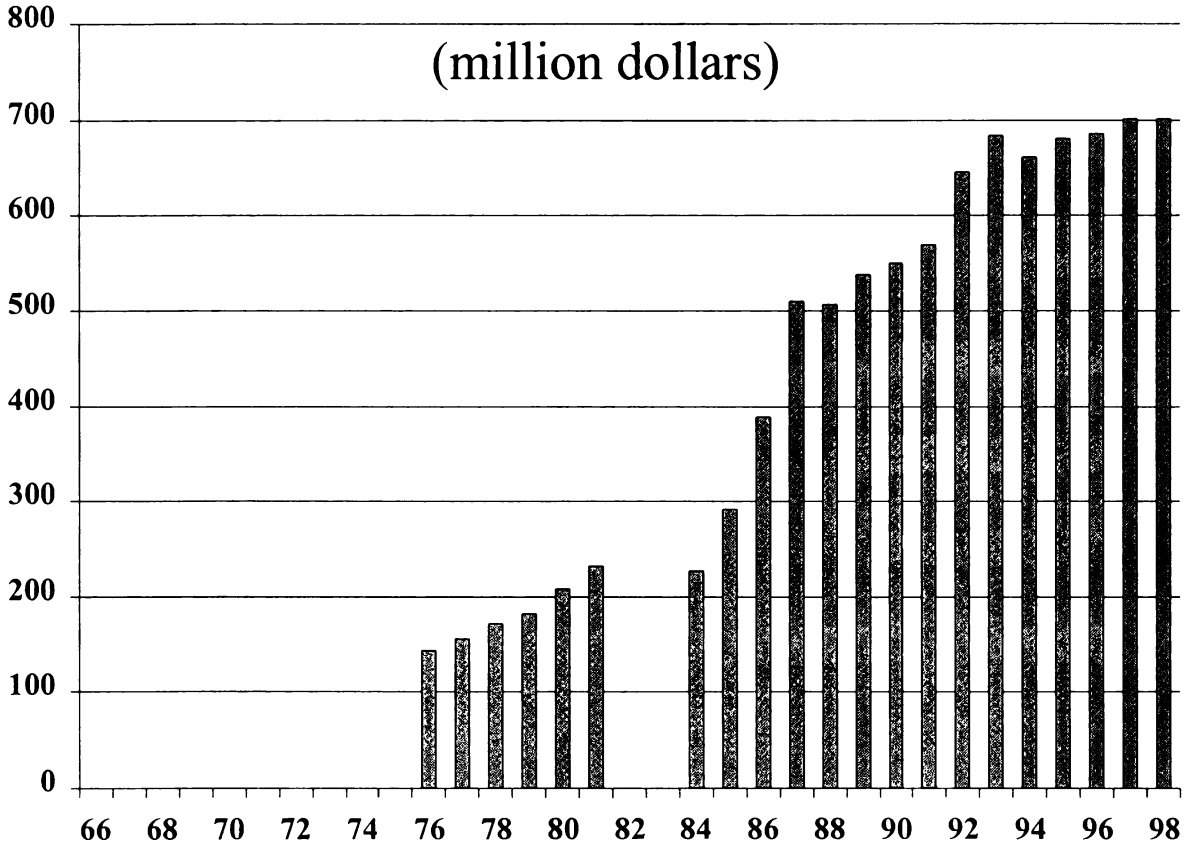

Figure 2. Annual U.S. wholesale values of flowering potted plants as recorded by the USDA from 1966 to 1998.

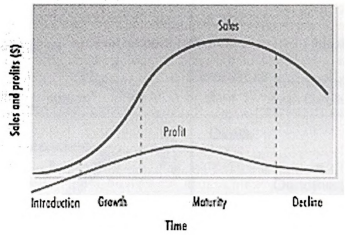

Figure 3. Product life cycle as defined by Kotler (1997). Sales and profit curves vary depending on which of the four stages of the life cycle a product is in.

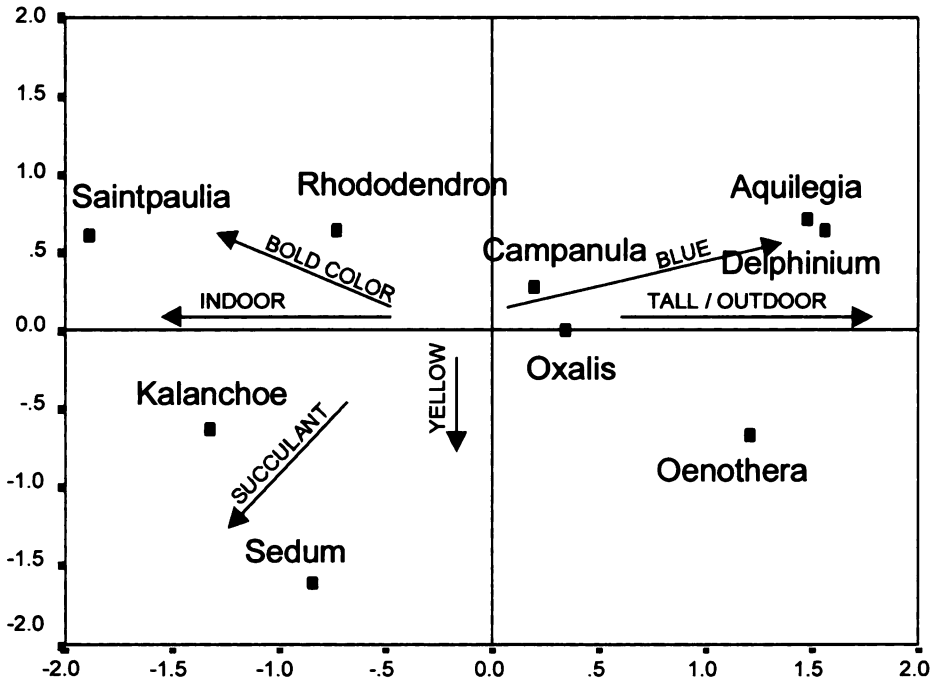

Figure 4. Perceptual map of 9 flowering plants as determined by paired comparison ratings of the total survey sample. The axes help to determine clusters that define pre-determined attitudes of consumers toward flowering plants.

CHAPTER 3

GARDEN PERFORMANCE OF SELECTED FORCED HERBACEOUS PERENNIALS

Garden Performance of Selected Forced Herbaceous Perennials

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Received for publication _____. Accepted for publication _____. We gratefully acknowledge the financial support of the American Floral Endowment in facilitating this research. We would also like to acknowledge the greenhouse and garden staff at Michigan State University for their assistance in growing plants and maintaining the trial beds.

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Postharvest Biology and Technology

Additional Index Words: bloom quality, foliage, plant quality

Absrtact. The popular perception that forcing plants has a detrimental effect on garden performance has never been tested by researchers, yet persists in the floriculture industry. Businesses have observed that plants in bloom sell faster than plants without flowers, making the presence of blooms desirable. With an increase in popularity of herbaceous perennials comes an industry interest in extending the sales period by having plants in bloom for an extended sales season. Michigan State researchers have developed protocols to program over 30 herbaceous perennials to flower on a specific date. Some of these perennials exhibit characteristics suitable or desirable for marketing as pot plants. We evaluated the garden performance of 11 species that exhibited desirable pot plant characteristics. Plants were evaluated over two years for bloom, foliage and overall plant quality. Plants were either forced or allowed to flower naturally. Half of the forced plants were subjected to a postharvest treatment, which simulated three days of shipping and 14 days of in-store display. At planting, half of the forced plants were cut back to 5 to 7 cm above ground. Ten of the 11 species showed good garden performance despite forcing. Cutting back at planting did improve the performance of one species (*Campanula portenschlagiana* Roem. & Schult.), while postharvest treatment had a detrimental effect on two others (included *Aquilegia flabellata* 'Cameo Mix' Siebold & Zucc. and *Pennisetum setaceum* 'Rubrum' Chiov.). Overall, forcing perennials for early garden plant sales, for one time pot plant use, or for both indoor and outdoor use can be a method of extending perennial sales while giving the customer a high quality product.

In the past few years perennial plants have become very popular among flowering plant consumers. In 1999, 83% of commercial grower participants in the Season Sales Summary said that they had experienced an increase in perennial sales (Behe, 1999). With an increase in perennial popularity come more businesses desiring further expansion of perennial sales. In order to continue growth and expansion, researchers have developed production protocols to force plants to bloom at any desired time. The ability to program perennials gives growers the potential to offer blooming plants to consumers year-round (Carlson, 2000). Growers or retailers may position these plants for one-time in home use, sold in the same fashion as poinsettias or florist mums. Businesses may also offer programmed plants for both indoor and outdoor use, which may provide a perceived added value to consumers. However, the potential to market perennials for dual (indoor/outdoor) use brings into question the garden performance of programmed perennials. Does programming plants to flower at a time different from natural flowering cause any detrimental effects in the garden?

Bedding plants, primarily annuals, have grown from a value of $180 thousand in 1980, to $1.3 million in 1994, to 1.8 million in 1998 (506% growth in 18 years), which is an average annual growth rate of 28% (USDA, 1999). Bedding plant sales are significantly increasing. Due to this popularity, several universities, private organizations and consumers are more concerned with plant performance. Some private and public enterprises are now performing trials on perennials in order to quantify garden performance of bedding plants. Since 1933 All-America Selections has coordinated garden performance trials on annual bedding plants (AAS, 2000). These trials were organized for several purposes. First was to establish whether or not

certain annual bedding plants, which were not already on the market, perform well every year. Second was to understand any special needs or disease problems that annuals may have. Third was the establishment of non-biased information about plant characteristics (AAS, 2000). Identical plants are issued to several test sites throughout a range of climates in the U.S. every year, and this culmination of bedding plant information provides a dependable source of both growing information and identity for the customer. If a bedding plant consumer can see that a certain plant is an All-America Selections winner, then he/she understands that the plant has been demonstrated to perform in the garden under all sorts of climates (Hancock, 1998).

While there have been 67 years of national annual bedding plant testing, there has not been consistent nation-wide perennial testing. Dr. Allen Armitage has been conducting perennial trials at the University of Georgia since 1983 (Armitage, 1996). However, this kind of information has not moved far beyond academic circles, and these trials have not been replicated in multiple climates.

Other herbaceous perennial trials include ones at Penn State University, Michigan State University, and a British organization known as Blooms of Bressingham North America. Penn State says that the purpose of their trials are for "facilitating the introduction and development of superior cultivars" (Shumac, 1998). Michigan State has conducted perennial trials since 1996 under the direction of Ann Hancock. Blooms of Bressingham began garden performance trials at the University of Washington in 1997 to establish plants that are "well-suited for the climate, soils and growing conditions found in this part of the country" (UW, 1998).

Researchers at all of these trials rate plants on overall plant vigor and disease resistance. In addition to overall vigor and disease resistance, Dr. Armitage's trials rate plants based on their "floriferousness" and "plant fullness". At Penn State, plants are also rated by their garden value. Ann Hancock uses flower uniformity and display impact to rate plants in the trials along with the other standards (Hancock, 1998). At University of Washington, the Blooms of Bressingham trials are rated on flower color quality as well as the other standard ratings. None of these trials, however, evaluate the performance of forced perennials. In fact, to date, there is little to no data published on the garden performance of forced herbaceous perennials.

The goal of this study was to develop information that growers and retailers can use to market programmed perennials. Providing garden performance data to these audiences will not only help them properly position and price their products, but also provide information on the post-sale performance of the plants. The specific objectives were to (1) quantify garden performance and (2) document over-winter survival of perennials planted in full flower and at the end of the useful postharvest life of selected perennials programmed to flower.

Materials and Methods

We chose 11 species of perennials based on their potential suitability as pot plants, their popularity in the garden (Table 1) and their successful programming properties.

The species planted in 1999 were *Aquilegia flabellata* 'Cameo Mix' Siebold & Zucc., *Campanula carpatica* 'Blue Clips' Jacq., *Campanula portenschlagiana* Roem.

& Schult., *Coreopsis grandiflora* 'Sunray' Per., *Echinacea purpurea* 'Magnus' Moench, *Lavandula angustifolia* 'Hidcote Blue' Mill. and *Leucanthemum* x *superbum* 'Snowcap' L. Four species were added in 2000: *Gaura lindheimeri* 'Whirling Butterflies' Engelm. & A. Gray., *Geranium dalmaticum* Rech.f., *Pennisetum setaceum* 'Rubrum' Chiov. and *Veronica spicata* 'Red Fox' L. Although pennisetum is not a perennial plant in Michigan (USDA Plant Hardiness Zone 5), it has become a popular garden plant within the past few years and warranted inclusion in the study.

Ten plants of each species were used as a comparison in a control group and were compared to four programmed treatments. The control plants were grown in a 16°C greenhouse with natural light and day-length. Treatments included programming to flower on May 15 or June 1. Half of the plants in each flowering period were subjected to a three-day simulation of shipping (no water, no light), followed by two weeks of in-store display simulation (22°C, fluorescent lights with light values ranging from 80μmol to 165μmol). Following postharvest treatment, plants were installed in full-sun beds, with sandy-loam soil, on the Michigan State University campus. At planting, half of both treatments were cut back five to seven cm above the ground.

Plants were installed on 30 to 60 cm centers on 31 May 1999 and between 31 May and 6 June 2000. Typical maintenance activities included deadheading, weed removal and supplemental irrigation twice weekly. Fertilization was applied at planting and consisted of a 19-4-23 ratio at a rate of 500 PPM (Greencare Fertilizers, Chicago, IL).

Data were collected on several key features of the plants; bloom quality, foliage quality, overall plant quality, percent of plant in bloom and, of the floral tissue, percent

of flowers in bud, open or fading. The quality data were collected on a five-point scale and were based on the All-America Selection standards (Table 2). Data were collected for plants in their first season weekly until the first week of October (week 40). Data for plants in their second season were collected weekly during bloom.

Results

The species studied were characterized as either plants that were not affected by forcing or postharvest treatment, plants that benefited from cutting back but were not affected by forcing, or plants that were negatively affected by storage but not by forcing. These differences in response to treatments can help marketers understand how best to position plants in the retail market. Based on these differences in response to forcing, postharvest treatment and cutting back, the species have been grouped into four marketing categories.

Good in the home, Great in the garden

Species in this category showed no detrimental effect on garden performance as a result of forcing or postharvest treatment. All treatments for all species performed equally well. Cutting back plants at installation did not improve garden performance. As a result, these species may be forced successfully for an early market date, to be used first indoors, or they may be marketed for use only outdoors.

C. carpatica 'Blue Clips'. Two weeks after planting in 1999 on week 25, plants that were cut back re-bloomed. Plants that were not cut back bloomed continuously throughout the summer and all plants produced blooms until week 31. Control plants continued to bloom for three more weeks (Fig. 10). Postharvest-treated

plants initially showed a decline in foliage quality (Fig. 11) and plant quality ($p<0.05$) (Fig. 12), but recovered by week 29. Forced plants had a lower percentage of blooms; however, this seemed to be corrected by cutting back at planting (Fig. 10). In 2000, plants that had originally been cut back had lower overall plant quality during bloom time (Fig. 15). All treatments produced peak bloom during week 26 and bloom quality ranged from average to good (Figs. 13,14). Plants ranged from 70 to 100 percent in bloom. Total bloom time was 6 weeks ranging from week 25 to week 30. There were no evident effects from forcing or postharvest treatment on Campanula garden performance.

Coreopsis. Garden performance was unaffected by forcing, postharvest treatment or cutting back at planting in 1999 (Figs. 25-28). Plants that were cut back re-bloomed within one week of planting; all other forced plants ceased bloom in week 24 and began to re-bloom in week 26. Coreopsis produced blooms until week 32. All plants survived the winter of 1999-2000 and bloomed. However, due to serious rodent damage to roots during the winter, plants did exhibit negative effects that were not necessarily attributed to postharvest treatment forcing or cutting back.

Echinacea. For the first two weeks after planting in 1999, postharvest treatment in combination with cutting back reduced overall plant quality ($p<0.05$) (Fig. 31). However, Echinacea recovered from these effects by the end of June (week 25), and performed equally well with all other plants. Initial bloom continued two weeks after planting, and in week 30 echinacea began to re-bloom for eight weeks (Fig. 30). In 2000, there was no evidence of any harmful effect from forcing, postharvest treatment or cutting back on garden performance ($p<0.05$) (Figs. 33-36). All plants

produced peak bloom at the same time within weeks 29 and 30, 2000. Bloom quality during this two week time period ranged from average to excellent and all plants were 100% in bloom. Total bloom time for echinacea was eight weeks (weeks 26-34).

Lavandula. After planting, in 1999, forced plants remained in bloom until week 25, and initially were of unacceptable to poor bloom quality (Fig. 37). However, all forced plants did re-bloom (by week 31) and remained in bloom until the end of September (week 38). Plants that were not cut back re-bloomed one week later (week 26). Lavandula subjected to postharvest treatment and cut back re-bloomed in week 32, while the other cut back plants re-bloomed earlier in week 30. Cutting back reduced bloom percentage ($p<0.05$) (Fig. 38). Comparison plants bloomed continuously from time of planting until the end of September. During weeks 33 to 39, forcing had a beneficial effect on overall plant quality ($p<0.05$) (Fig. 39). In 2000, forcing, cutting back and postharvest treatment had no effect on garden performance (Figs. 41-44). All plants produced peak bloom during week 24 with good to excellent bloom quality. Total bloom time was 7 weeks, ranging from week 23 to week 29.

Leucanthemum. Overall plant quality of forced leucanthemum remained as good as, or better than, comparison plants for the whole season ($p<0.05$) (Fig. 47). Forced plants, which were in open flower at planting, continued to bloom for three weeks after planting (until week 26), and there was not re-bloom for any plants (Fig. 46). Comparison plants were in bud at planting, and continued to bloom until week 28. Cutting back resulted in plants with better foliage during the month of September (weeks 35 to 39) ($p<0.05$) (Fig. 48). In 2000, all leucanthemum performed equally well with good to excellent overall plant quality for the first month in bloom, June

(Figs. 49-52). All plants bloomed during the same time period with peak bloom during weeks 24 and 25. Total bloom time for all treatments was 7 weeks ranging from week 22 to week 28.

Gaura. In 2000, the forced plants had better bloom quality, foliage quality, and better overall plant quality than the non-forced plants ($p<0.05$) (Figs. 53-56). This trend began at the time of planting (week 23) to the end of the data collection period (week 39). Cutting back at planting and postharvest treatment had no effect on garden performance. Cut back plants began to re-bloom two weeks after planting (week 25) (Fig. 54). All forced Gaura maintained good to excellent bloom quality during the entire trial.

Geranium. In 2000, these plants ceased blooming within the first week after planting (week23) (Fig. 58). Geranium never re-bloomed during the data collection period. Foliage quality and overall plant quality ranged widely for all treatments, showing no consistent effects from forcing, postharvest treatment or cutting back at planting. (Figs. 59-60).

Veronica. After week 27 in 2000, all Veronica performed equally well in all areas of garden performance (Figs. 65-68). Within the first two weeks of the trial (weeks 24 and 25), postharvest treatment caused a negative effect on foliage quality ($p<0.05$) (Fig. 68). Plants that were cut back soon recovered (week 27) and re-bloomed (Fig. 65). Veronica continued to bloom at low percentages (<=50%) from week 30 to week 37.

Good in the home, Great in the garden... with a little help

This species showed a negative effect as a result of postharvest treatment that was not exhibited when plants were cut back at planting. Forcing had no effect on garden performance among these plants. These plants can be marketed for dual (indoor and outdoor) use with the suggestion of cutting back at planting.

C. portenshlagiana. In 1999, from week 23 to week 26, cutting back produced plants with better overall plant quality ($p<0.05$) (Fig. 19). Cutting back also helped to produce a second flush of blooms. Initially, after planting, campanula bloomed for two weeks. Cut back plants re-bloomed in week 28, and plants not cut back at planting re-bloomed in week 30. Campanula remained in bloom until week 35. There was no effect from forcing on the garden performance of the plants in either 1999 (Figs. 17-20) or 2000 (Figs. 21-24). Also in 2000, there was no effect from cutting back ($p<0.05$). All plants produced peak bloom during week 20 and bloom quality ranged from good to excellent (Fig. 21). Total bloom time was 4 weeks, ranging from week 20 to week 23.

Good in the home or Great in the garden

The species in this group showed negative effects on garden performance from postharvest treatment. However, cutting back and forcing had no detrimental effect on any garden performance. These plants should be marketed for one time use in the home, or for early color in the garden.

Aquilegia. Overall, in 1999 there was no difference in plant quality or bloom quality among the treatments (Figs. 1-4). However, through August and September, the postharvest treatment had a negative effect on foliage quality ($p<0.05$) (Fig. 4). All

plants ceased bloom in week 24. In 2000, forcing, postharvest treatment, and cutting back had no detrimental effect on garden performance ($p<0.05$) (Figs. 5-8). Peak bloom for all plants was during week 18, and bloom quality ranged from good to excellent. Total bloom time was 4 weeks ranging from weeks 17 to 20.

Pennisetum. In 2000, there was no difference in bloom quality among treatments after week 28, when cut back plants began to re-bloom ($p<0.05$) (Fig. 61). However, plants that were not cut back had a higher percentage of blooms until week 34 (Fig. 62). Cutting back helped create better foliage quality and overall plant quality during weeks 23 to 26 ($p<0.05$) (Fig. 64). Postharvest treatment had a negative effect on overall plant quality ($p<0.05$) (Fig. 63).

All plants were in flower at planting, with bloom period ranging from one to eight weeks, depending on species. Once in the ground, Echinacea, Lavender, *Campanula carpatica* 'Blue Clips', *C. portenschlagiana* and Coreopsis re-bloomed after initial blooms faded. Plants that had been cut back produced a full looking flush of foliage and more even branching than plants that were not cut back. Plants that had been subjected to post harvest treatment initially (within the first 2 weeks of planting) showed leaf discoloration, weak stems, and stunted height.

Of 350 plants forced in 1999, less than 1% (all Echinacea) did not survive the winter. While all species did not bloom at the same time in 2000 as they did in 1999, all treatments flowered simultaneously at their natural bloom time. Bloom period ranged from 2 weeks (Aquilegia) to 6 weeks (Echinacea), depending on species. By the end of July, 20% of the Aquilegia plants had gone dormant.

Of the 200 plants forced in 2000, 1.5 % (all geranium) did not survive to September 2000. This result was not related to any of the treatments. All treatments of all species were in flower at the time of planting, with bloom period ranging from less than one week (*Geranium dalmaticum*) to 12 weeks (*Gaura lindheimeri* 'Whirling Butterflies'). Pennisetum produced a second flush of blooms, while Gaura continuously bloomed until September. Forced plants, which were not subjected to the postharvest treatment showed more vigorous growth, and little to no discoloration in leaves and stems within the first month outdoors ($p<0.05$). Gaura and Veronica recovered from postharvest effects within two weeks of planting.

Discussion

In summary, ten of the eleven plants tested in this study showed no poor garden performance as a result of forcing. Postharvest treatment negatively effected garden performance of two species (Aquilegia and Pennisetum).

These results suggest that growers can force plants into bloom to lengthen a sales period. While growers will have to remain cautious of postharvest treatment of these plants, labeling can play an important role in communicating information to the consumer. Labels may include information that helps promote good garden performance, such as cutting back some species at planting. Other labels may state that a species should not be planted after one time pot use.

Overall, forcing perennials for early bedding plant sales, for one time pot plant use, or for both indoor and outdoor use can be a method of extending perennial sales while giving the customer a quality product. There are many species, besides those

tested in this study, that might show good garden performance after forcing; therefore, more research is needed to further confirm the theory that forcing does not harm garden performance.

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Table 1. Production trends for selected perennials according to the 1999 Season Sales Summary survey showing popularity from either numerical rating or percent of crops sold.

Species	Numerical Rating[z]	% of total sales crop
Aquileiga	2.8	2.4
Coreopsis	3.4	4.3
Campanula[y]		
Dendranthemum	3.4	11.0
Echinacea	3.4	3.8
Gaura	2.8	1.6
Geranium[x]	3.6	15.6
Lavandula[y]		
Ornamental Grass[w]	3.1	5.2
Veronica	2.8	2.6

[z] Average rating, where 4=excellent, 3=very good, 2=average and 1=poor.

[y] No report on this genus.

[x] Represents Geranium propagated by cuttings and include both annual and perennial.

[w] No specific listing for Pennisetum.

Table 2. Garden performance rating systems used by All-America Selections and Michigan State University.

All America Selections[z]		Michigan State University	
Numerical Values	Terms	Terms	Definition
0	Not Worthy of Introduction	Dead	No Living Tissue on Plant
1	Some Merit But No Award	Unacceptable	Little to No Growth, Necrotic Tissue, Much Discoloration
2	Possible AAS Award	Poor	Little Growth, Uneven Growth, Some Discoloration, Little Necrotic Tissue
3	Superior Entry, Worthy of Award	Average	Moderate Growth, Somewhat Uneven Growth, No Necrotic Tissue, Some Discoloration
4	Excellent; Possible Gold Medal Winner	Good	Vigorous Growth, Even Growth, No Necrotic Tissue, Little Discoloration
5	Outstanding Achievement; Gold Medal Winner	Excellent	Vigorous to Robust Growth, Even Growth, No Necrotic Tissue, No Discoloration

[z] AAS official judge helped MSU researchers to adapt the AAS score sheet to more specifically meet the study evaluation requirements.

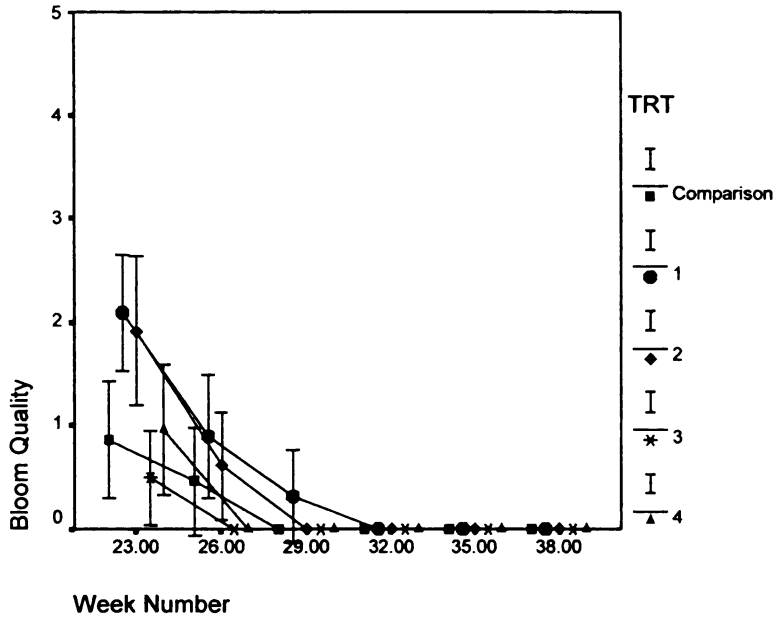


Fig. 1. Bloom quality ratings of *Aquilegia flabellata* 'Cameo' in 1999. Plants were rated from 0 to 5. Treatments are as follows: (1) forced with postharvest treatment, (2) forced with postharvest treatment and cut back at planting, (3) forced, (4) forced and cut back at planting.

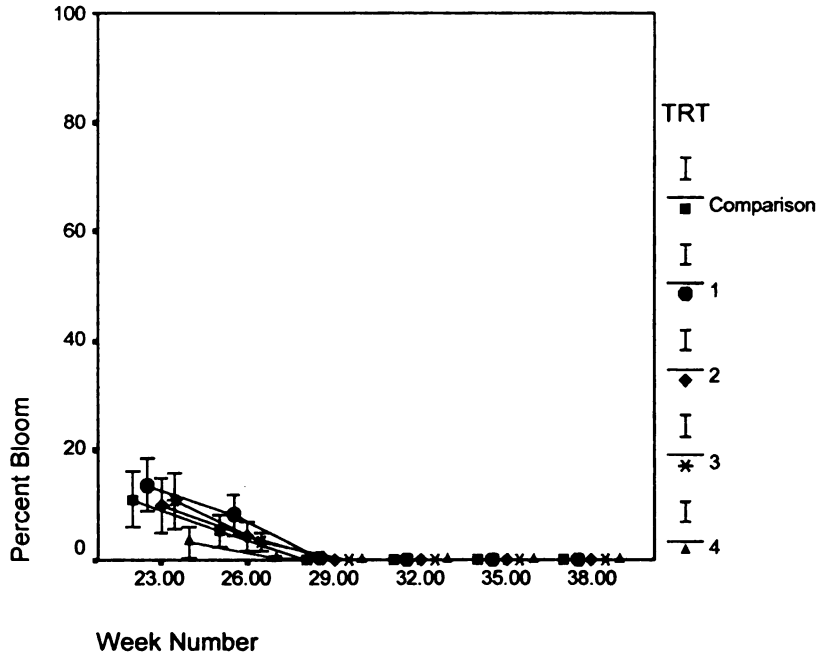


Fig. 2. Percentage of bloom of *Aquilegia flabellata* 'Cameo' in 1999. Treatments are as follows: (1) forced with postharvest treatment, (2) forced with postharvest treatment and cut back at planting, (3) forced, (4) forced and cut back at planting.

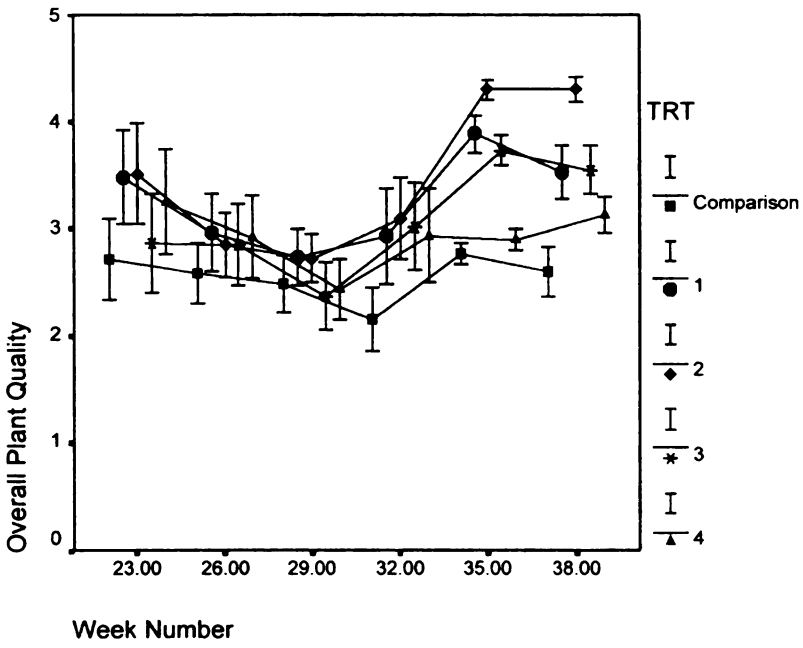


Fig. 3. Overall plant quality ratings of *Aquilegia flabellata* 'Cameo' in 1999. Plants were rated from 0 to 5. Treatments are as follows: (1) forced with postharvest treatment, (2) forced with postharvest treatment and cut back at planting, (3) forced, (4) forced and cut back at planting.

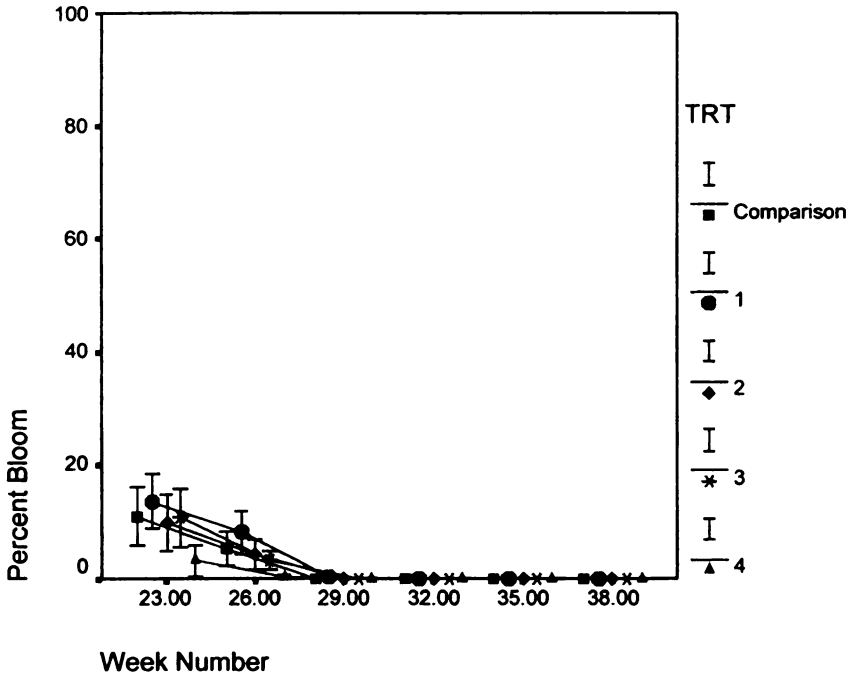


Fig. 4. Foliage quality ratings of *Aquilegia flabellata* 'Cameo' in 1999. Plants were rated from 0 to 5. Treatments are as follows: (1) forced with postharvest treatment, (2) forced with postharvest treatment and cut back at planting, (3) forced, (4) forced and cut back at planting.

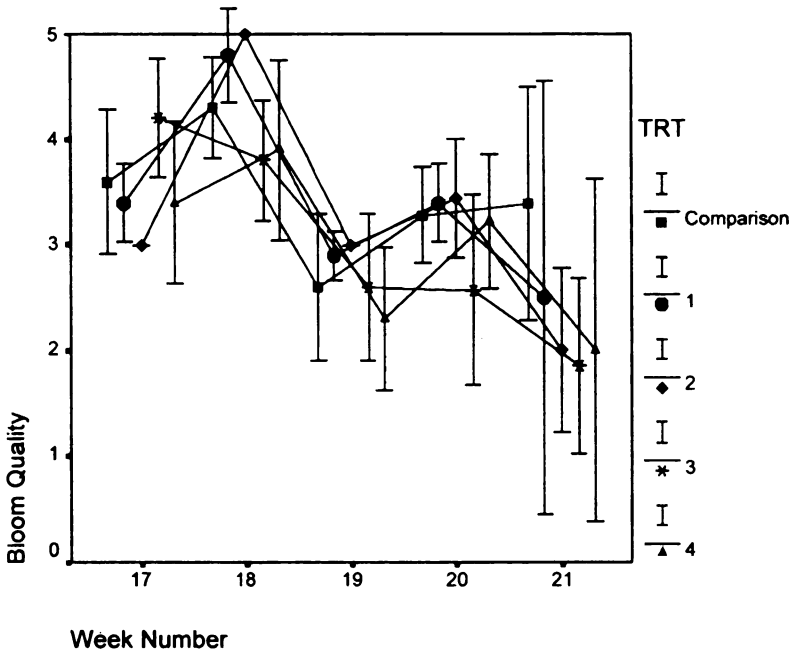


Fig. 5. Bloom quality ratings of *Aquilegia flabellata* 'Cameo' in 2000. Plants were rated from 0 to 5. Treatments are as follows: (1) forced with postharvest treatment, (2) forced with postharvest treatment and cut back at planting, (3) forced, (4) forced and cut back at planting.

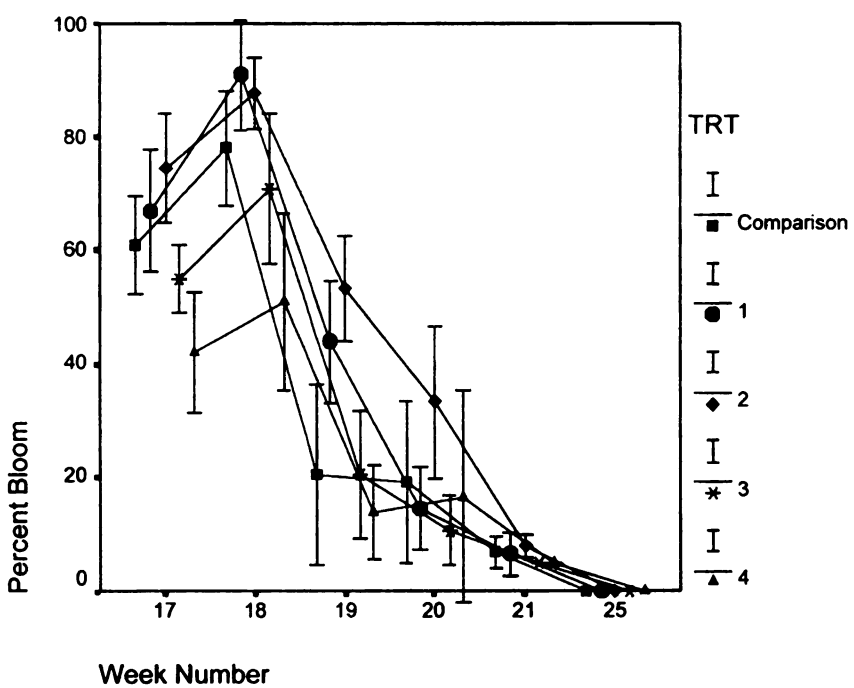


Fig. 6. Percentage of bloom of *Aquilegia flabellata* 'Cameo' in 2000. Treatments are as follows: (1) forced with postharvest treatment, (2) forced with postharvest treatment and cut back at planting, (3) forced, (4) forced and cut back at planting.

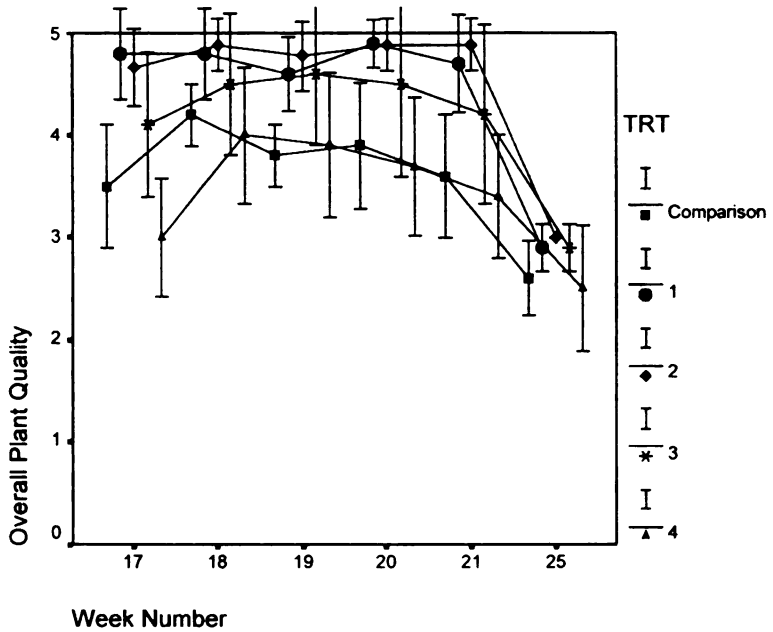


Fig. 7. Overall plant quality ratings of *Aquilegia flabellata* 'Cameo' in 2000. Plants were rated from 0 to 5. Treatments are as follows: (1) forced with postharvest treatment, (2) forced with postharvest treatment and cut back at planting, (3) forced, (4) forced and cut back at planting.

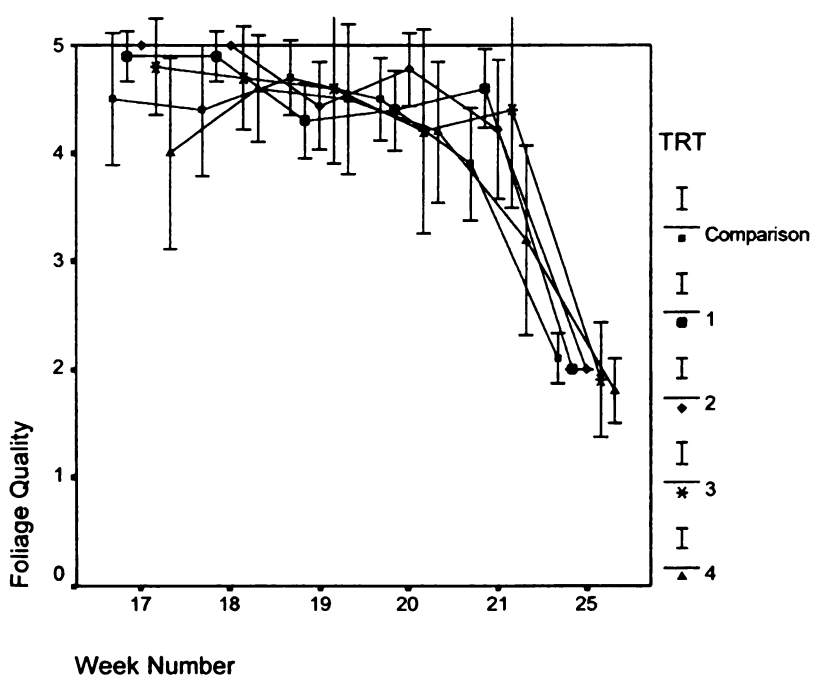


Fig. 8. Foliage quality ratings of *Aquilegia flabellata* 'Cameo' in 2000. Plants were rated from 0 to 5. Treatments are as follows: (1) forced with postharvest treatment, (2) forced with postharvest treatment and cut back at planting, (3) forced, (4) forced and cut back at planting.

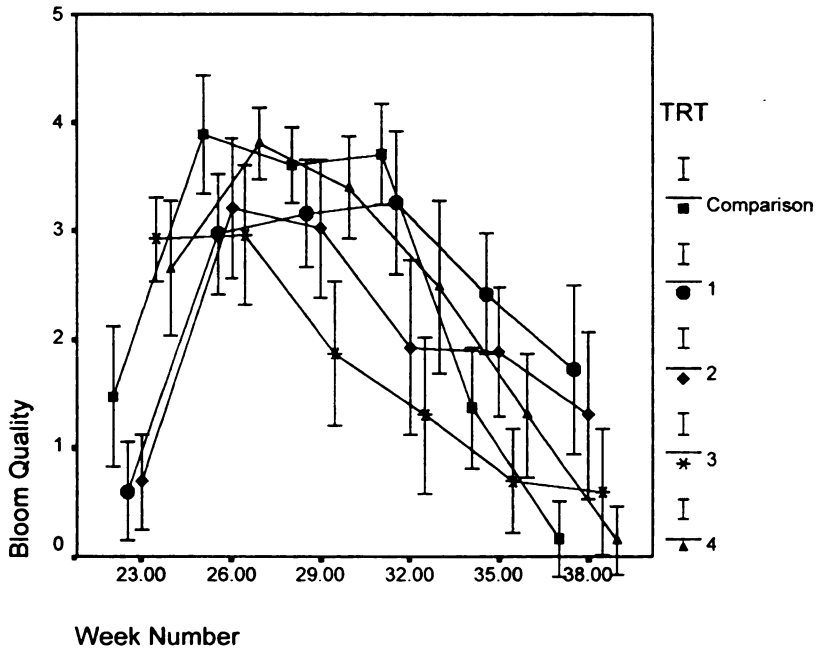


Fig. 9. Bloom quality ratings of *Campanula carpatica* 'Blue Clips' in 1999. Plants were rated from 0 to 5. Treatments are as follows: (1) forced with postharvest treatment, (2) forced with postharvest treatment and cut back at planting, (3) forced, (4) forced and cut back at planting.

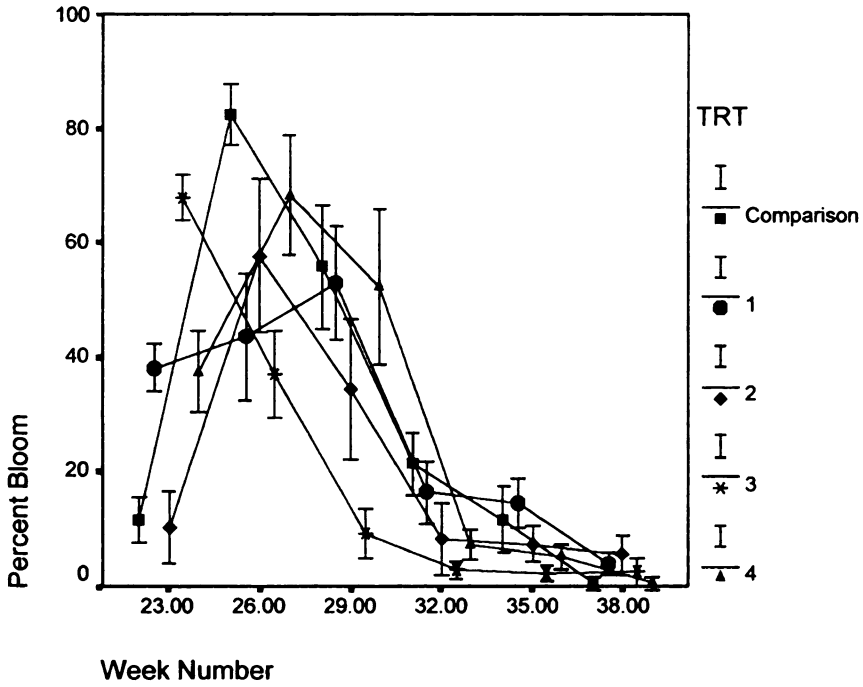


Fig. 10. Percentage of bloom of *Campanula carpatica* 'Blue Clips' in 1999. Treatments are as follows: (1) forced with postharvest treatment, (2) forced with postharvest treatment and cut back at planting, (3) forced, (4) forced and cut back at planting.

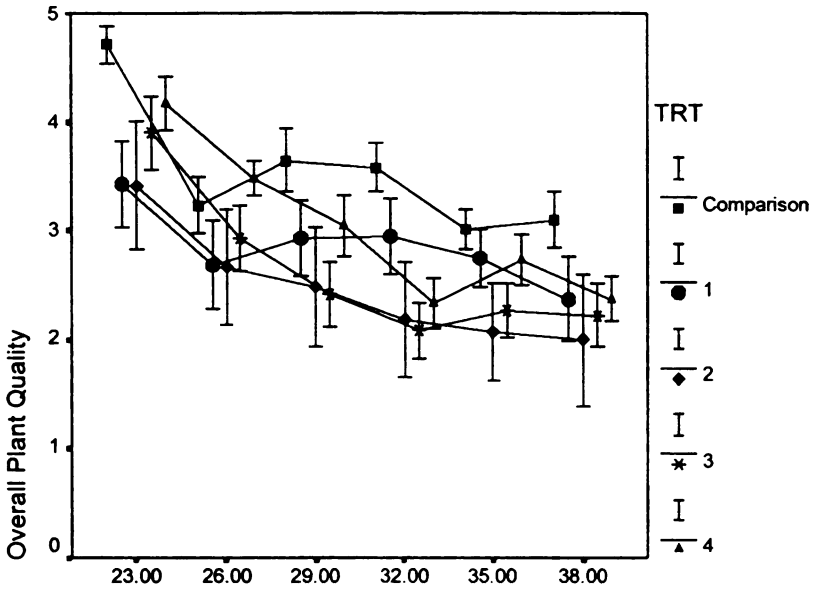


Fig. 11. Overall plant quality ratings of *Campanula carpatica* 'Blue Clips' in 1999. Plants were rated from 0 to 5. Treatments are as follows: (1) forced with postharvest treatment, (2) forced with postharvest treatment and cut back at planting, (3) forced, (4) forced and cut back at planting.

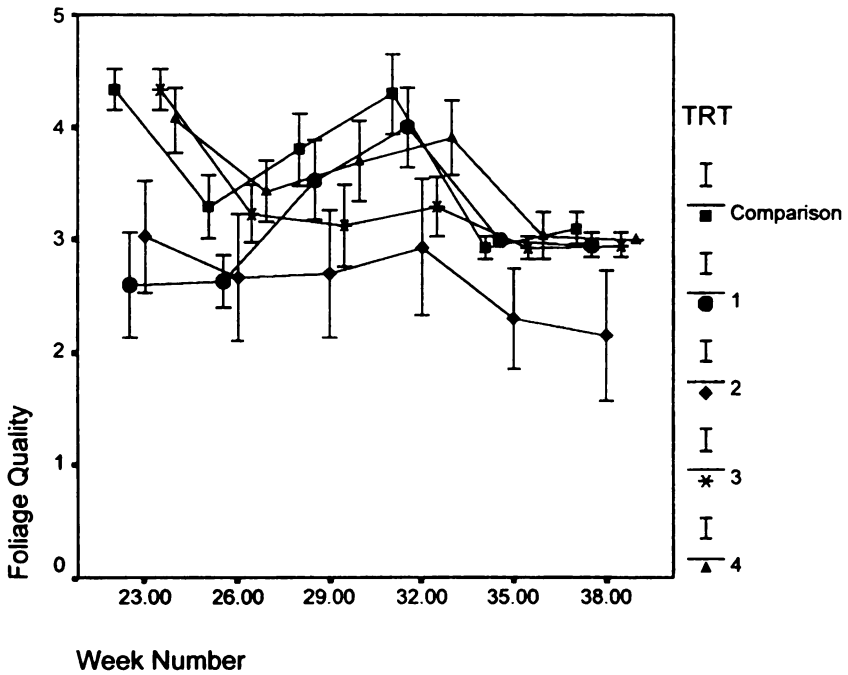


Fig. 12. Foliage quality ratings of *Campanula carpatica* 'Blue Clips' in 1999. Plants were rated from 0 to 5. Treatments are as follows: (1) forced with postharvest treatment, (2) forced with postharvest treatment and cut back at planting, (3) forced, (4) forced and cut back at planting.

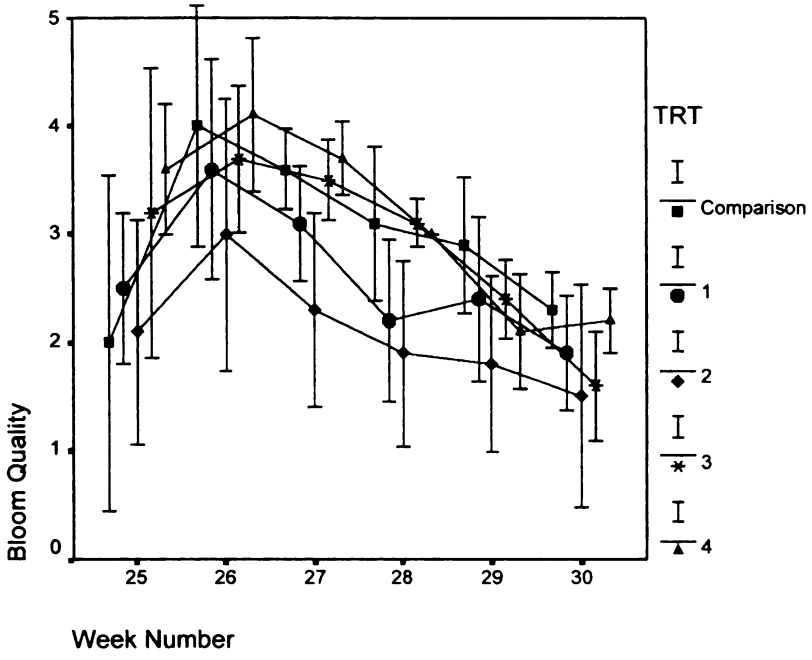


Fig. 13. Bloom quality ratings of *Campanula carpatica* 'Blue Clips' in 2000. Plants were rated from 0 to 5. Treatments are as follows: (1) forced with postharvest treatment, (2) forced with postharvest treatment and cut back at planting, (3) forced, (4) forced and cut back at planting.

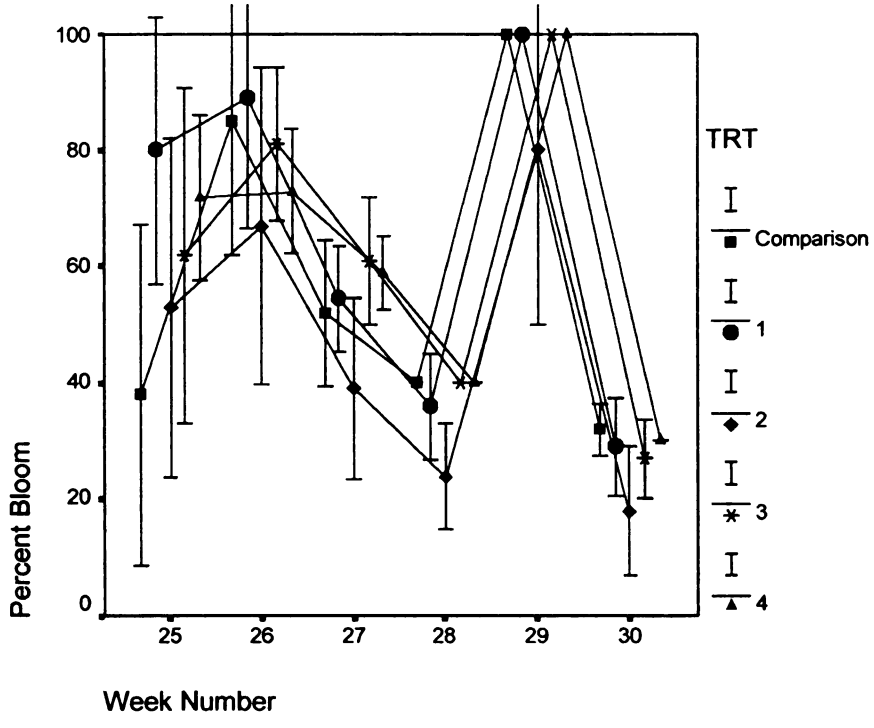


Fig. 14. Percentage of bloom of *Campanula carpatica* 'Blue Clips' in 2000. Treatments are as follows: (1) forced with postharvest treatment, (2) forced with postharvest treatment and cut back at planting, (3) forced, (4) forced and cut back at planting.

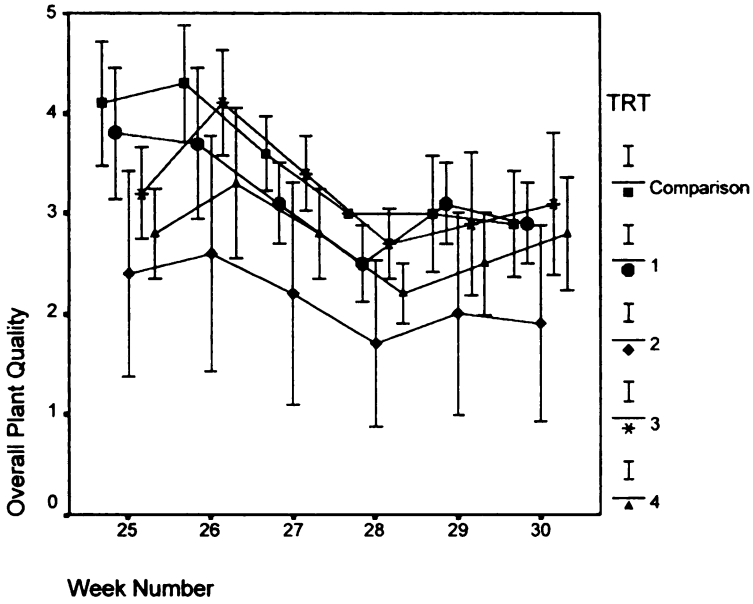


Fig. 15. Overall plant quality ratings of *Campanula carpatica* 'Blue Clips' in 2000. Plants were rated from 0 to 5. Treatments are as follows: (1) forced with postharvest treatment, (2) forced with postharvest treatment and cut back at planting, (3) forced, (4) forced and cut back at planting.

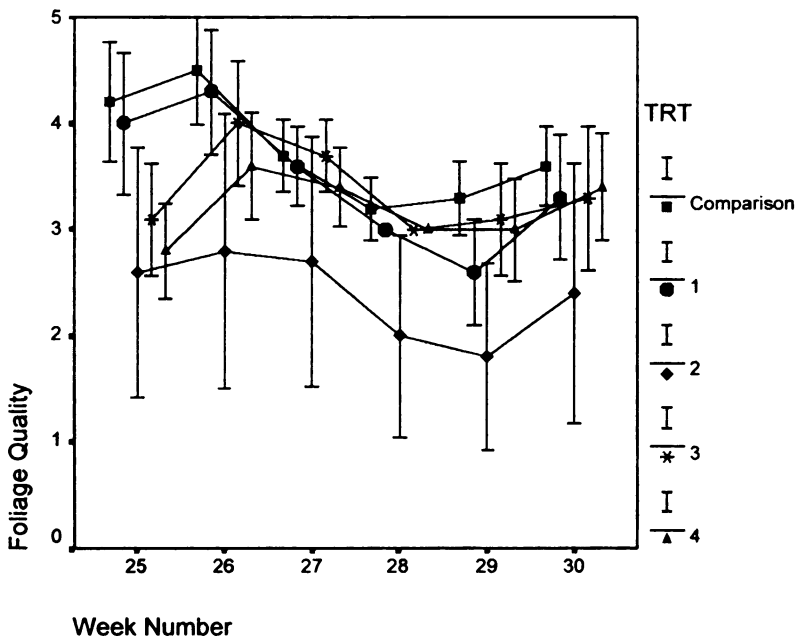


Fig. 16. Foliage quality ratings of *Campanula carpatica* 'Blue Clips' in 2000. Plants were rated from 0 to 5. Treatments are as follows: (1) forced with postharvest treatment, (2) forced with postharvest treatment and cut back at planting, (3) forced, (4) forced and cut back at planting.

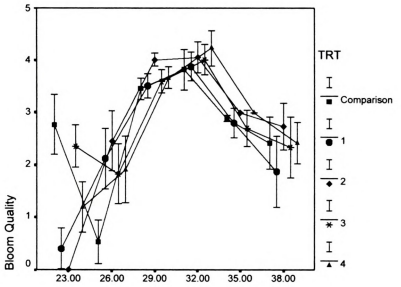


Fig. 17. Bloom quality ratings of *Campanula portenschlagiana* in 1999. Plants were rated from 0 to 5. Treatments are as follows: (1) forced with postharvest treatment, (2) forced with postharvest treatment and cut back at planting, (3) forced, (4) forced and cut back at planting.

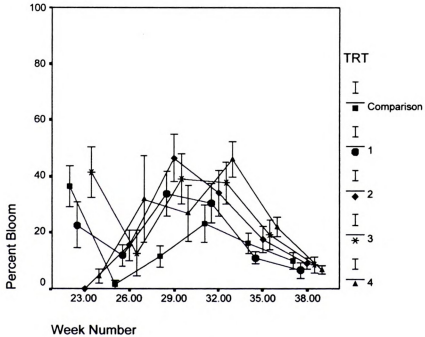


Fig. 18. Percentage of bloom of *Campanula portenschlagiana* in 1999. Treatments are as follows: (1) forced with postharvest treatment, (2) forced with postharvest treatment and cut back at planting, (3) forced, (4) forced and cut back at planting.

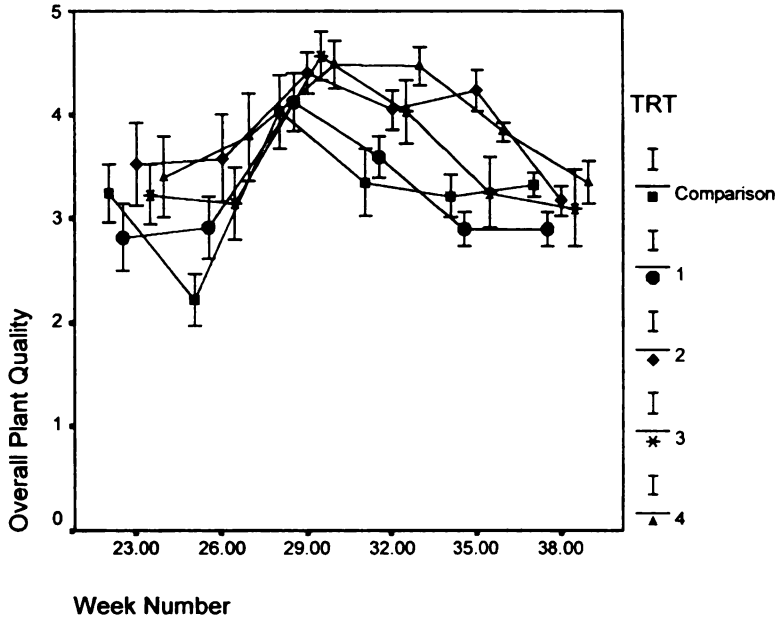


Fig. 19. Overall plant quality ratings of *Campanula portenshlagiana* in 1999. Plants were rated from 0 to 5. Treatments are as follows: (1) forced with postharvest treatment, (2) forced with postharvest treatment and cut back at planting, (3) forced, (4) forced and cut back at planting.

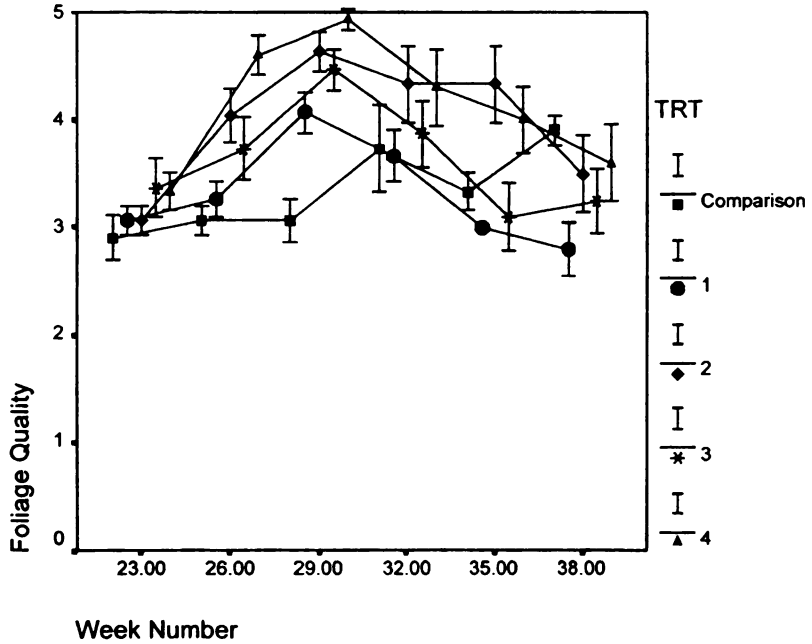


Fig. 20. Foliage quality ratings of *Campanula portenschlagiana* in 1999. Plants were rated from 0 to 5. Treatments are as follows: (1) forced with postharvest treatment, (2) forced with postharvest treatment and cut back at planting, (3) forced, (4) forced and cut back at planting.

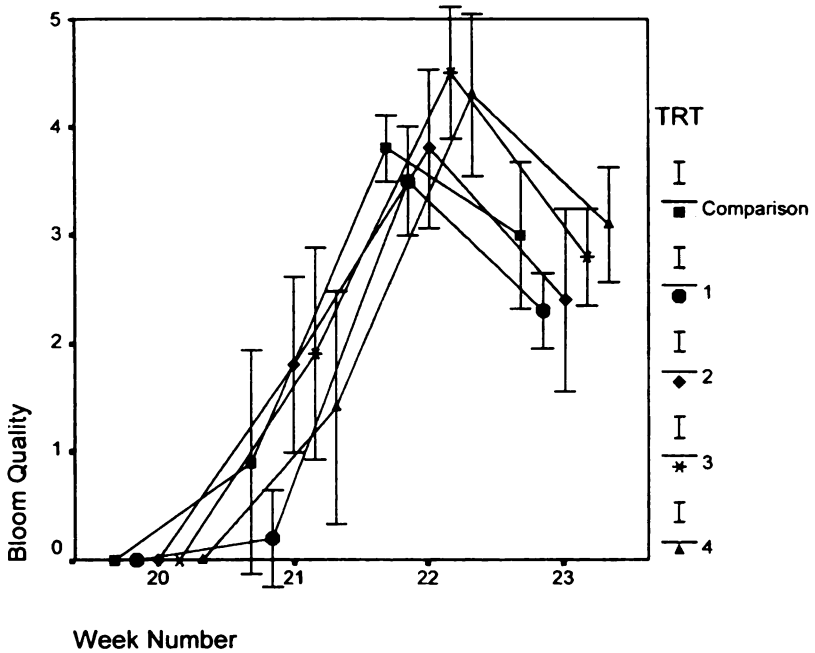


Fig. 21. Bloom quality ratings of *Campanula portenschlagiana* in 2000. Plants were rated from 0 to 5. Treatments are as follows: (1) forced with postharvest treatment, (2) forced with postharvest treatment and cut back at planting, (3) forced, (4) forced and cut back at planting.

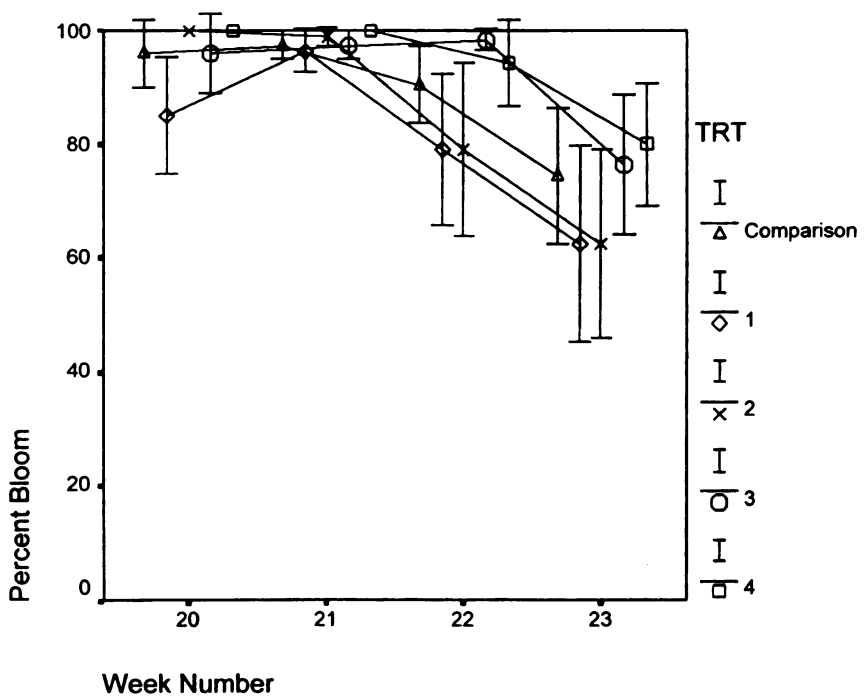


Fig. 22. Percentage of bloom of *Campanula portenschlagiana* in 2000. Treatments are as follows: (1) forced with postharvest treatment, (2) forced with postharvest treatment and cut back at planting, (3) forced, (4) forced and cut back at planting.

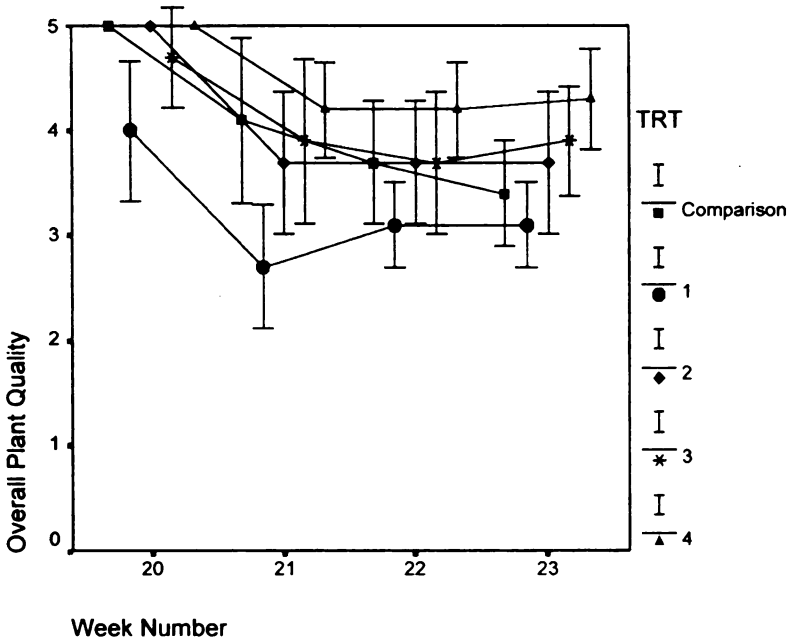


Fig. 23. Overall plant quality ratings of *Campanula carpatica* 'Blue Clips' in 2000. Plants were rated from 0 to 5. Treatments are as follows: (1) forced with postharvest treatment, (2) forced with postharvest treatment and cut back at planting, (3) forced, (4) forced and cut back at planting.

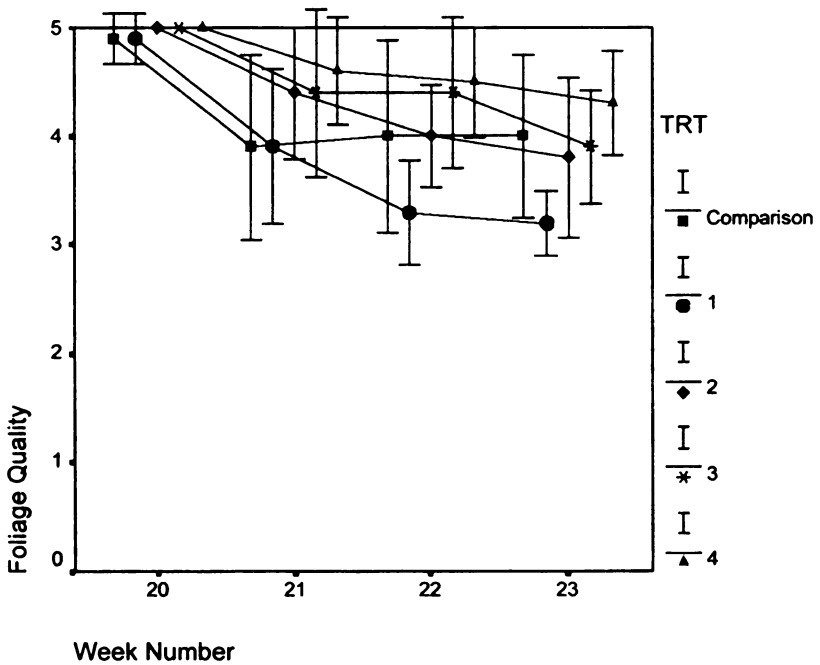


Fig. 24. Foliage quality ratings of *Campanula portenschlagiana* in 2000. Plants were rated from 0 to 5. Treatments are as follows: (1) forced with postharvest treatment, (2) forced with postharvest treatment and cut back at planting, (3) forced, (4) forced and cut back at planting.

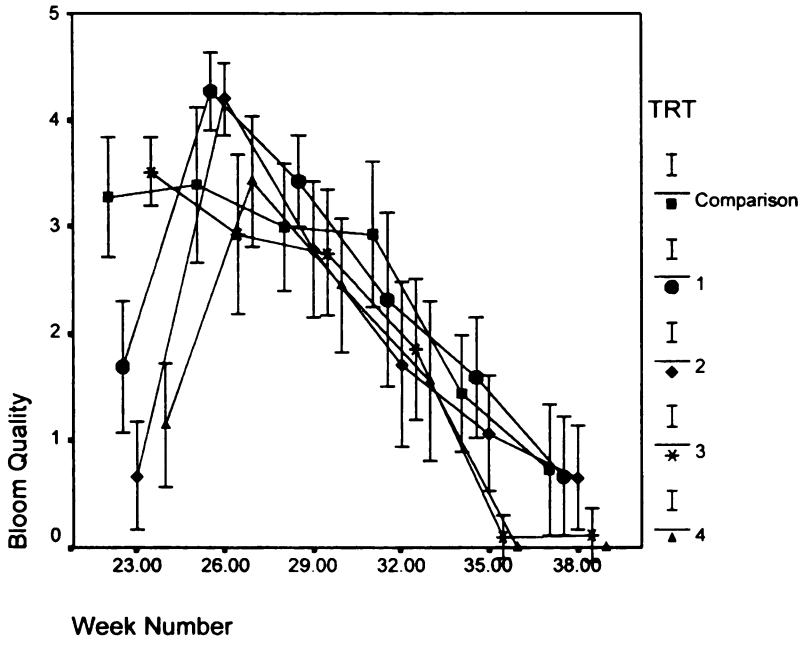


Fig. 25. Bloom quality ratings of *Coreopsis grandiflora* in 1999. Plants were rated from 0 to 5. Treatments are as follows: (1) forced with postharvest treatment, (2) forced with postharvest treatment and cut back at planting, (3) forced, (4) forced and cut back at planting.

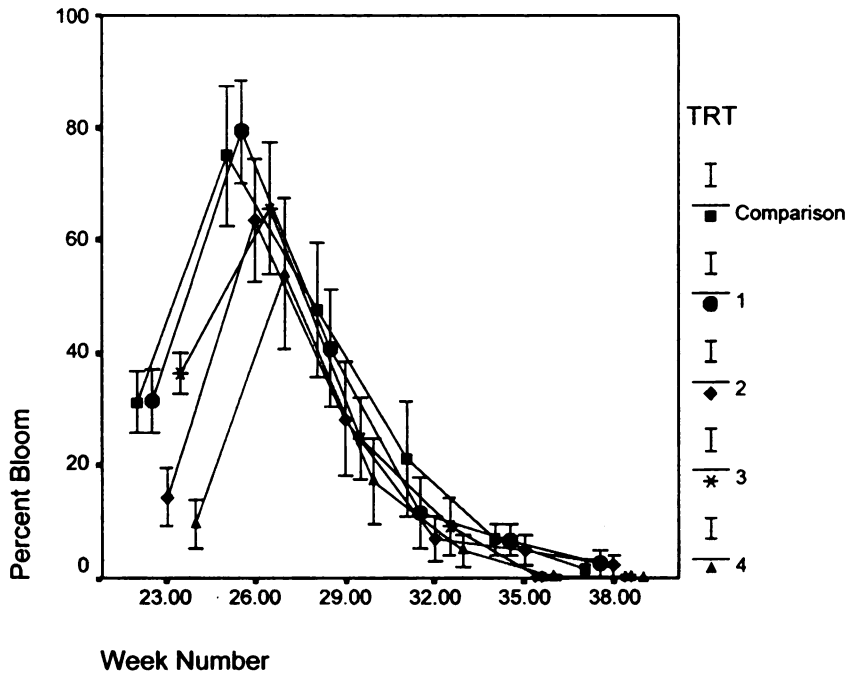


Fig. 26. Percentage of bloom of *Coreopsis grandiflora* in 1999. Treatments are as follows: (1) forced with postharvest treatment, (2) forced with postharvest treatment and cut back at planting, (3) forced, (4) forced and cut back at planting.

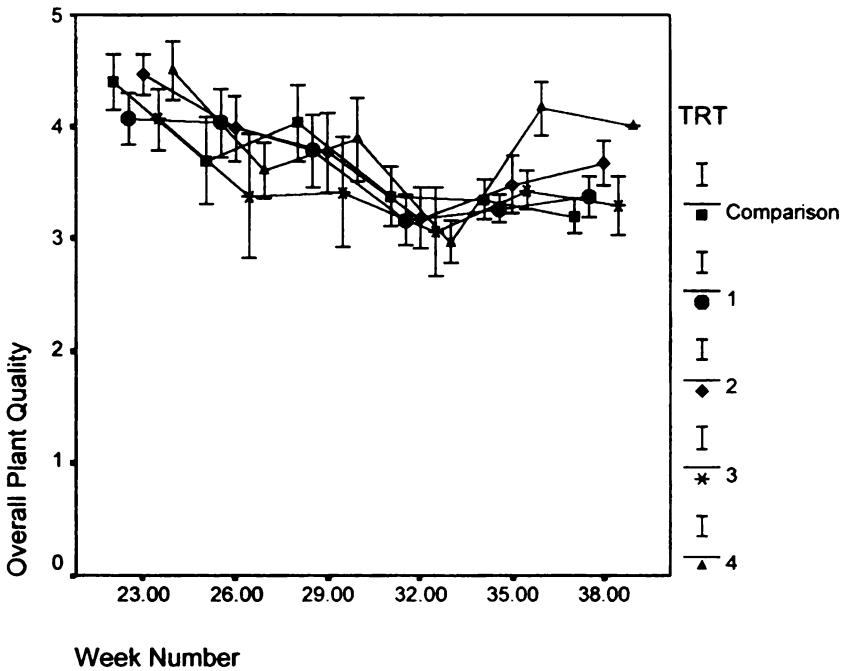


Fig. 27. Overall plant quality ratings of *Coreopsis grandiflora* in 1999. Plants were rated from 0 to 5. Treatments are as follows: (1) forced with postharvest treatment, (2) forced with postharvest treatment and cut back at planting, (3) forced, (4) forced and cut back at planting.

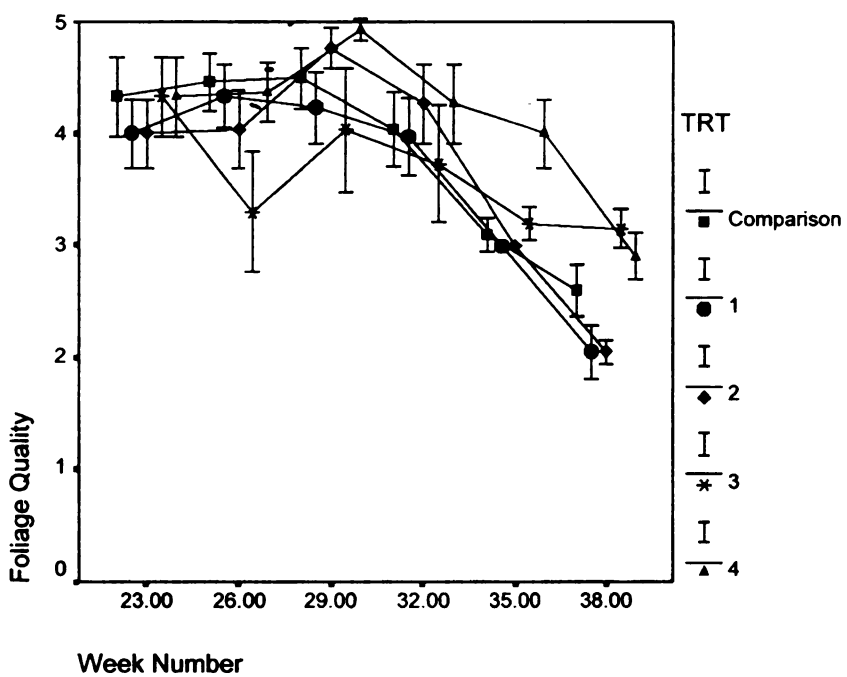


Fig. 28. Foliage quality ratings of *Coreopsis grandiflora* in 1999. Plants were rated from 0 to 5. Treatments are as follows: (1) forced with postharvest treatment, (2) forced with postharvest treatment and cut back at planting, (3) forced, (4) forced and cut back at planting.

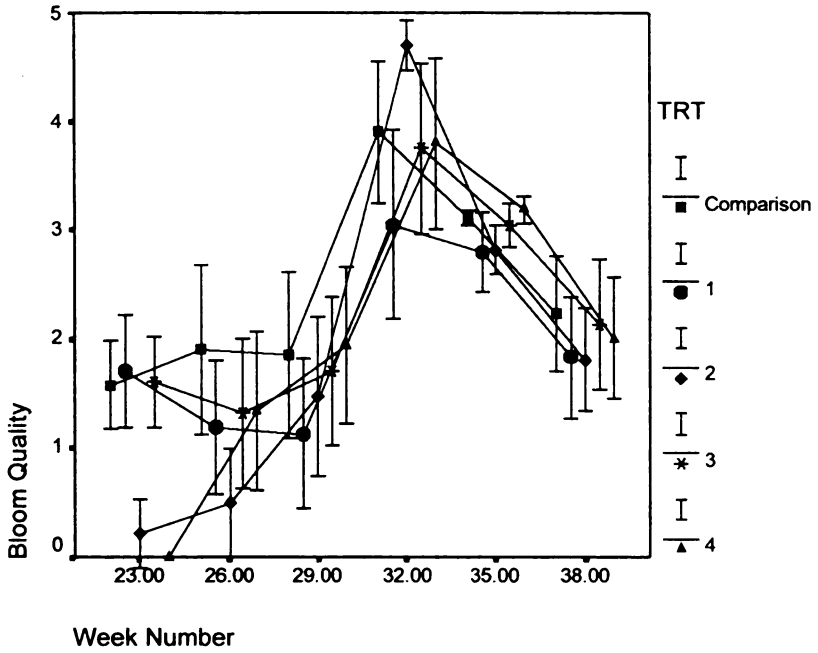


Fig. 29. Bloom quality ratings of *Echinacea purpurea* 'Magnus' in 1999. Plants were rated from 0 to 5. Treatments are as follows: (1) forced with postharvest treatment, (2) forced with postharvest treatment and cut back at planting, (3) forced, (4) forced and cut back at planting.

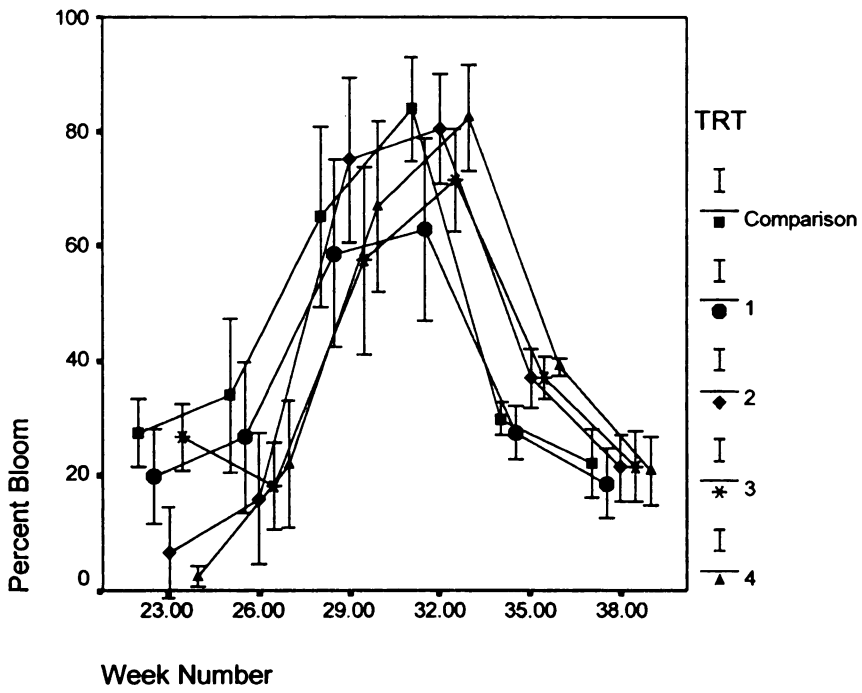


Fig. 30. Percentage of bloom of *Echinacea purpurea* 'Magnus' in 1999. Treatments are as follows: (1) forced with postharvest treatment, (2) forced with postharvest treatment and cut back at planting, (3) forced, (4) forced and cut back at planting.

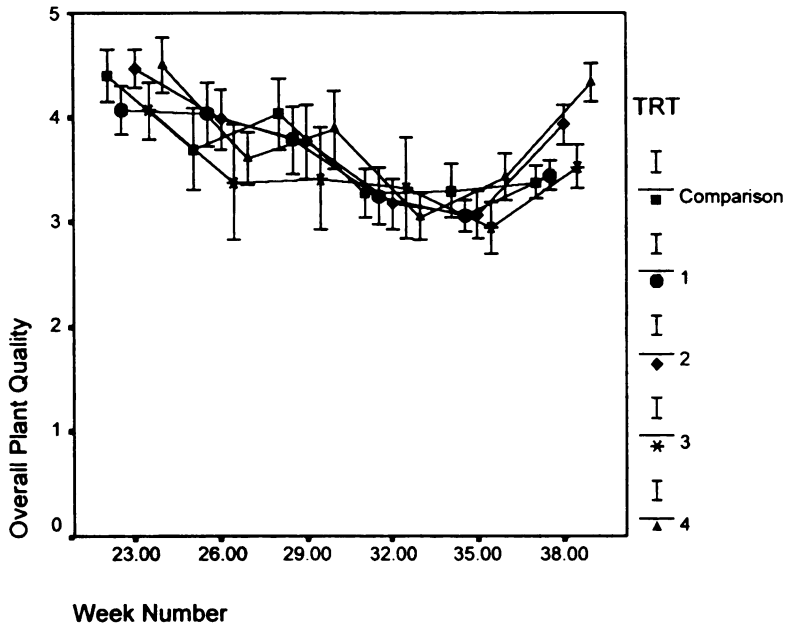


Fig. 31. Overall plant quality ratings of *Echinacea purpurea* 'Magnus' in 1999. Plants were rated from 0 to 5. Treatments are as follows: (1) forced with postharvest treatment, (2) forced with postharvest treatment and cut back at planting, (3) forced, (4) forced and cut back at planting.

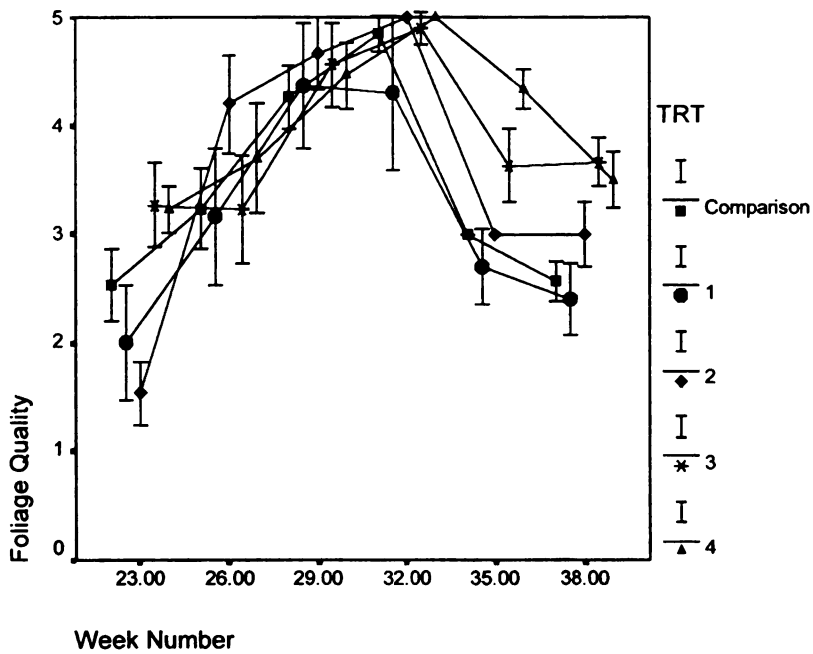


Fig. 32. Foliage quality ratings of *Echinacea purpurea* 'Magnus' in 1999. Plants were rated from 0 to 5. Treatments are as follows: (1) forced with postharvest treatment, (2) forced with postharvest treatment and cut back at planting, (3) forced, (4) forced and cut back at planting.

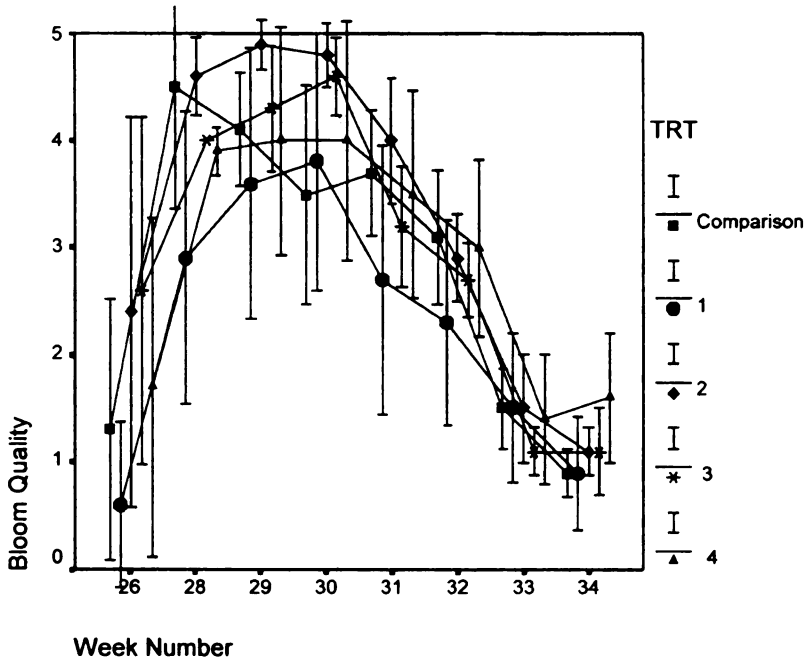


Fig. 33. Bloom quality ratings of *Echinacea purpurea* 'Magnus' in 2000. Plants were rated from 0 to 5. Treatments are as follows: (1) forced with postharvest treatment, (2) forced with postharvest treatment and cut back at planting, (3) forced, (4) forced and cut back at planting.

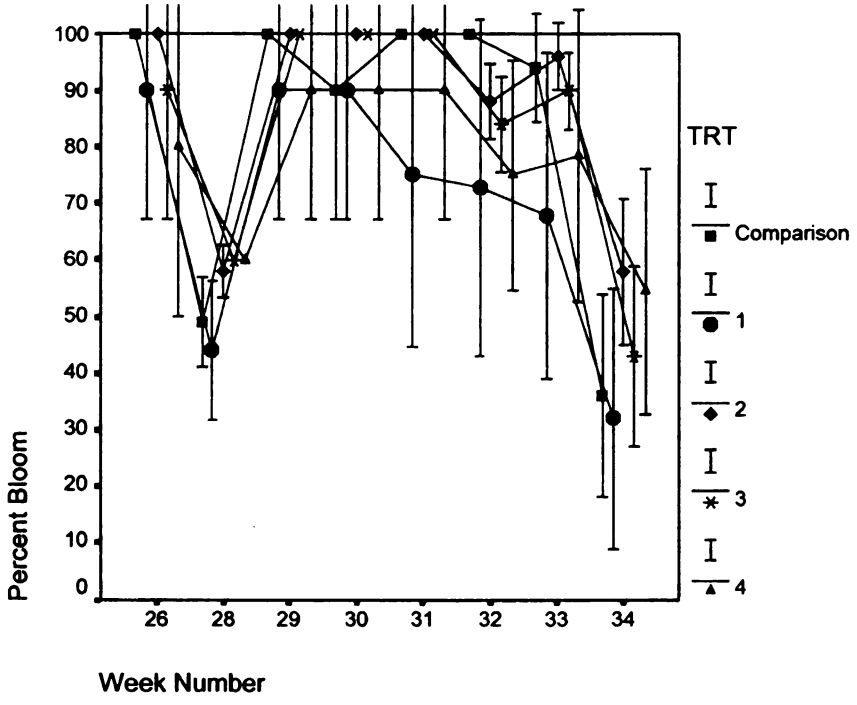


Fig. 34. Percentage of bloom of *Echinacea purpurea* 'Magnus' in 2000. Treatments are as follows: (1) forced with postharvest treatment, (2) forced with postharvest treatment and cut back at planting, (3) forced, (4) forced and cut back at planting.

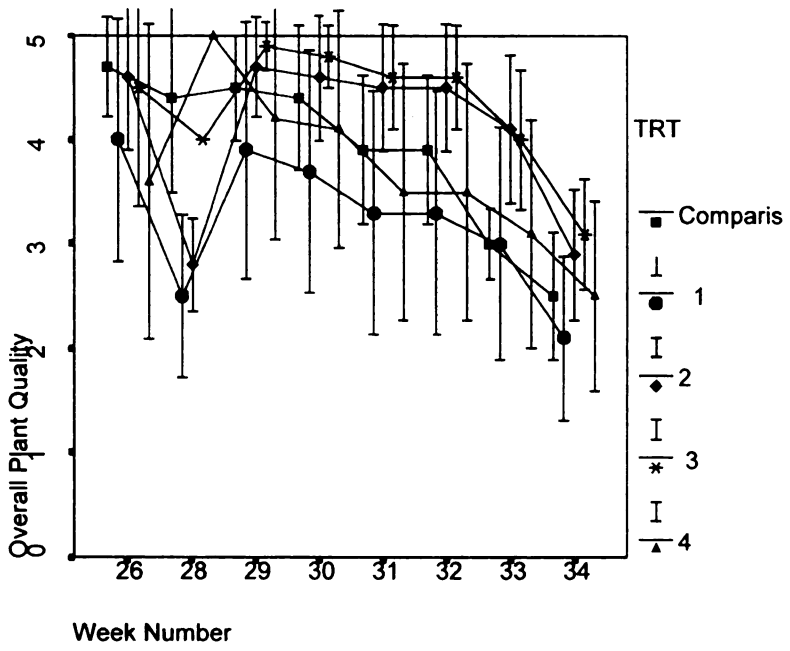


Fig. 35. Overall plant quality ratings of *Echinacea purpurea* 'Magnus' in 2000. Plants were rated from 0 to 5. Treatments are as follows: (1) forced with postharvest treatment, (2) forced with postharvest treatment and cut back at planting, (3) forced, (4) forced and cut back at planting.

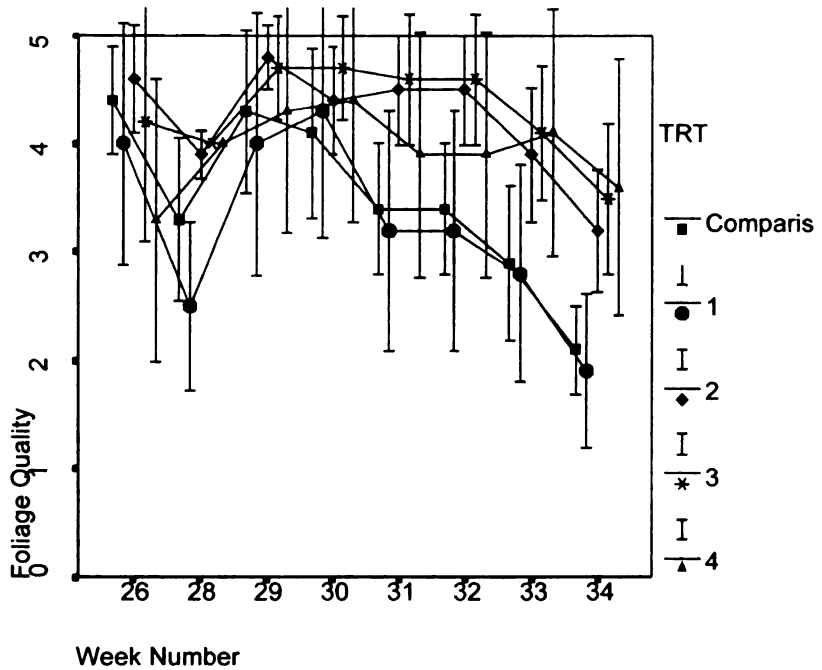


Fig. 36. Foliage quality ratings of *Echinacea purpurea* 'Magnus' in 2000. Plants were rated from 0 to 5. Treatments are as follows: (1) forced with postharvest treatment, (2) forced with postharvest treatment and cut back at planting, (3) forced, (4) forced and cut back at planting.

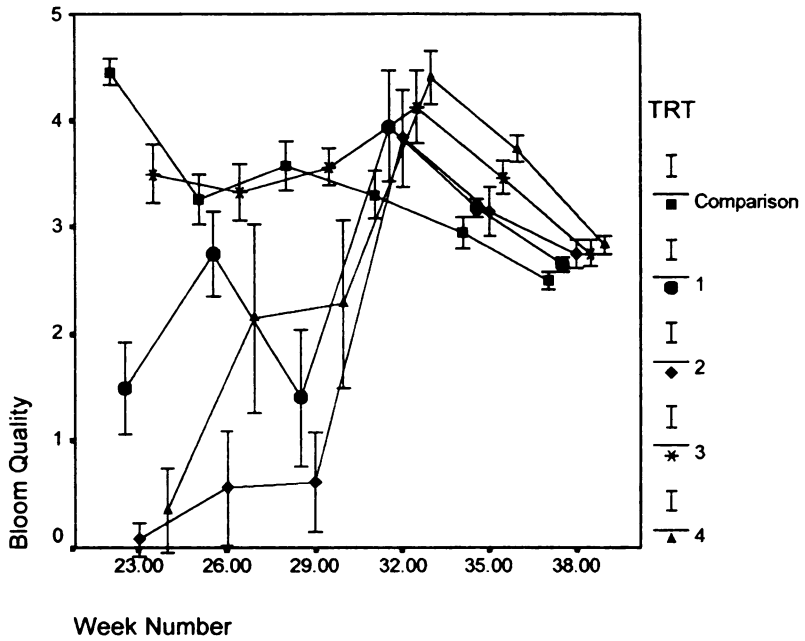


Fig. 37. Bloom quality ratings of *Lavandula angustifolia* 'Hidcote Blue' in 1999. Plants were rated from 0 to 5. Treatments are as follows: (1) forced with postharvest treatment, (2) forced with postharvest treatment and cut back at planting, (3) forced, (4) forced and cut back at planting.

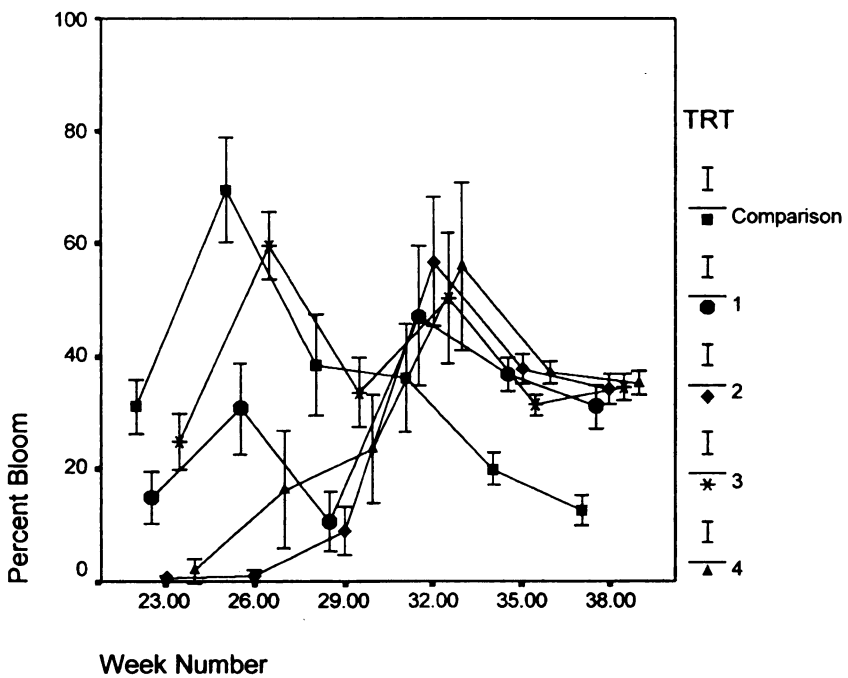


Fig. 38. Percentage of bloom of *Lavandula angustifolia* 'Hidcote Blue' in 1999. Treatments are as follows: (1) forced with postharvest treatment, (2) forced with postharvest treatment and cut back at planting, (3) forced, (4) forced and cut back at planting.

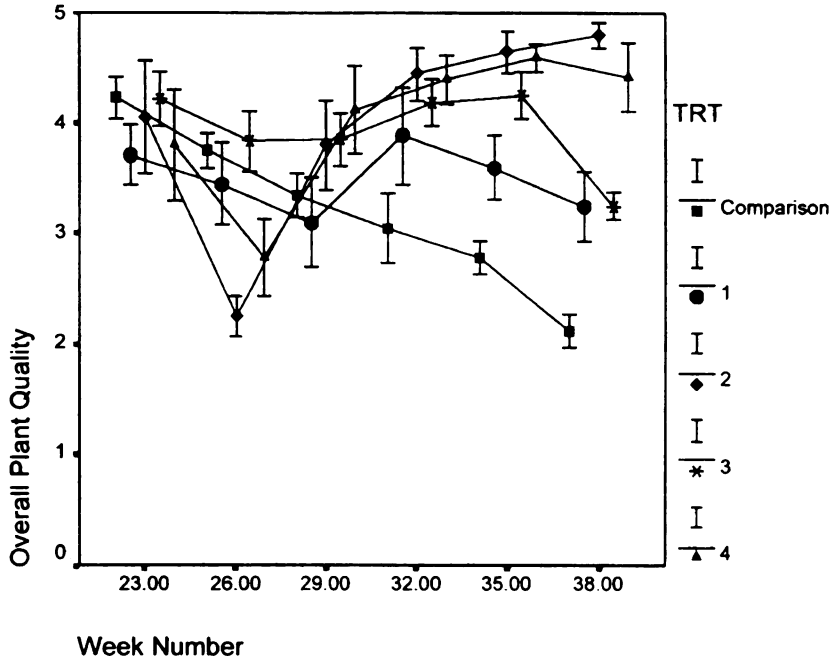


Fig. 39. Overall plant quality ratings of *Lavandula angustifolia* 'Hidcote Blue' in 1999. Plants were rated from 0 to 5. Treatments are as follows: (1) forced with postharvest treatment, (2) forced with postharvest treatment and cut back at planting, (3) forced, (4) forced and cut back at planting.

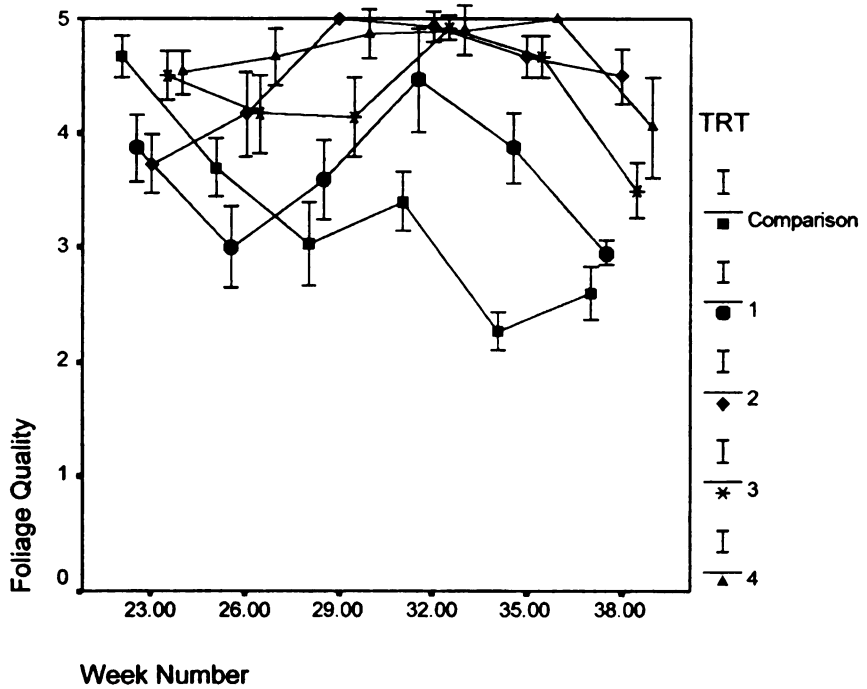


Fig. 40. Foliage quality ratings of *Lavandula angustifolia* 'Hidcote Blue' in 1999. Plants were rated from 0 to 5. Treatments are as follows: (1) forced with postharvest treatment, (2) forced with postharvest treatment and cut back at planting, (3) forced, (4) forced and cut back at planting.

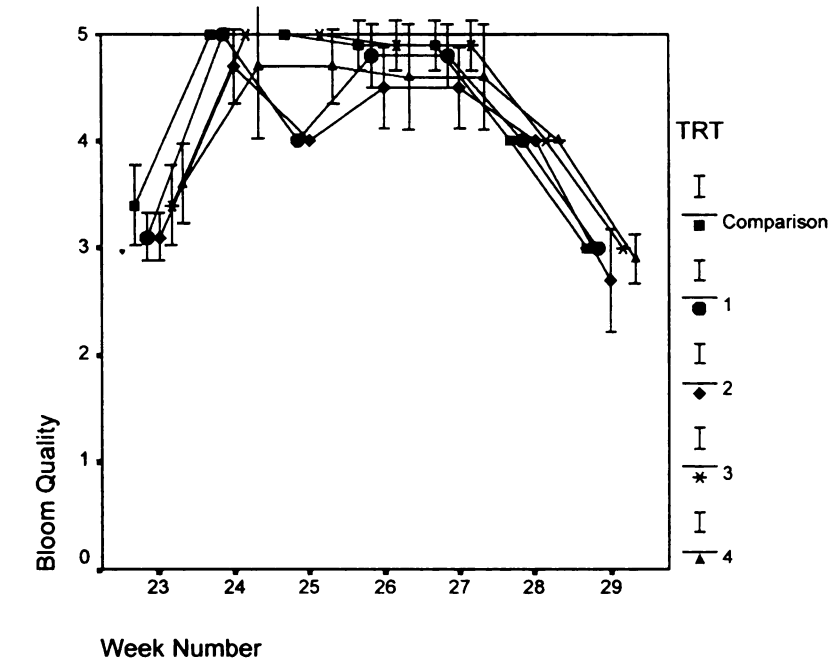


Fig. 41. Bloom quality ratings of *Lavandula angustifolia* 'Hidcote Blue' in 2000. Plants were rated from 0 to 5. Treatments are as follows: (1) forced with postharvest treatment, (2) forced with postharvest treatment and cut back at planting, (3) forced, (4) forced and cut back at planting.

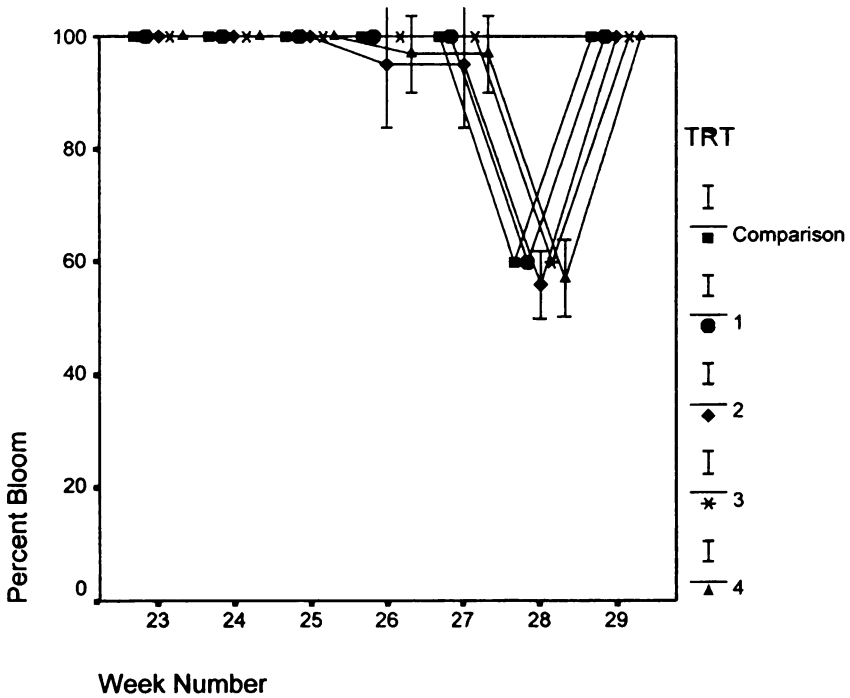


Fig. 42. Percentage of bloom of *Lavandula angustifolia* 'Hidcote Blue' in 2000. Treatments are as follows: (1) forced with postharvest treatment, (2) forced with postharvest treatment and cut back at planting, (3) forced, (4) forced and cut back at planting.

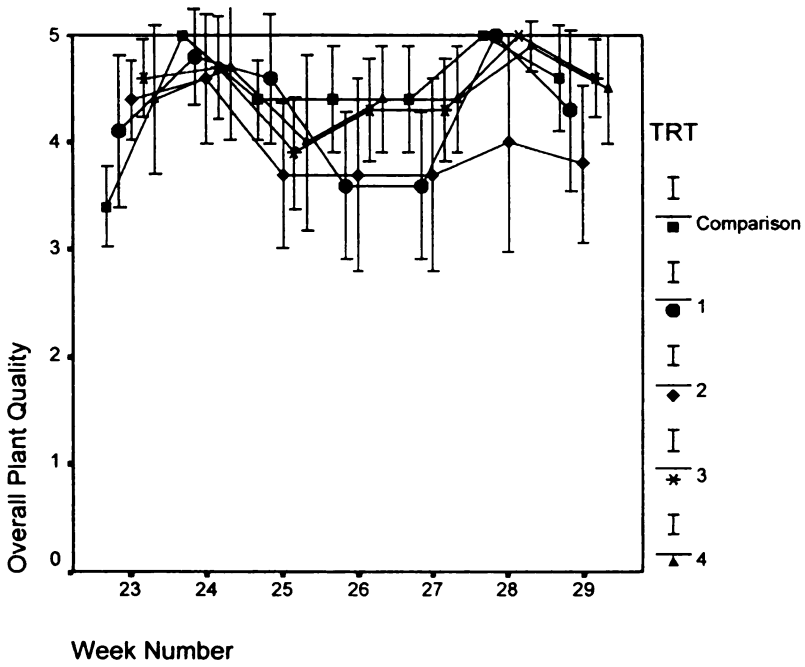


Fig. 43. Overall plant quality ratings of *Lavandula angustifolia* 'Hidcote Blue' in 2000. Plants were rated from 0 to 5. Treatments are as follows: (1) forced with postharvest treatment, (2) forced with postharvest treatment and cut back at planting, (3) forced, (4) forced and cut back at planting.

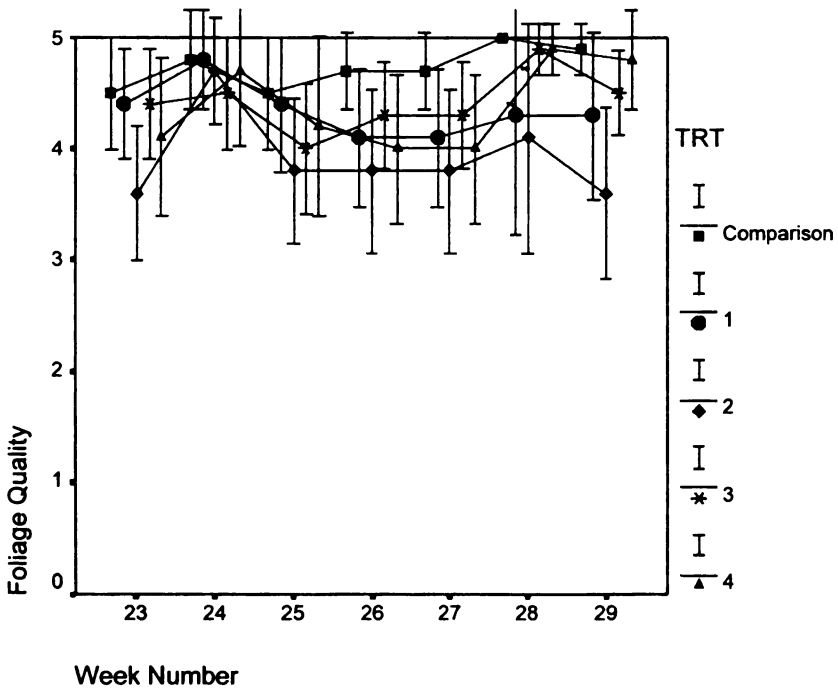


Fig. 44. Foliage quality ratings of *Lavandula angustifolia* 'Hidcote Blue' in 2000. Plants were rated from 0 to 5. Treatments are as follows: (1) forced with postharvest treatment, (2) forced with postharvest treatment and cut back at planting, (3) forced, (4) forced and cut back at planting.

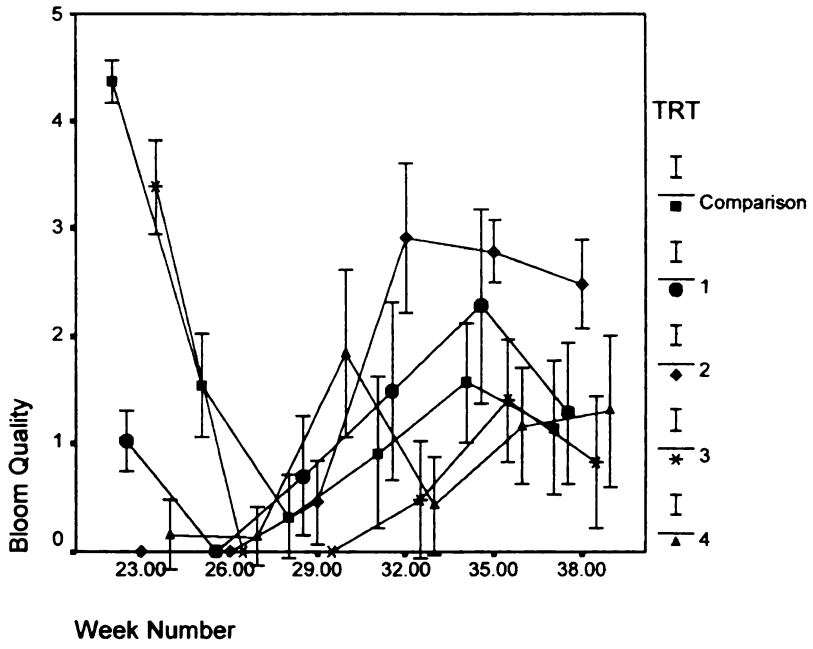


Fig. 45. Bloom quality ratings of *Leucanthemum* x *superbum* 'Snowcap' in 1999. Plants were rated from 0 to 5. Treatments are as follows: (1) forced with postharvest treatment, (2) forced with postharvest treatment and cut back at planting, (3) forced, (4) forced and cut back at planting.

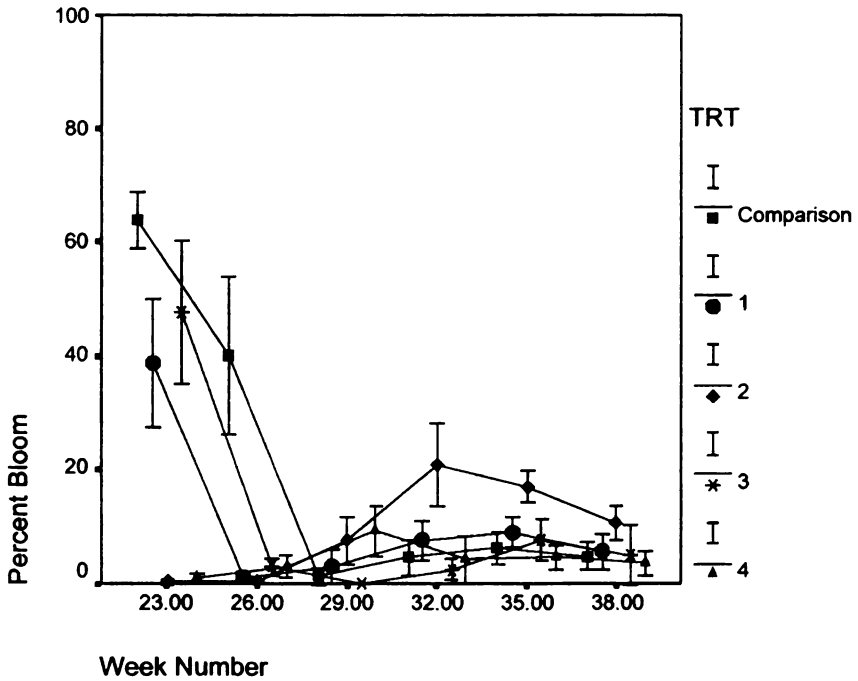


Fig. 46. Percentage of bloom of *Leucanthemum* x *superbum* 'Snowcap' in 1999. Treatments are as follows: (1) forced with postharvest treatment, (2) forced with postharvest treatment and cut back at planting, (3) forced, (4) forced and cut back at planting.

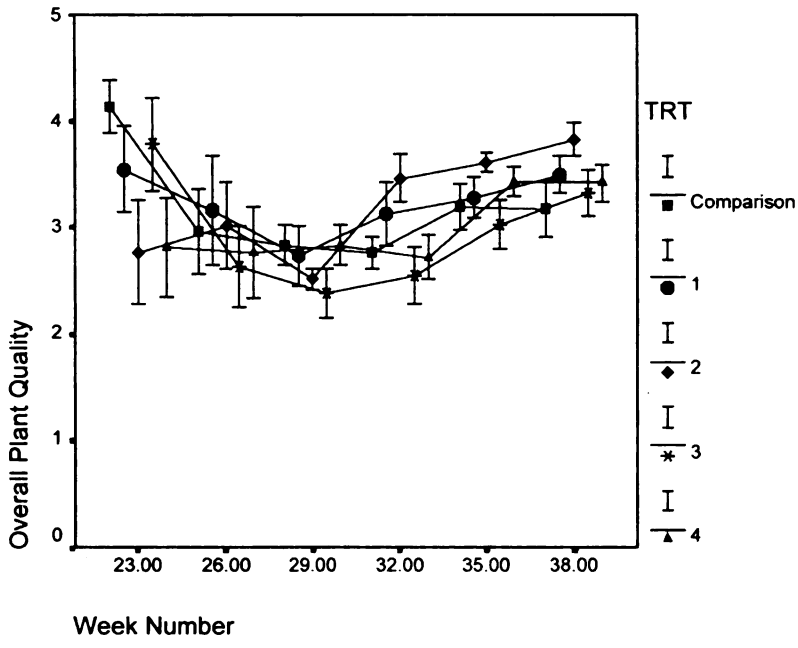


Fig. 47. Overall plant quality ratings of *Leucanthemum* x *superbum* 'Snowcap' in 1999. Plants were rated from 0 to 5. Treatments are as follows: (1) forced with postharvest treatment, (2) forced with postharvest treatment and cut back at planting, (3) forced, (4) forced and cut back at planting.

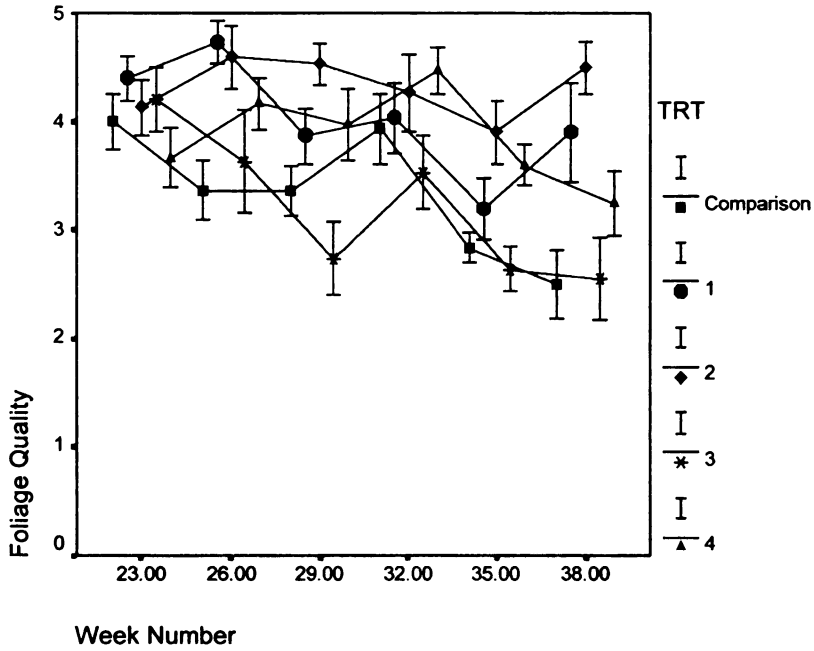


Fig. 48. Foliage quality ratings of *Leucanthemum* x *superbum* 'Snowcap' in 1999. Plants were rated from 0 to 5. Treatments are as follows: (1) forced with postharvest treatment, (2) forced with postharvest treatment and cut back at planting, (3) forced, (4) forced and cut back at planting.

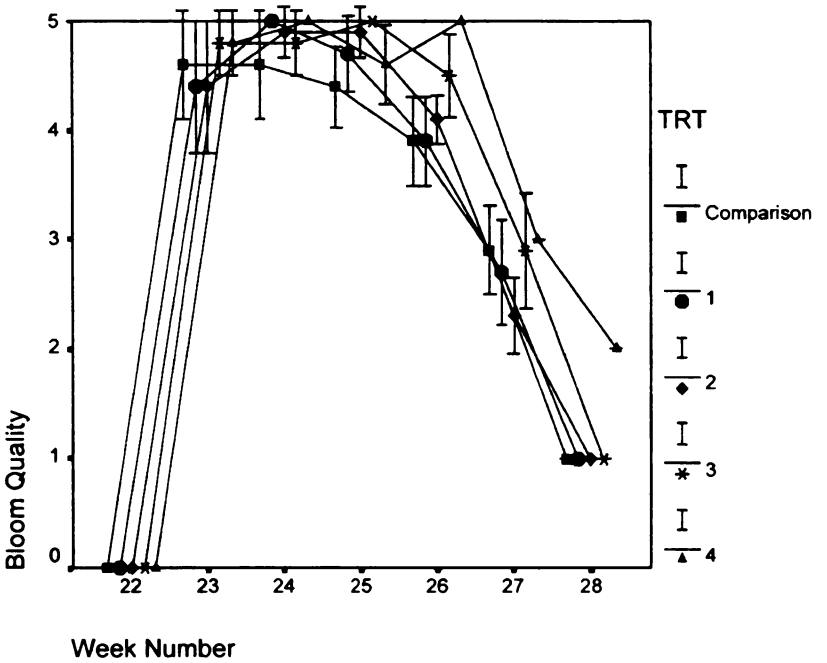


Fig. 49. Bloom quality ratings of *Leucanthemum* x *superbum* 'Snowcap' in 2000. Plants were rated from 0 to 5. Treatments are as follows: (1) forced with postharvest treatment, (2) forced with postharvest treatment and cut back at planting, (3) forced, (4) forced and cut back at planting.

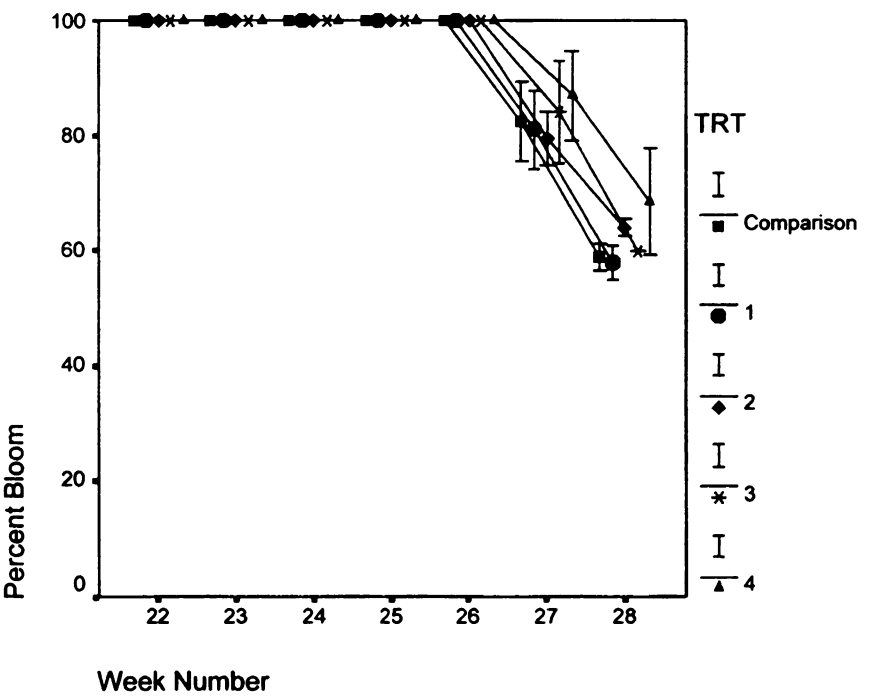


Fig. 50. Percentage of bloom of *Leucanthemum* x *superbum* 'Snowcap' in 2000. Treatments are as follows: (1) forced with postharvest treatment, (2) forced with postharvest treatment and cut back at planting, (3) forced, (4) forced and cut back at planting.

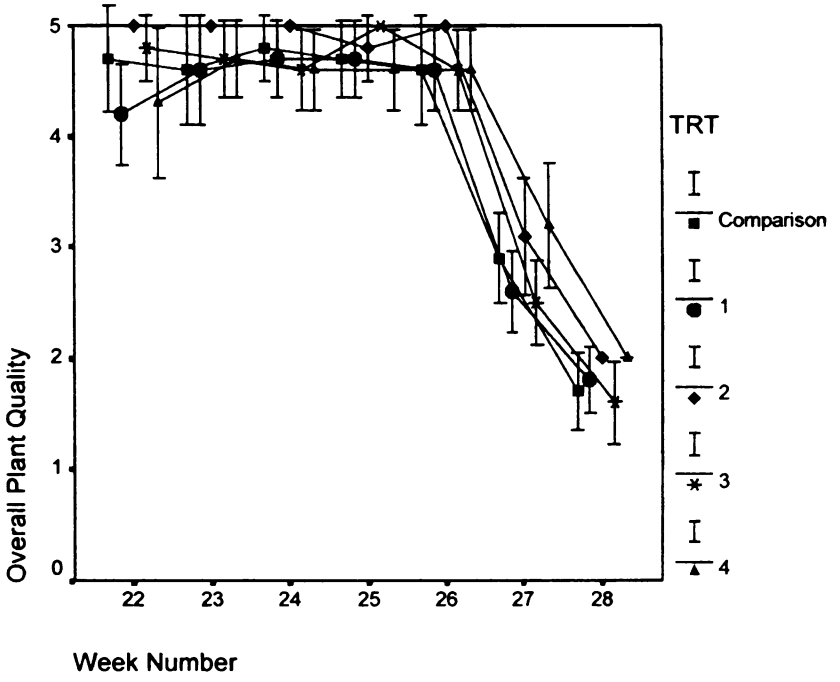


Fig. 51. Overall plant quality ratings of *Leucanthemum* x *superbum* 'Snowcap' in 2000. Plants were rated from 0 to 5. Treatments are as follows: (1) forced with postharvest treatment, (2) forced with postharvest treatment and cut back at planting, (3) forced, (4) forced and cut back at planting.

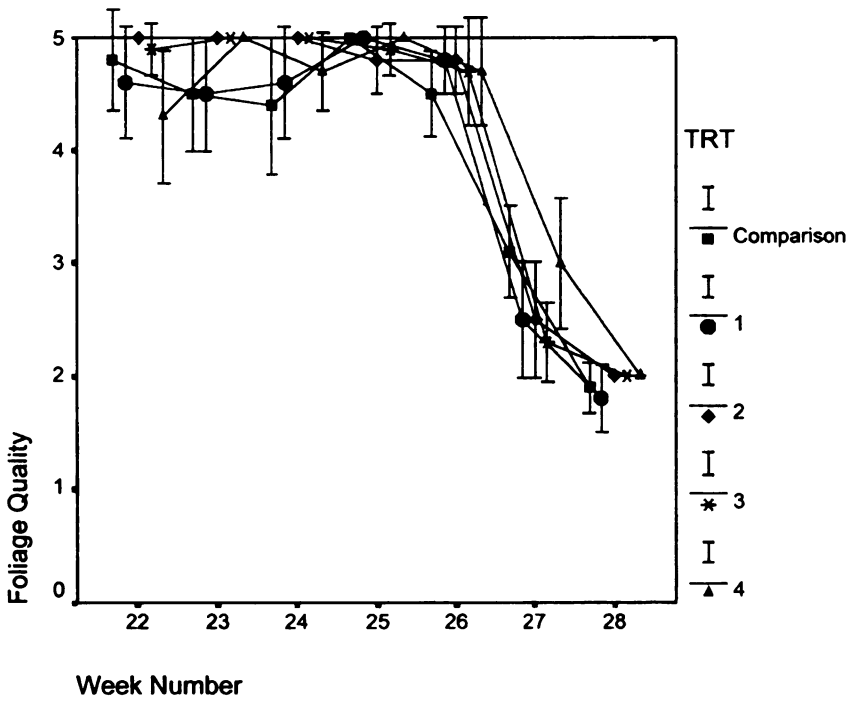


Fig. 52. Foliage quality ratings of *Leucanthemum* x *superbum* 'Snowcap' in 2000. Plants were rated from 0 to 5. Treatments are as follows: (1) forced with postharvest treatment, (2) forced with postharvest treatment and cut back at planting, (3) forced, (4) forced and cut back at planting.

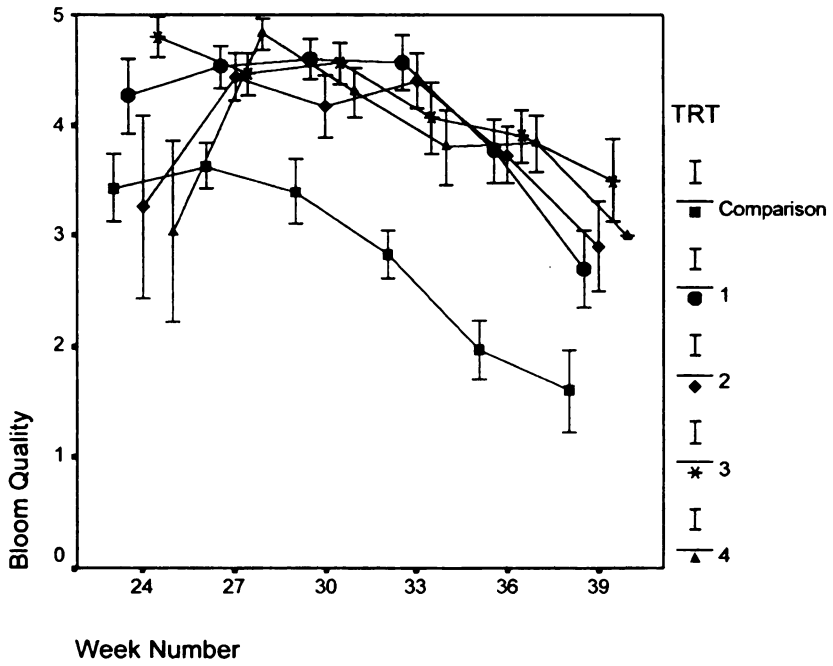


Fig. 53. Bloom quality ratings of *Gaura lindheimeri* 'Whirling Butterflies' in 2000. Plants were rated from 0 to 5. Treatments are as follows: (1) forced with postharvest treatment, (2) forced with postharvest treatment and cut back at planting, (3) forced, (4) forced and cut back at planting.

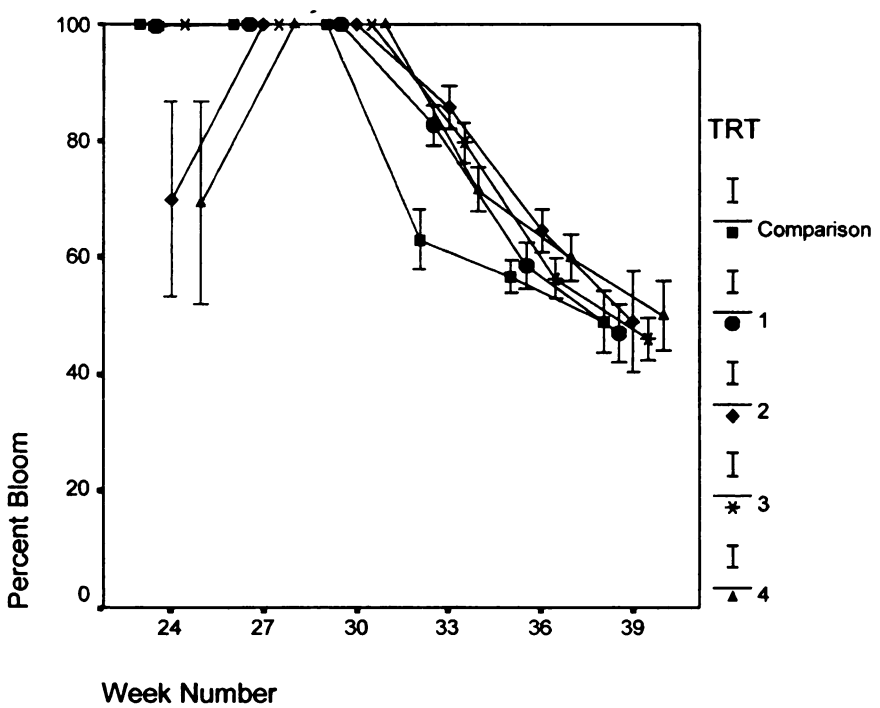


Fig. 54. Percentage of bloom of *Gaura lindheimeri* 'Whirling Butterflies' in 2000. Treatments are as follows: (1) forced with postharvest treatment, (2) forced with postharvest treatment and cut back at planting, (3) forced, (4) forced and cut back at planting.

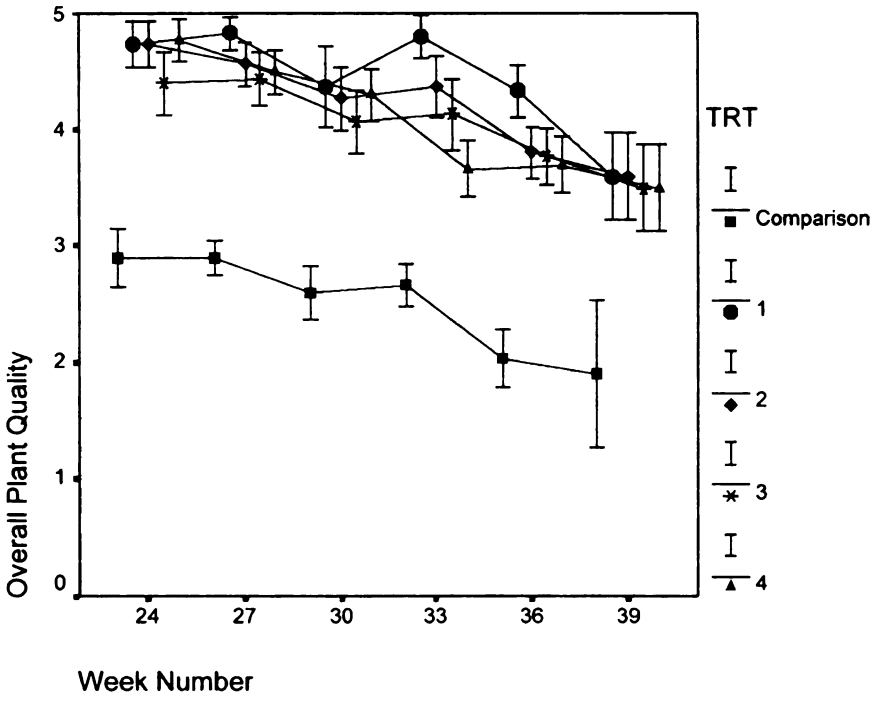


Fig. 55. Overall plant quality ratings of *Gaura lindheimeri* 'Whirling Butterflies' in 2000. Plants were rated from 0 to 5. Treatments are as follows: (1) forced with postharvest treatment, (2) forced with postharvest treatment and cut back at planting, (3) forced, (4) forced and cut back at planting.

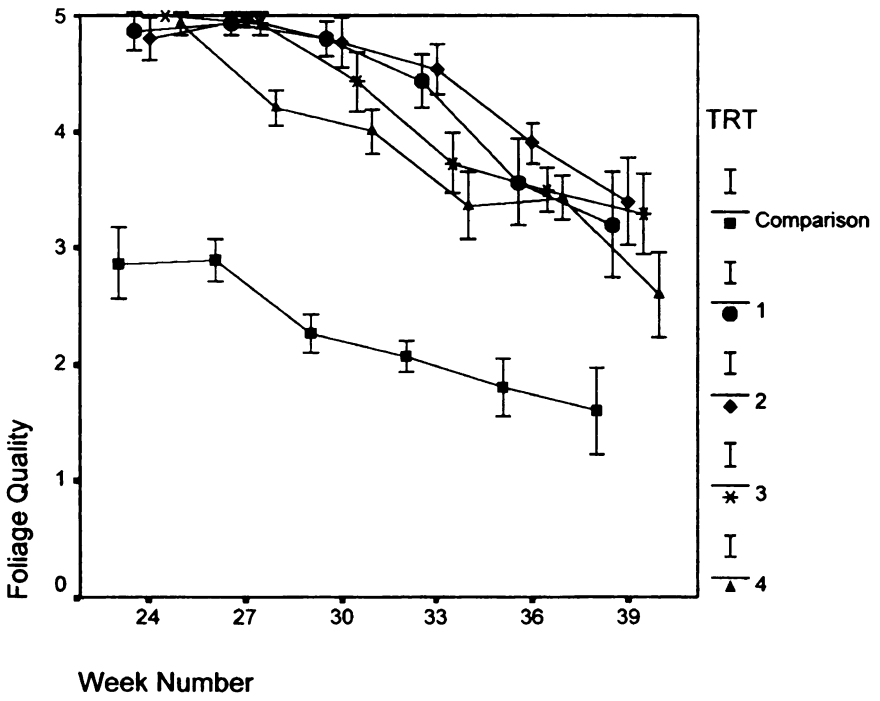


Fig. 56. Foliage quality ratings of *Gaura lindheimeri* 'Whirling Butterflies' in 2000. Plants were rated from 0 to 5. Treatments are as follows: (1) forced with postharvest treatment, (2) forced with postharvest treatment and cut back at planting, (3) forced, (4) forced and cut back at planting.

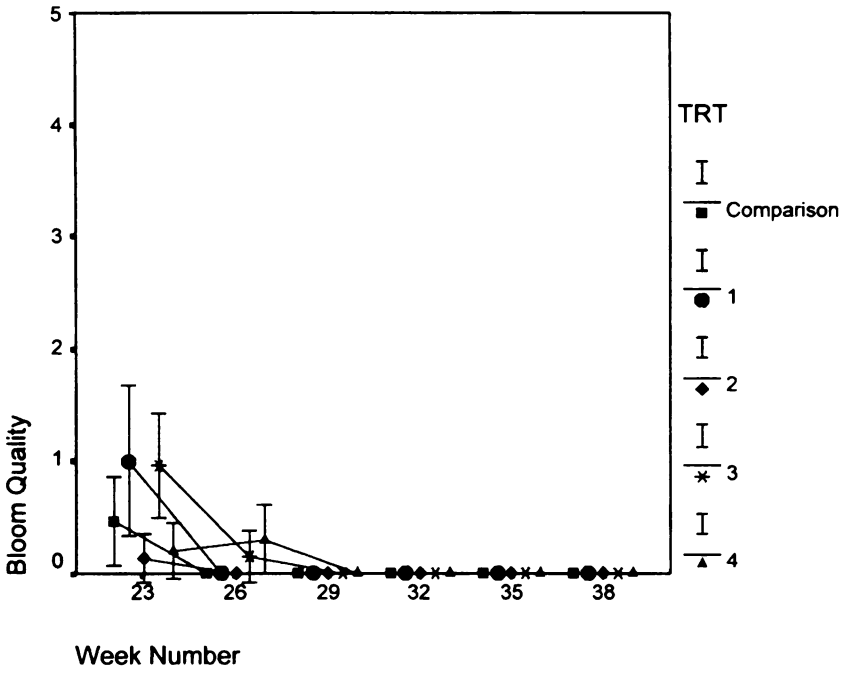


Fig. 57. Bloom quality ratings of *Geranium dalmaticum* in 2000. Plants were rated from 0 to 5. Treatments are as follows: (1) forced with postharvest treatment, (2) forced with postharvest treatment and cut back at planting, (3) forced, (4) forced and cut back at planting.

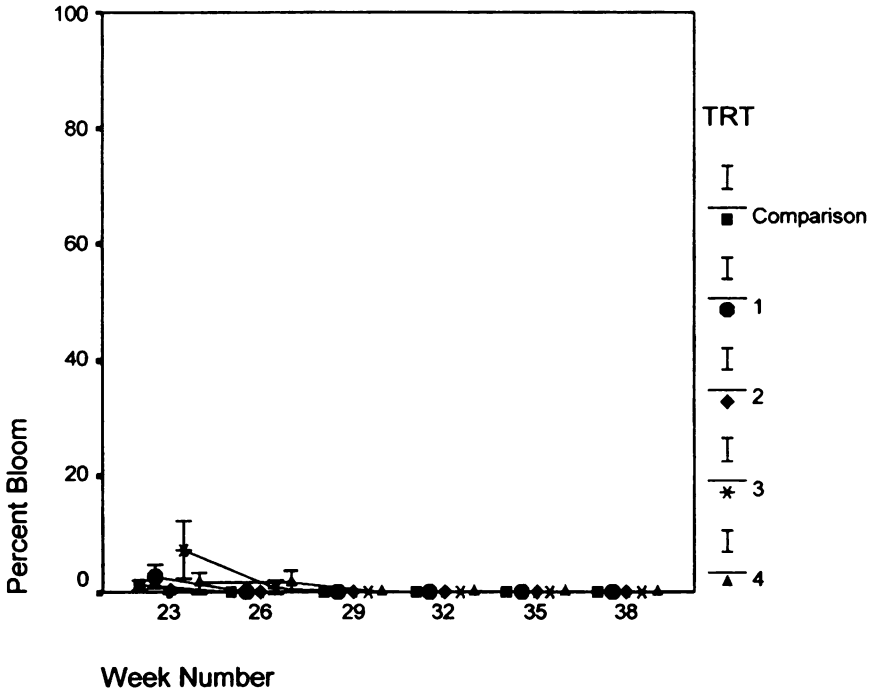


Fig. 58. Percentage of bloom of *Geranium dalmaticum* in 2000. Treatments are as follows: (1) forced with postharvest treatment, (2) forced with postharvest treatment and cut back at planting, (3) forced, (4) forced and cut back at planting.

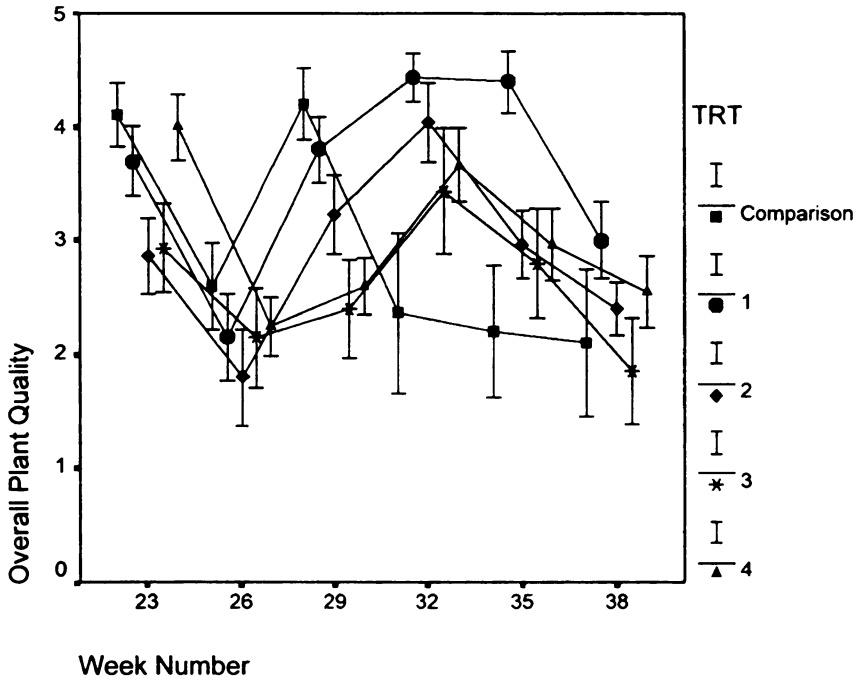


Fig. 59. Overall plant quality ratings of *Geranium dalmaticum* in in 2000. Plants were rated from 0 to 5. Treatments are as follows: (1) forced with postharvest treatment, (2) forced with postharvest treatment and cut back at planting, (3) forced, (4) forced and cut back at planting.

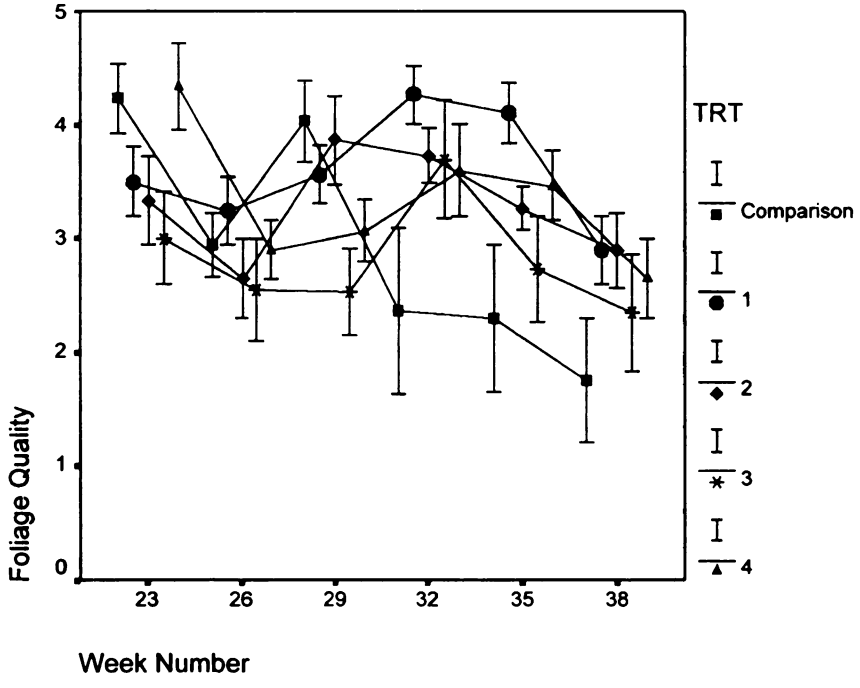


Fig. 60. Foliage quality ratings of *Geranium dalmaticum* in 2000. Plants were rated from 0 to 5. Treatments are as follows: (1) forced with postharvest treatment, (2) forced with postharvest treatment and cut back at planting, (3) forced, (4) forced and cut back at planting.

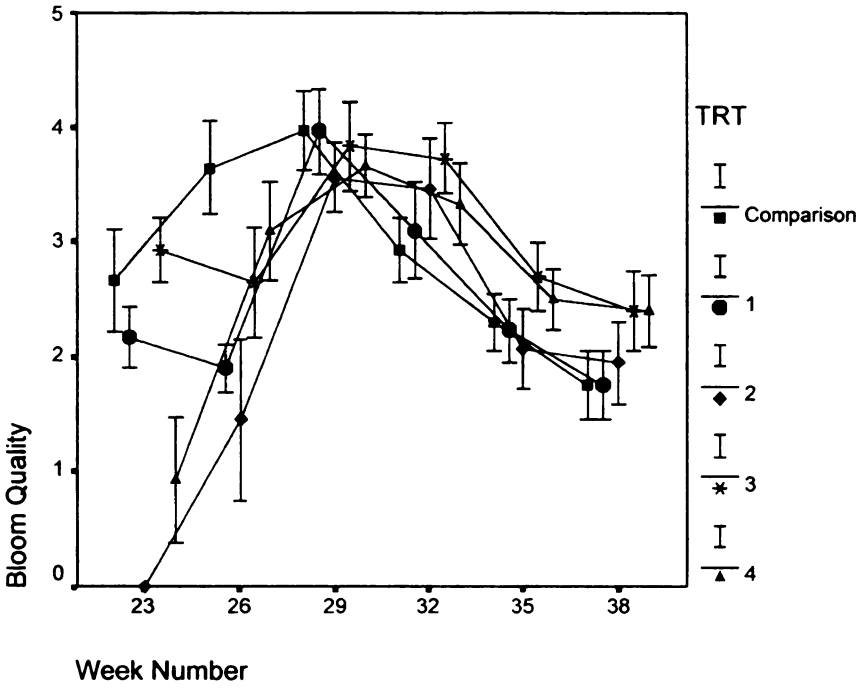


Fig. 61. Bloom quality ratings of *Pennisetum setaceum* 'Rubrum' in 2000. Plants were rated from 0 to 5. Treatments are as follows: (1) forced with postharvest treatment, (2) forced with postharvest treatment and cut back at planting, (3) forced, (4) forced and cut back at planting.

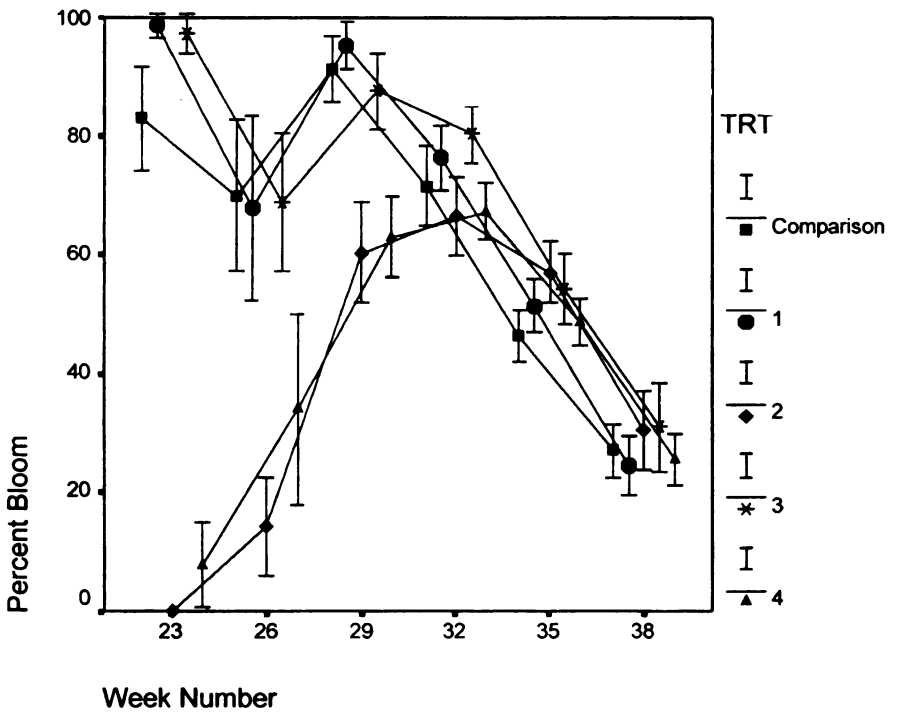


Fig. 62. Percentage of bloom of *Pennisetum setaceum* 'Rubrum' in 2000. Treatments are as follows: (1) forced with postharvest treatment, (2) forced with postharvest treatment and cut back at planting, (3) forced, (4) forced and cut back at planting.

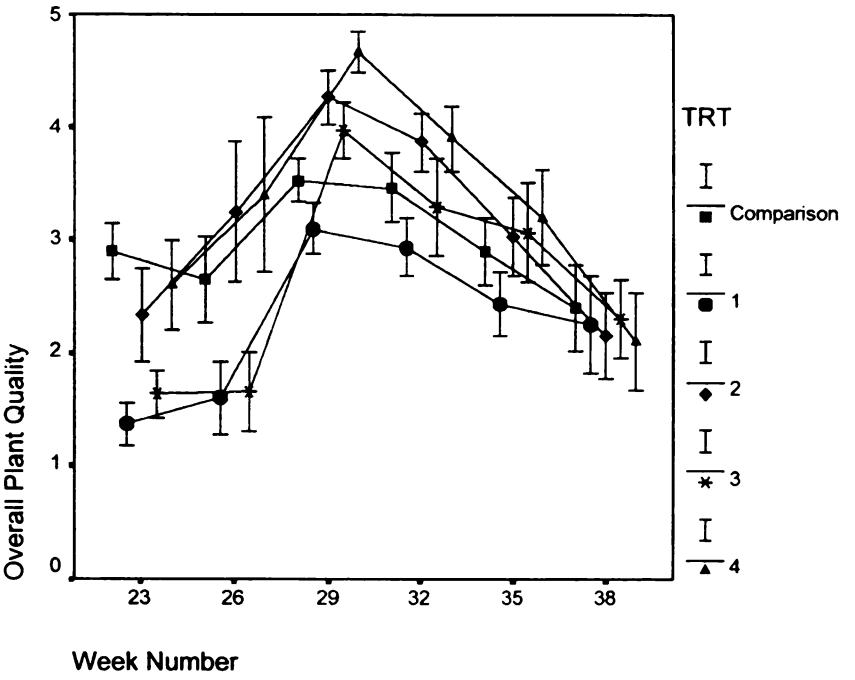


Fig. 63. Overall plant quality ratings of *Pennisetum setaceum* 'Rubrum' in in 2000. Plants were rated from 0 to 5. Treatments are as follows: (1) forced with postharvest treatment, (2) forced with postharvest treatment and cut back at planting, (3) forced, (4) forced and cut back at planting.

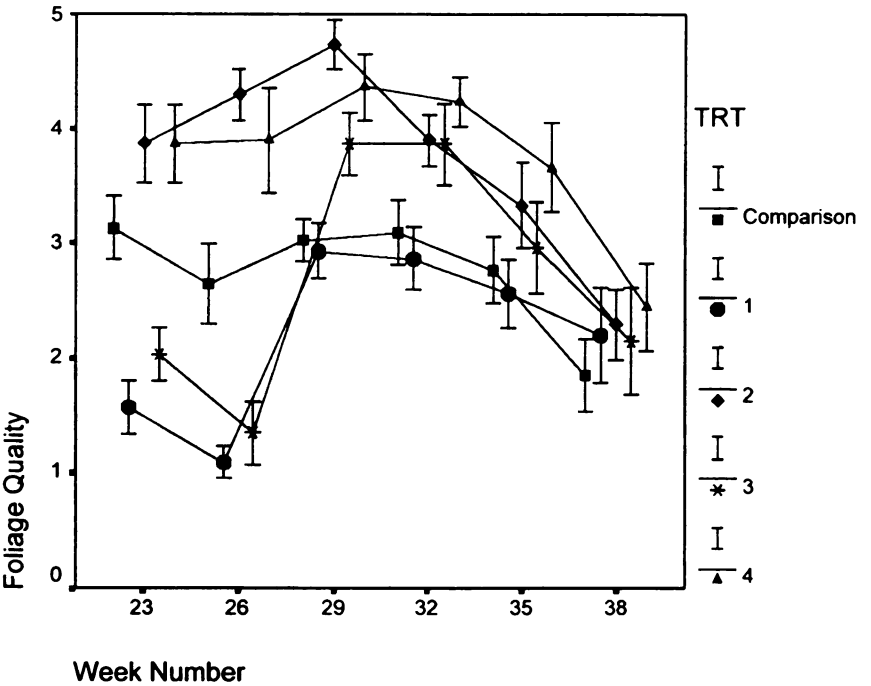


Fig. 64. Foliage quality ratings of *Pennisetum setaceum* 'Rubrum' in 2000. Plants were rated from 0 to 5. Treatments are as follows: (1) forced with postharvest treatment, (2) forced with postharvest treatment and cut back at planting, (3) forced, (4) forced and cut back at planting.

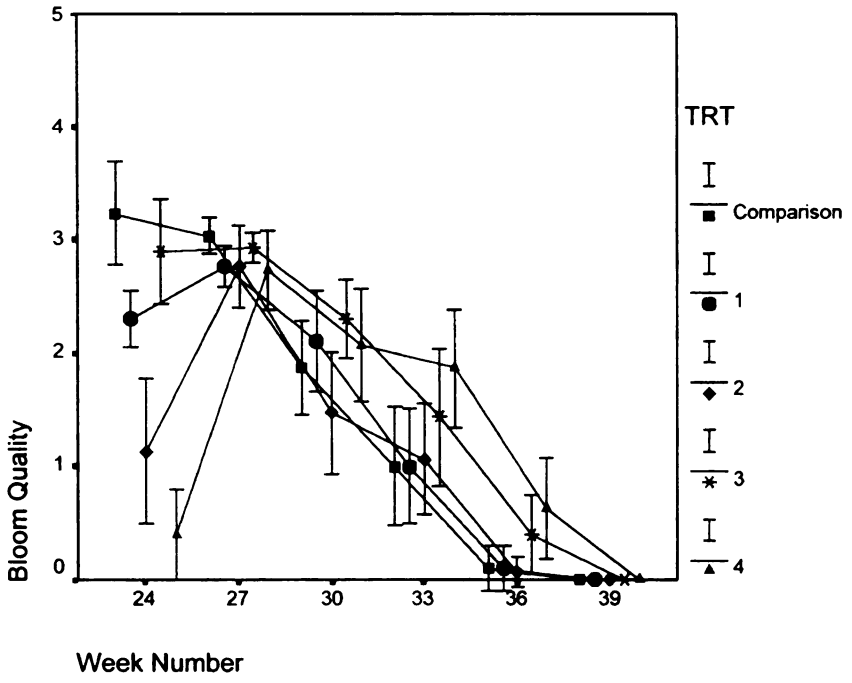


Fig. 65. Bloom quality ratings of *Veronica spicata* 'Red Fox' in 2000. Plants were rated from 0 to 5. Treatments are as follows: (1) forced with postharvest treatment, (2) forced with postharvest treatment and cut back at planting, (3) forced, (4) forced and cut back at planting.

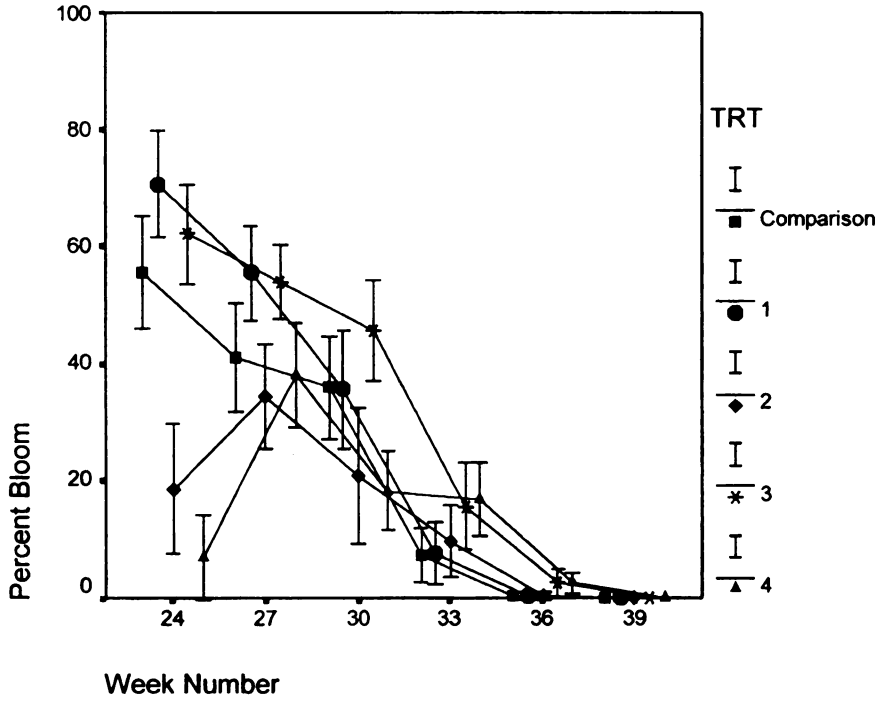


Fig. 66. Percentage of bloom of *Veronica spicata* 'Red Fox' in 2000. Treatments are as follows: (1) forced with postharvest treatment, (2) forced with postharvest treatment and cut back at planting, (3) forced, (4) forced and cut back at planting.

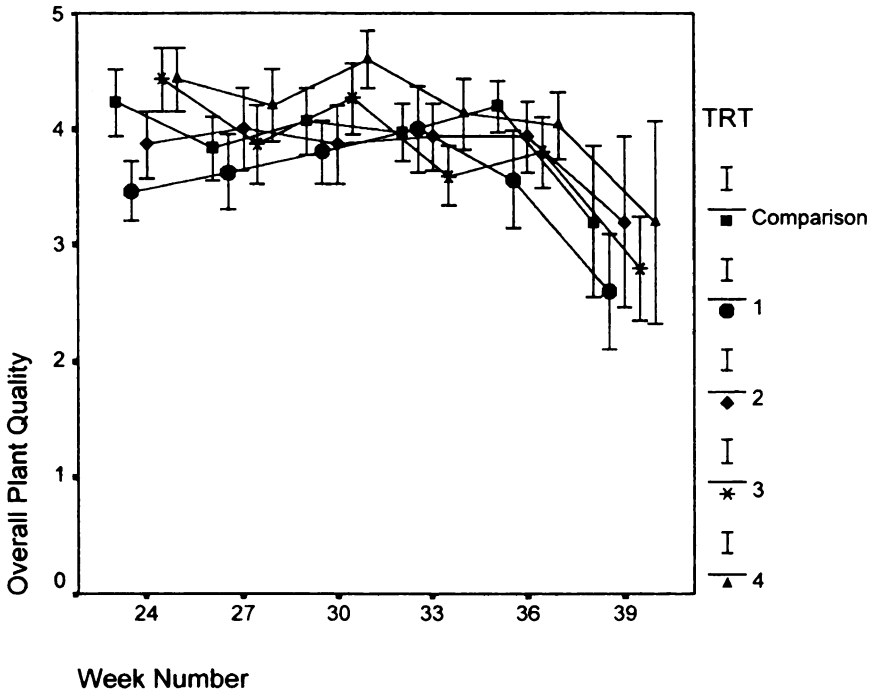


Fig. 67. Overall plant quality ratings of *Veronica spicata* 'Red Fox' in in 2000. Plants were rated from 0 to 5. Treatments are as follows: (1) forced with postharvest treatment, (2) forced with postharvest treatment and cut back at planting, (3) forced, (4) forced and cut back at planting.

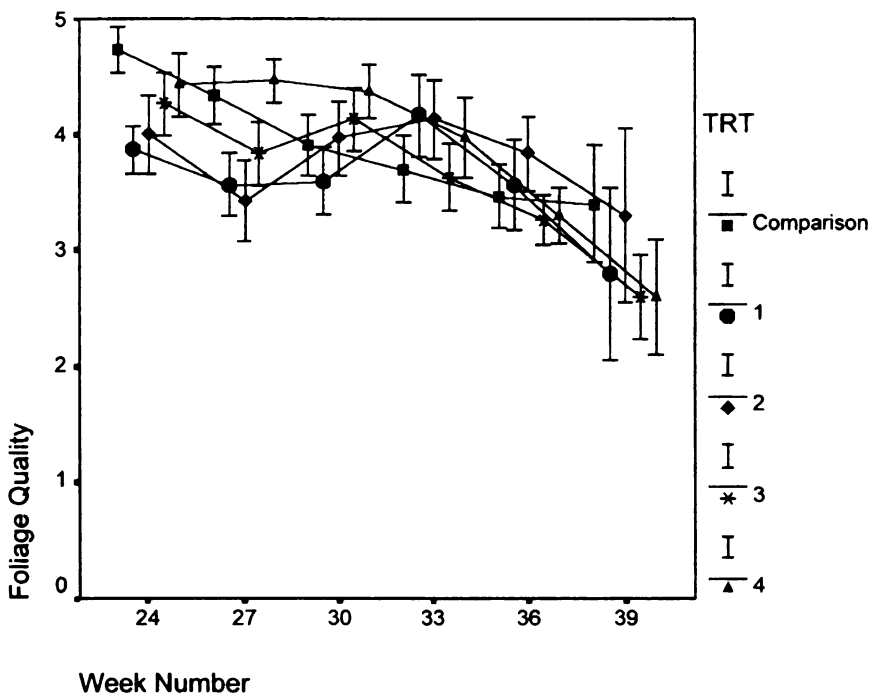


Fig. 68. Foliage quality ratings of *Veronica spicata* 'Red Fox' in 2000. Plants were rated from 0 to 5. Treatments are as follows: (1) forced with postharvest treatment, (2) forced with postharvest treatment and cut back at planting, (3) forced, (4) forced and cut back at planting.

APPENDIX A

The following is a copy of the survey instrument used in 1999. In the areas labeled "refer to display boards", participants were asked to look at various pairs of flowering plant photographs and determine, on a seven point scale (1 being most dissimilar and 7 being most similar), similarity of the pair.

Flowering Plants Comparison Survey

MSU Horticulture

Please take a few minutes to answer some questions about gardening and the flowering plants included in this survey. Thank you, in advance, for your helpful answers to our questions.

In a typical spring month, how many hours per week do you spend in your garden? _____hours

Refer to display boards. Please circle one.

Pair 1:	1	2	3	4	5	6	7
Pair 2:	1	2	3	4	5	6	7
Pair 3:	1	2	3	4	5	6	7

Are you male or female? Please circle one. M F

How many flowering plants did you buy for indoor display in 1998? _____Plants

Refer to display boards. Please circle one.

Pair 4:	1	2	3	4	5	6	7
Pair 5:	1	2	3	4	5	6	7
Pair 6:	1	2	3	4	5	6	7

In what year were you born? 19_____

Are you a graduate of Michigan's Master Gardener program?
____Yes _____No

Refer to display boards. Please circle one.

Pair 7:	1	2	3	4	5	6	7
Pair 8:	1	2	3	4	5	6	7

How many years of formal education have you completed? (for example, 12 years = High School graduate) ____years

What was your household income in 1998?

___ Less than $25,000
___ $25,001 to $50,000
___ $50,001 to $75,000
___ $75,001 to $100,000
___ $100,001 to $125,000
___ $125,001 to $150,000
___ $150,001 or more

Refer to display boards. Please circle one.

Pair 9: 1 2 3 4 5 6 7
Pair 10: 1 2 3 4 5 6 7
Pair 11: 1 2 3 4 5 6 7

How many people live in your household? _____People

For how many years have you been gardening? ____years

Refer to display boards. Please circle one.

Pair 12: 1 2 3 4 5 6 7
Pair 13: 1 2 3 4 5 6 7
Pair 14: 1 2 3 4 5 6 7

What is your marital status? Please check one.

___Married with dependents
___Married without dependents
___Single with dependents
___Single without dependents

What is the size of your property? _____ Ft^2

OVER 

Refer to display boards. Please circle one.

Pair 15:	1	2	3	4	5	6	7
Pair 16:	1	2	3	4	5	6	7

What percentage of your land is devoted to:

_____ % Vegetable gardens
_____ % Flowering plants
_____ % Lawn

Refer to display boards. Please circle one.

Pair 17:	1	2	3	4	5	6	7
Pair 18:	1	2	3	4	5	6	7
Pair 19:	1	2	3	4	5	6	7

In 1998, how much did you spend, in terms of dollars, on perennials? (plants that are supposed to come back year after year, for example, mum or tulip) $_____

Refer to display boards. Please circle one.

Pair 20:	1	2	3	4	5	6	7
Pair 21:	1	2	3	4	5	6	7

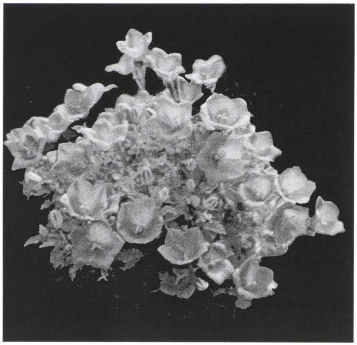
How much did you spend, in terms of dollars, on annuals in 1998? (plants that only last one season, for example, begonia or impatiens) $_____

Refer to display boards. Please circle one.

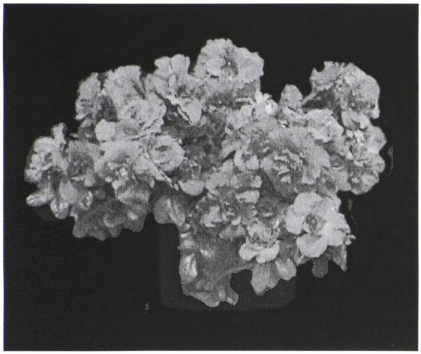
Pair 22:	1	2	3	4	5	6	7
Pair 23:	1	2	3	4	5	6	7
Pair 24:	1	2	3	4	5	6	7

Thank you for your time!

Saintpaulia ionantha
African Violet
Traditional Indoor Usage



Campanula carpatica 'Blue Clips'
Blue Bells
Traditional Outdoor Usage



Rhododendron sp.
Florist's Azalea
Traditional Indoor Usage

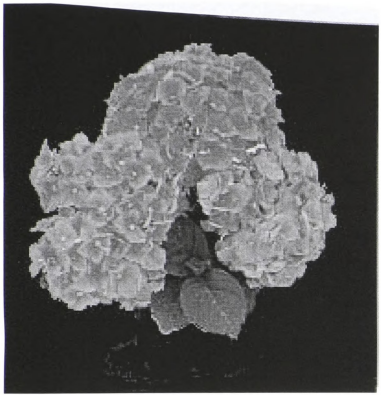
Kalanchoe blossfeldiana
Kalanchoe
Traditional Indoor Usage

Scientific Name: *Salvia* x *sylvestris* 'May Night'
Common Name: Hybrid Sage
Traditional Outdoor Usage

Scientific Name: *Echinacea purpurea* 'Magnus'
Common Name: Purple Cone Flower
Traditional Outdoor Usage

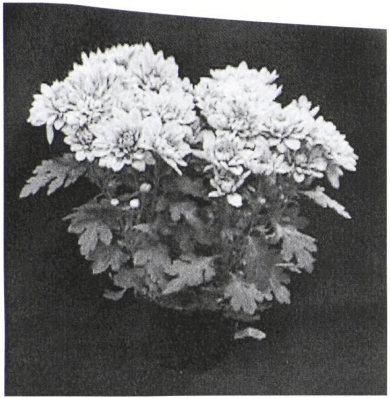
Scientific Name: *Aquilegia* x *hybrida* 'Blue Bird'
Common Name: Columbine
Traditional Outdoor Usage

Scientific Name: *Achillea grandifolia*
Common Name: Yarrow
Traditional Outdoor Usage

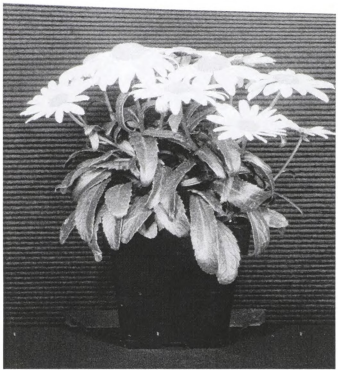


Scientific Name: *Hydrangea macrophylla*
Common Name Florist's Hydrangea
Traditional Indoor Usage

Scientific Name: *Lavandula angustifolia* 'Hidcote Blue'
Common Name: Lavender
Traditional Outdoor Usage



Scientific Name: *Chrysanthemum sp.*
Common Name Florist's Mum
Traditional Indoor Usage



Scientific Name: *Leucanthemum* x *superbum* 'Snowcap'
Common Name: Shasta Daisy
Traditional Outdoor Usage

Scientific Name: *Coreopsis verticillata* 'Moonbeam'
Common Name: Coreopsis
Traditional Outdoor Usage

Scientific Name: *Rudbeckia fulgida* 'Goldsturn'
Common Name: Black Eyed Susan
Traditional Outdoor Usage

APPENDIX B

The following is a copy of the survey instrument used in 2000. In the areas labeled "refer to display boards", participants were asked to look at various pairs of flowering plant photographs and determine, on a seven point scale (1 being most dissimilar and 7 being most similar), similarity of the pair.

Flowering Plant Survey

Michigan State University Department of Horticulture

Please take a few minutes to answer some questions about gardening and the flowering plants included in this survey. Thank you, in advance, for your helpful answers to our questions.

For the next nine questions, refer to section 1 of the display boards. Please circle one response.

Would you consider plant A to be used **indoors, outdoors, or both indoors and outdoors**?
Exclusively Indoor Exclusively Outdoor Both Indoor and Outdoor

Would you consider plant B to be used **indoors, outdoors, or both indoors and outdoors**?
Exclusively Indoor Exclusively Outdoor Both Indoor and Outdoor

Would you consider plant C to be used **indoors, outdoors, or both indoors and outdoors**?
Exclusively Indoor Exclusively Outdoor Both Indoor and Outdoor

Would you consider plant D to be used **indoors, outdoors, or both indoors and outdoors**?
Exclusively Indoor Exclusively Outdoor Both Indoor and Outdoor

Would you consider plant E to be used **indoors, outdoors, or both indoors and outdoors**?
Exclusively Indoor Exclusively Outdoor Both Indoor and Outdoor

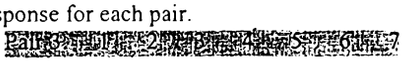
Would you consider plant H to be used **indoors, outdoors, or both indoors and outdoors**?
Exclusively Indoor Exclusively Outdoor Both Indoor and Outdoor

Would you consider plant G to be used **indoors, outdoors, or both indoors and outdoors**?
Exclusively Indoor Exclusively Outdoor Both Indoor and Outdoor

Would you consider plant H to be used **indoors, outdoors, or both indoors and outdoors**?
Exclusively Indoor Exclusively Outdoor Both Indoor and Outdoor

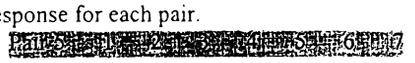
Would you consider plant I to be used **indoors, outdoors, or both indoors and outdoors**?
Exclusively Indoor Exclusively Outdoor Both Indoor and Outdoor

In a typical spring or summer month, how many hours per week, on average, do you spend in your garden? _____hours

Refer to display boards. Please circle one response for each pair.
Pair 2: 1 2 3 4 5 6 7 

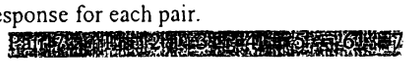
Are you male or female? Please circle one. M F

How many flowering plants did you buy for indoor display in 1999? _____ Plants

Refer to display boards. Please circle one response for each pair.
Pair 4: 1 2 3 4 5 6 7 

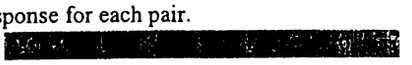
In what year were you born? 19_____

Approximately how much, in dollars, did you spend on your lawn and garden in 1999? $_____

Refer to display boards. Please circle one response for each pair.
Pair 6: 1 2 3 4 5 6 7 

How many years of formal education have you completed? (12 years = H.S. graduate) _____years

What was your household income in 1999?
__ Less than $25,000 __ $25,001 to $50,000 __ $50,001 to $75,000
__ $75,001 to $100,000 __ $100,001 to $125,000 __ $125,001 to $150,000
__ $150,001 or more

Refer to display boards. Please circle one response for each pair.
Pair 8: 1 2 3 4 5 6 7 

OVER ➡

How many adults (age 21 or higher) live in your household? _____Adults

How many children (under age 21) live in your household? _____Children

Refer to display boards. Please circle one response for each pair.
Pair 10: 1 2 3 4 5 6 7 [redacted]

On a scale of 1-7, in terms of gardening experience, how would your friends rate you? Please circle one.

not experienced			average			very experienced
1	2	3	4	5	6	7

On a scale of 1-7, how would you rate your level of gardening enjoyment? Please circle one.

not enjoyable			average			very enjoyable
1	2	3	4	5	6	7

Refer to display boards. Please circle one response for each pair.
Pair 12: 1 2 3 4 5 6 7 [redacted]

What percentage of your land is devoted to:
_____ % Lawn _____ % Flowering plants _____ % Vegetable gardens

What is the size of your property? _____Ft x _____Ft

Refer to display boards. Please circle one response for each pair.
Pair 14: 1 2 3 4 5 6 7 [redacted]

In 1999, how much money did you spend, in dollars, on perennials? (plants that are supposed to come back year after year, for example, hosta or lavender) $_____

Refer to display boards. Please circle one response for each pair.
Pair 16: 1 2 3 4 5 6 7 [redacted]

How much money did you spend, in dollars, on annuals in 1999? (plants that only last one season, for example, marigolds or impatiens) $_____

Refer to display boards. Please circle one response for each pair.
Pair 18: 1 2 3 4 5 6 7 [redacted]
[redacted]

For the next four questions, refer back to section 1 of the display boards. Please circle up to three responses.

Circle the letters for three plants that you would most likely use in an **outdoor garden bed**.
A B C D E F G H I

Circle the letters for three plants that you would most likely use for **decoration in your home**.
A B C D E F G H I

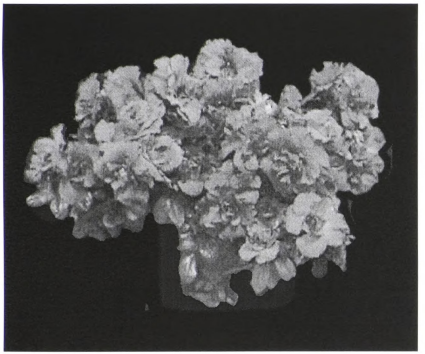
Circle the letters for three plants whose **flower color you most prefer**.
A B C D E F G H I

Circle the letters for three plants that you would most likely purchase **to give as a gift to a friend**.
A B C D E F G H I

Thank you for your time!

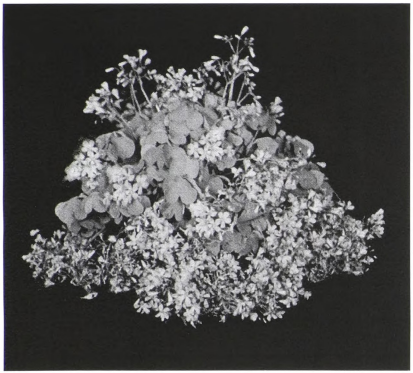
Saintpaulia ionantha
African Violet
Traditional Indoor Usage

Campanula carpatica 'Blue Clips'
Blue Bells
Traditional Outdoor Usage



Rhododendron sp.
Florist's Azalea
Traditional Indoor Usage

Kalanchoe blossfeldiana
Kalanchoe
Traditional Indoor Usage

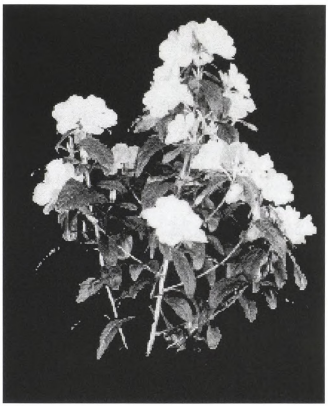


Oxalis crassipes 'Rosea'
Shamrocks
Traditional Outdoor Usage

Sedum spectabille 'Brilliant'
Sedum
Traditional Outdoor Usage

Delphinium grandiflorum 'Blue Mirror'
Delphinium
Traditional Outdoor Usage

Aquilegia x *hybrida* 'Blue Bird'
Columbine
Traditional Outdoor Usage



Oenothera fruiticosa 'Youngii-lapsley'
Sundrops
Traditional Outdoor Usage

APPENDIX C

MICHIGAN STATE
UNIVERSITY

September 28, 1998

TO: Bridget Behe
A216 Plant & Soil Sci. Bldg

RE: IRB#: **98-588**
TITLE: CONSUMER PERCEPTIONS OF HERBACEOUS PERENNIALS AS NEW FLOWERING POTTED PLANTS
REVISION REQUESTED: N/A
CATEGORY: 1-C
APPROVAL DATE: 09/18/98

The University Committee on Research Involving Human Subjects'(UCRIHS) review of this project is complete. I am pleased to advise that the rights and welfare of the human subjects appear to be adequately protected and methods to obtain informed consent are appropriate. Therefore, the UCRIHS approved this project and any revisions listed above.

RENEWAL: UCRIHS approval is valid for one calendar year, beginning with the approval date shown above. Investigators planning to continue a project beyond one year must use the green renewal form (enclosed with the original approval letter or when a project is renewed) to seek updated certification. There is a maximum of four such expedited renewals possible. Investigators wishing to continue a project beyond that time need to submit it again for complete review.

REVISIONS: UCRIHS must review any changes in procedures involving human subjects, prior to initiation of the change. If this is done at the time of renewal, please use the green renewal form. To revise an approved protocol at any other time during the year, send your written request to the UCRIHS Chair, requesting revised approval and referencing the project's IRB # and title. Include in your request a description of the change and any revised instruments, consent forms or advertisements that are applicable.

PROBLEMS/ CHANGES: Should either of the following arise during the course of the work, investigators must notify UCRIHS promptly: (1) problems (unexpected side effects, complaints, etc.) involving human subjects or (2) changes in the research environment or new information indicating greater risk to the human subjects than existed when the protocol was previously reviewed and approved.

If we can be of any future help, please do not hesitate to contact us at (517)355-2180 or FAX (517)432-1171.

~~Sincerely~~,

David E. Wright

David E. Wright, Ph.D.
UCRIHS Chair

DEW:bed

cc: Elizabeth Hyman

OFFICE OF
RESEARCH AND GRADUATE STUDIES

University Committee on Research Involving Human Subjects (UCRIHS)

Michigan State University
246 Administration Building
East Lansing, Michigan
48824-1046

517/355-2180
FAX 517/432-1171

APPENDIX D

The following is a copy of the article 'Consumer Perceptions of Selected Flowering Plants' as it appeared in the Proceedings of the fourteenth International Symposium on Horticultural Economics edition of Acta Horticulturae, September 2000. The proceedings were published by the International Society for Horticultural Science.

CONSUMER PERCEPTIONS OF SELECTED FLOWER PLANTS

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Keywords: paired comparisons, perceptual map

Abstract

The USA wholesale market for pot plants, valued at $701 million in 1998, is second to bedding plants, and growing at less than one-percent annually. The outdoor market for bedding plants is nearly $2 billion (U. S.) and growing eight-percent annually. Customers who purchase indoor flowering pot plants may have specific expectations about them, and may feel they will not perform well in the garden. Michigan State researchers have developed protocols to program over 30 herbaceous perennials to flower on a specific date. Some of these perennials exhibit characteristics for marketing as pot plants followed by good garden performance. One method of identifying how customers perceive these potentially new products is through the development of perceptual maps. Perceptual mapping shows how customers implicitly categorize products, leading marketers to identify new market opportunities or ways to position and price similar products. We surveyed 239 visitors to the Detroit, Michigan, flower show in April 1999, to determine their perceptions of 5 traditional indoor flowering pot plants and 9 traditional outdoor perennials. Their similarity / dissimilarity perceptions were recorded on a 7 point scale and squared Euclidean distances were calculated to develop maps. Major dimensions identified were an indoor/outdoor dimension, a bold/pastel color dimension, and a flower form dimension. This provided evidence that participants recognized the perennials as belonging outdoors in the garden, giving marketers an opportunity to advertise this advantage when merchandising them as pot plants. Color is regarded as an important aspect in the purchase of any flower, and was identified here as another classification dimension. Since different customer segments may perceive plants differently, we developed separate perceptual maps for several consumer groups.

1. Introduction

Sales of new or redesigned products can profitably rejuvenate the product life cycle. Introducing new or redesigned products to the market poses interesting challenges for marketers. How will the new products be priced and to what are they most comparable?How will customers perceive the new product and how can it be most profitably priced?Initial marketing strategies can be developed to build interest in the new product, create awareness, and generally promote the product and its uses. Market research conducted prior to product launching can give businesses a better understanding of customers' perceptions relative to the new product, and an idea of which product features to begin to promote. This type of research often probes issues such as consumer perceptions and preferences among product concepts. Results from this type of research can facilitate further product development, and eliminate potentially unprofitable product development.

Industries ranging from automotive to clothing regularly survey consumers to develop new products. In the floral industry, much less research is conducted. Anecdotal evidence suggests that if a plant is flowering in the marketplace, it will sell. Researchers have little conclusive evidence that indicates which product types or features, beyond

Proc. XIV^th Int. Symp. on Hort. Economics
Ed. J.P. Ogier
Acta Hort. 536, ISHS 2000

color, the consumer is seeking or most willing to purchase. There is insufficient research to show how consumers perceive flowering plants, relative to each other. This kind of information would be useful in developing new types of flowering plants, and positioning them in the marketplace.

Annual flowering plants, purchased for installation in the exterior landscape, have a U. S. market value of $1. 8 billion (USDA, 2000). This category grew an eight-percent last year. Herbaceous perennials comprise a portion of bedding plant production, and are typically purchased for exterior landscape installation. While the USDA keeps no accurate statistics on the size or value of the perennial market, we conservatively estimate its value at $32 million. In 1988, the U. S. Census Bureau estimated the perennial market value at $31. 9 million. Wholesale value of flowering plant sales was $701 million in 1998, and up 3% over the last five years. While this product category is not increasing at the rate of bedding plant category growth, perhaps new plant introductions could spur this on.

One market research method that could potentially help the horticulture industry understand how consumers perceive flowering plants is perceptual mapping. Through the use of multidimensional scaling (MDS), researchers can form a spatial map that represents the market, or a perceptual map (Kotler, 1997). Maps are based on paired comparison data and estimate a spacial representation products and positioning options (Baier & Gaul, 1999). Carmichael (1996) conducted a study using MDS to identify the most effective language in business communications. A perceptual map gives a marketer the ability to see in a two-dimensional space how the consumer thinks about products. If similar kinds of maps can be created with selected flowering plants, horticulture marketers would better understand floral consumers' perceptions.

A perceptual map can be defined as "an attempt by a researcher to determine the perceived relative image of a set of objects" (Hair, 1992). Knowing what interests the consumer about a product gives that marketer an opportunity to influence purchase habits (Simonson, 1992). Previous research shows that consumers migrate to certain products and brands they know. For example, red poinsettias have traditionally been associated with Christmas, and red plants have the dominant market share. Yet, novelty poinsettia colors have risen in sales within the past few years since their introduction (Stickel, 1994). When consumers purchase multiple products in a certain category for an extended period, in this case poinsettias, they tend to want to try new items (Simonson, 1992). This provides a great opportunity for growers to up-sell their products, buying additional complimentary products which may be more profitable. For instance, a novelty poinsettia or amaryllis may compliment the traditional red poinsettia purchase.

Inviting consumers to be involved in the process of creating products gives the business invaluable input. This input gives businesses the opportunity to fine tune things in the final stages of product development so as to ensure that a desirable product is paced on the market (Dickenson & Wilby, 1997) . To date, there is no MDS information published with regard to flowering plants.

2. Materials and Methods

Our hypothesis was that consumers would recognize some plants as traditional, indoor-pot plants and others as outdoor garden perennial plants. We supposed that as a consumer's gardening experience or investment increased this delineation would become more explicit. They may, therefore, appreciate the value added if some traditional garden plants could be first used indoors as a flowering pot plant.

For this study, we selected fourteen flowering plants. Five were traditional potted flowering plants: *Saintpaulia ionantha* (blue-purple), *Chrysanthemum sp.* (pink-lavender), *Kalanchoe blossfeldiana* (yellow), *Rhododendron sp.* (salmon pink), and *Hydrangea macrophylla* (pink). Nine were non-traditional potted flowering plants: *Achillea grandifolia, Aquilegia* x *hybrida* 'Blue Bird', *Campanula carpatica* 'Blue Clips', *Coreopsis verticillata* 'Moonbeam', *Echinacea purpurea* 'Magnus', *Lavandula*

angustifolia 'Hidcote Blue', *Leucanthemum* x *superbum* 'Snowcap', *Rudbeckia fulgida* 'Goldsturn', and *Salvia* x *sylvestris* 'May Night'. These plants were selected for their diverse flower colors, flower forms, and use in Michigan gardens (USDA zone 5).

A complete factorial design was created in order to compare all 14 plants to each other. This design resulted in needing to ask consumers to make 91 comparisons. We divided the 91 comparisons into four surveys to reduce fatigue. Each survey contained 23 or 24 comparison questions, and additionally including a repeat of the first pair at the end of the survey form to serve as an anchor in analyses. In order to avoid order effect, pair-comparison questions were interspersed with demographic questions.

Photographs of the plants in flower were used in order to maintain consistency over time. Eight pairs of photographs were displayed on a black 3' x 3' foam board, and three boards were displayed together. Boards were rotated every hour so that every fourth hour the same display order was given.

We measured consumer perceptions using a semantic differential scale, which consisted of bipolar adjective pairs that anchor either end of a set of numbers (Kotler, 1997). We asked consumers to evaluate perceived similarities in pairs of flowering plant photographs. When bipolar adjective pairs were most similar, they received a rating of 7, and when they were most dissimilar received a rating of 1. A rating of 4 identified a pair perceived as neither similar nor dissimilar. Pair ratings were used to create a spatial map of how consumers perceived flowering plants. By transforming the consumer judgements of similarity into distances represented in a multidimensional space, the objects in question were visually clustered on a grid. The two-dimensional space gave two axes by which objects were distinguished from one another (Hair, et. all, 1992).

The survey form consisted of one standard page printed in two columns, landscape style, folded in half. Both sides of the page were printed so as to make four pages (one title page and three questionnaire pages). The Michigan State University Committee on Research Involving Human Subjects approved this methodology in accordance with U. S. federal law and university policy.

We selected Detroit as a site to administer the survey because Detroit's population has a close match to the overall demographics of the nation and is a viable test market (Waldrop, 1992). Detroit has an annual flower show, which appeared to be an appropriate venue to intercept consumers with a range of interests in flowers and plants. On April 9 & 10, 1999, 239 completed responses were collected at the Bloomfest Flower Show in Detroit, Michigan at Cobo Hall Exhibition Center.

We incorporated 9 gardening behavioral questions and 5 demographic questions throughout the survey. The gardening behavioral questions addressed issues relating to gardening experience and habits: (a) were participants Master Gardeners, (b) how many hours per week did they spend gardening, (c) how many plants did they purchased for indoor display in 1998, (d) how many years they had been gardening, (e) what was the approximate size of their properties,(f) how much had they spent on perennial and annual plants in 1998, and (g)what percentage of their property was devoted to vegetable gardens, flowering gardens, and lawn. Thedemographic questions captured the participant'sgender, age, income level, family status, and education level.

Completed surveys were coded and then entered into a computer spreadsheet (Excel 97) for statistical analysis (SPSS 8. 0). The statistical analysis of the paired comparisons was done using a multidimensional scaling program using ALSCAL (SPSS-PC), where paired-comparison means were put into a similarity matrix,and then put through the ALSCAL computer program. This program measured the Euclidean distances of the pairs in order to create the perceptual map.

3. Results

Of the 239 surveys completed, the lowest number of paired comparisons completed per version was 53, and the largest number was 66. The average length of time participants took to complete the survey was seven minutes.

3.1. Dollars Spent v. Time in the Garden

Participants gave a large range of responses when asked how much they spent on annual plants in 1998. Answers ranged from $0 to $400 (US), however the modes were $50 (14. 4%) and $100 (14. 4%).
Similarly, when asked about perennial plant expenditures in 1998, the mode was $100 dollars (16. 3%). However, the second most frequent response was $200 dollars (10%). We concluded that our sample spent more money on perennials than annuals. Perennials tend to be more expensive than annuals, mainly due to production intensity.

Participants were first asked to quantify how many hours per week they spent in their gardens in a typical spring month. The mean was 3. 3 hours, while the most frequent response was one hour (28. 5% of the population). The second most frequent response was 2 hours (20. 3% of the population). The number of hours spent gardening was mildly associated to the total amount of dollars spent on flowering garden plants (annuals and perennials) (R^2= 0. 173, p=0. 02). Typically people who spent less time in the garden spent less money on flowering plants. People who reported spending between $5 and $200 (US) on flowering plants said they spent an average of 10. 3 hours per week in the garden. The participants who spent $201 to $400 (US) on flowering plants reported spending an average of 13. 3 hours per week in the garden.

While time spent in the garden was mildly related to the amount of money people spent on flowering plants, gardening experience was not. There was no relationship between years of gardening experience and dollars spent on flowering plants (R^2= 0. 122, p=0. 09). The average years of gardening experience among participants were 6 to 10. The mode was ten years (13. 8%).

3.2. Gender, Education, Household, Income and Age

Of the participants who responded to our question of gender, 74. 8% of the sample were female, while 25. 2% were male. Participants had completed a mean of 15. 4 years of formal education, or equivalent to a U. S. bachelor's degree; 57. 3% of the participants had completed 16 or more years of education. The U. S. average is 25%, so these participants are more educated than the average U. S. citizen (Mitchell, 1998). Households included typically a mean of 2 persons (43. 1%) who were married with dependants (36. 4%). The mean income range for participants in 1998 was $50,001 to $75,000 (US). The mean age was between 49 and 50 years, while the largest age group was 47 years (4. 6%).

3.3. Property and Usage

The average property size of participants was a 40,292 ft. ^{2} (less then one acre), or 3743 m^2. The participants were asked to divide their property according to how the land was used: lawn, flowering gardening and vegetable gardening. On average, 28. 5% of the property was used for flower gardening, 57. 5% was used for lawn, and 9. 9% was used for vegetable gardening.

3.4. General Trends

The perceptual map has a grid with two axes or dimensions, by which the two most significant attributes of the objects cluster. These dimensions are determined subjectively due to the manner in which the objects cluster within the space of the map. There were distinct plant clusters defined in the map (Figure 1). Along the X-axis, the first cluster was within the range of –2. 0 to –1. 0 and included rhododendron, saint paulia and hydrangea. Similarities among the plants in this cluster were indoor usage and form. These plants are traditionally used as indoor potted plants. The second cluster on the X-axis was within range –0. 5 to –0. 5. The two plants in this group are chrysanthemum and

aquilegia. Not only were these plants similar in color, but also they were similar in height. The third X-axis cluster fell within range 0. 5 to 1. 5. These plants are traditionally used outdoors and are usually 12+ inches (31+ cm) tall.

While the Y-axis showed no definite patters when examined alone, when combined with the X-axis clusters there were some very definite patterns. The noticeable group (first X cluster and Y-axis range 0. 5 to –1. 0) was comprised of plants with similar form and usage (indoor cluster). Campanula fell outside this cluster, which may be attributed to its traditional use in the U. S. as an outdoor plant. The next noticeable grouping (middle cluster) was chrysanthemum and aquilegia (second X cluster and Y-axis range 0. 5 to 0. 0). These two plants have a similar height, and are both used outdoors, however chrysanthemum is also used as an indoor plant. This cluster suggests the sample group had no preformed opinion that these two plants are exclusively for outdoor use. The middle cluster shows that there is a willingness to accept these types of plants for either indoor use. The cluster in the upper right quadrant (third X cluster and Y-axis range 0. 5 to 1. 5) were similar in appearance in that they were all cool colors and were similar in height and form (spike/tall cluster). The cluster in the lower right quadrant (third X cluster and Y-axis range 0. 0 to –1. 5) was comprised of ray and disk type plants also with similar height and form (ray/disk cluster). While usage in these last two clusters is a dominant theme, form seems to be equally important with outdoor plants.

3.5. Female Perspective

The predominance of female participants, along with the fact that women make the majority of retail flowering plant purchases (Gallup, 1999), prompted us to create a perceptual map base on their responses (Figure 2). Clusters in the female sample (n=116) were very similar to those in the general sample. The same types of clusters exist in figure 2 as in figure 1, however the boundaries of the indoor (-1. 0 to 0. 5, -2. 0 to -1. 0), spike/tall (0. 5 to 1. 5, -0. 5 to -1. 0), and ray/disk (0. 0 to 1. 5, 0. 5 to 1. 5) clusters are different, and there was no middle cluster. Aquilegia fell between chrysanthemum and the tall/spike cluster. One observation, which may explain this difference, is that along the negative side of the Y-axis, only cool color flowers clustered. This suggests that among women color may be just as important as form. Another difference was that only saint paulia and campanula fell into the lower left quadrant, again suggesting that color is important.

3.6. Gardening Time and Dollars

Maps were created for two of the expenditure sub-samples mentioned earlier. Both maps contain some of the general clusters contained in the previous maps. The map of participants who reported spending $5 to $200 (U. S.) on flowering plants (figure 3) revealed an indoor cluster (-2. 0 to -1. 0, -1. 0 to 1. 0), a middle cluster (-0. 5 to 0. 0, 0. 0 to 0. 5), a tall/spike cluster (0. 5 to 1. 0, 0. 0 to 1. 5), and a ray/disk cluster (0. 5 to 1. 5, -1. 5 to 0. 0). The map of participants who reported spending $201 to $400 (U. S.) on flowering plants (figure 4) contained an indoor cluster (-2. 0 to -1. 0, -1. 0 to 1. 0), a tall/spike cluster (0. 5 to 1. 5, 0. 5 to 1. 0), and a ray/disk cluster (0. 5 to 1. 5, -1. 5 to 0. 0). Some of the most obvious differences in the two maps were distances between plants in the indoor clusters, the position of aquilegia, and the distances between plants in the tall/spike clusters. The distances between plants in the indoor cluster in figure 3 are close together. For example, campanula and saint paulia nearly overlapped, while in figure 4 the two plants were spread much farther apart. This suggests that the people who spent less on flowering plants tended to differentiate between indoor plants less than those who spent more. The position in which aquilegia fell in the two maps also suggests that there is a difference in the way that these sample groups perceived the plants. In figure 3 aquilegia clusters with chrysanthemum, suggesting that this group of people was more willing to accept the plant for either indoor or outdoor use. In figure 4 aquilegia clusters

with the tall/spike cluster, suggesting that this sample group considered the plant for outdoor use only.

4. Discussion

The main re-occurring clusters throughout all of the maps were indoor, tall/spike, and ray/disk. The most consistent dimensions were usage and form. Also, chrysanthemum consistently fell in the center of the usage axis for every map. This suggests that participants had strong associations between usage and form. The short, full plants consistently mapped out on the left (indoor) side of the x-axis, while the taller plants mapped out on the right (outdoor). If these two dimensions (usage and form) are purchase factors for consumers, then marketers could easily to promote plants based on these categories. In figure 2, color was an important classification factor for women when they thought about the plants in the survey. This may be just as important of a purchase factor when female consumers are purchasing potted indoor plants.

Expenditure and time spent in the garden, mildly correlated, were important in how members of the sample chose to associate the plants. The participants who spent more time and money associated the aquilegia very closely with the tall/spike cluster. This indicates that these people had stronger pre-determined associations with outdoor plants than the participants who spent less time and money.

In all of the maps campanula consistently clustered with the indoor plants and in figures 2 and 3 it clustered with saintpaulia. The expression "form follows function" might be reversed in this situation in that the form of a plant may suggest to the consumer the plant's function. The trends seen in these maps may be an indication of two things: (1) that consumers are willing to accept flowering plants with short, full form as potted indoor plants, and (2) that consumers simply are not aware that some of these plants are garden perennials.

We confirmed our hypothesis that customers would recognize and differentiate between traditional indoor potted plants and outdoor bedding plants. With a mild correlation between time and money spent in the garden, we saw this distinction become clearer as the time/money spent increased.

In marketing perennials as "new" potted plants we should emphasize the value-added attribute of enjoying a perennial in the home before potentially planting it in the garden. This attribute is more recognizable as the dollar/time expenditure increased meaning that at least some consumers may have the desire and ability to pay more for a plant they can enjoy in both locations.

Additionally, marketers have a great opportunity to reposition some outdoor potted plants for indoor uses with virtually no product competition. We recognize, as did our participants, that the chrysanthemum is a plant with potentially two uses: indoor and outdoor. Aquilegia fell closest to chrysanthemum, indicating that plant as one that may be among the first to market with a dual use. A creative marketer may be able to capitalize on this repositioning, especially for the Mother's Day market. It is close to the last frost-free date for most major U. S. cities. In theory, a customer could purchase a programmed perennial for Mother's Day and plant it safely in the garden in approximately two weeks.

Acknowledgements

This research was funded by a grant from the American Floral Endowment, Glen Carbon, IL 62034. We would also like to acknowledge Forrest S. Carter and Tomas J. Page, Jr. for sharing their expertise in the organization of the experiment and analyzation of the data.

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Figures

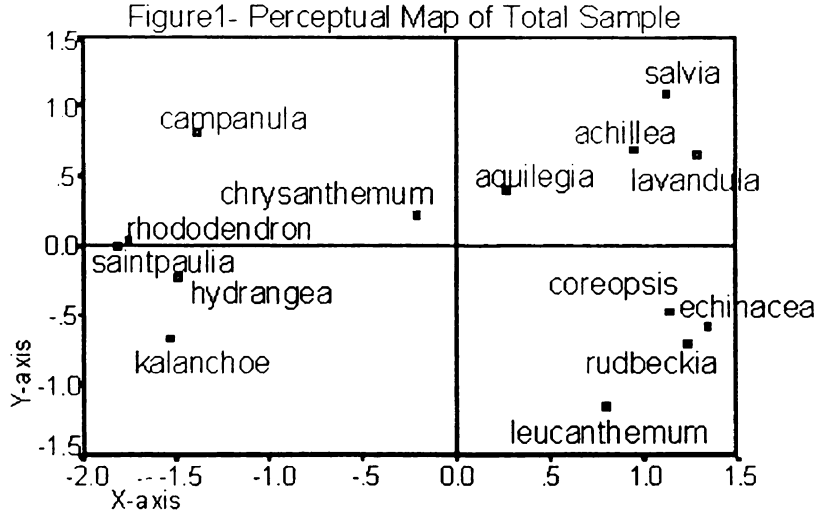


Figure 2- Perceptual Map of Female Sample

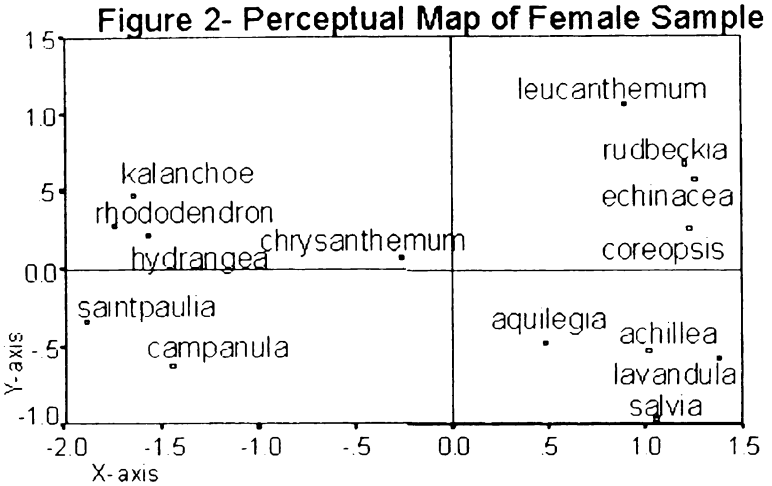


Figure 3- Perceptual Map of $5-$200 Sample

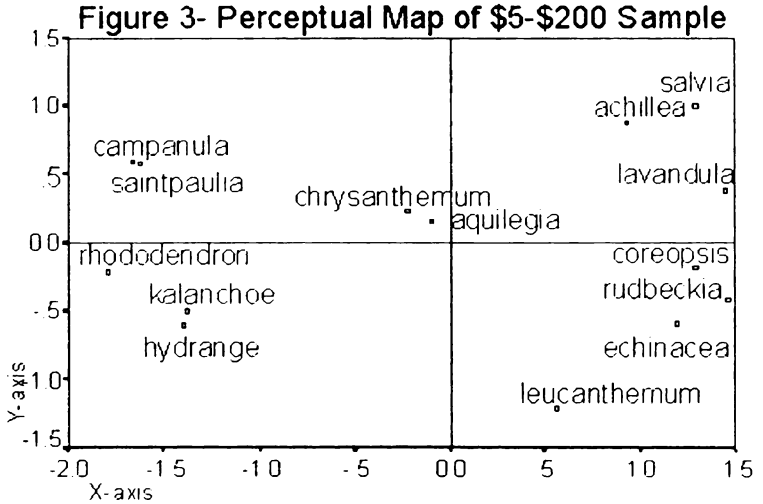
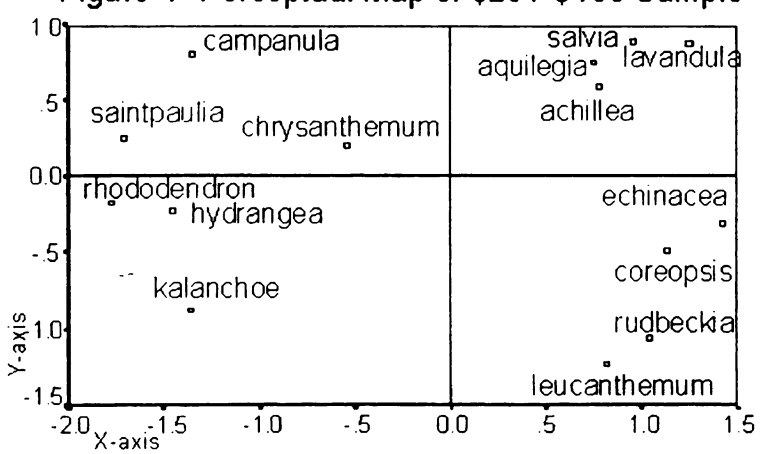


Figure 4- Perceptual Map of $201-$400 Sample



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APPENDIX E

The following is a copy of the article 'Why Consumers Buy Potted Flowering Plants: A Focus Group Study Of Master Gardeners '. The article is in press and scheduled for publication in January 2001 in the forty-fourth Proceedings of the Southern Nurserymen's Association Research Conference 2000.

Why Consumers Buy Potted Flowering Plants: A Focus Group Study of Master Gardeners

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Index Words: Purchase habits, Expectations, Seasonality

Nature of Work: Many businesses use focus groups to determine perceptions and attitudes from a certain group of consumers (Cowley 1999). Businesses that use focus groups are often looking for ways to satisfy customer needs more effectively or investigate new product acceptance. Focus group information is then used to further develop a product and its marketing stragtegy. Understanding how and why a consumer makes a purchase helps businesses develop more profitable products and marketing methods. Our goal was to identify the key purchase attitudes that garden product consumers have toward flowering plants.

There are common assumptions that growers and retailers make regarding the consumers wants and needs. One widely accepted thought is that there are seasonal limitations of plant sales such as poinsettia or Easter lily. Another thought is that consumers are not willing to purchase plants, other than those seasonal selections, that have been forced. Growers and retailers tend to schedule their crop production based on these assumptions rather than direct input from the customer. It would be a great advantage to know what consumers are looking for and are willing to buy before production begins. Our goal was to delineate the key factors influencing flowering plant purchase decisions.

On August 7, 1999, fifteen Master Gardeners from Genessee County, Michigan, participated in a focus group concerning purchase habits, paradigms, and expectations of flowering plants. The group convened at 9a.m. in the county extension office and lasted for eighty-five minutes. Master Gardeners were chosen due to their pre-disposition toward gardening and level of gardening experience. The first ten minutes of the group consisted of introductions among participants and moderator and explanation of the project and legalities. The next twenty minutes consisted of a discussion concerning the how's and why's of purchase habits. Within the next forty minutes, the group was asked to discuss certain paradigms they have toward seasonally and indoor/outdoor use of plants. Finally, in the last fifteen minutes, the group was focused on a discussion about expectations of forced plants.

Results and Discussion:

<u>Purchase Habits</u>

When asked the question "Why do you buy flowering plants?", participants gave a very wide range of responses, many of which were expected. However, there were several unique statements made. Among the expected responses were "constant color", and "to liven up my garden." One of the participants responded differently when she stated that she was looking for seasonal rotation for a planter box in her home. She said that after Christmas, there was a serious lull in selection and that "bulbs just aren't satisfying."

Participants said they tend to purchase plants in very large quantities and throughout the year. Two participants said they make most of their purchases through catalogues, but most other participants purchase from garden centers and "definitely not" from mass merchandisers. Participants expressed a great dissatisfaction with customer service at these establishments.

The Master Gardeners said they tend to purchase potted flowering plants for holidays, table centerpieces and gifts. With regard to gifts, the plants were mostly given to elderly parents. The most frequently mentioned plants included poinsettia, Easter lily and spring bulbs. Uniquely, one of the respondents said that he wished coleus was sold more often for indoor color use. "With coleus you don't have to worry about whether or not there's a flower-- it's just about the color... the leaves are always there. Flowers fade."

Flowering Plant Paradigms

When asked, "Do you see a distinct difference between indoor and outdoor plants?" there were varying responses. The participants who said yes said that outdoor plants tend to be "larger" and require full sun, while indoor plants are smaller, tropical, have longer bloom periods, and do not require as much sun. Those who said that there is no difference had many reasons. Several people stated that they tend to "hold things indoors if in bloom" and then return the plants outdoors when finished blooming. Two participants had the opposite view and stated that they use houseplants as annuals in the garden.

All participants said that they purchase a poinsettia strictly because it is a winter holiday (mainly Christmas) tradition. However, most said they would be willing to purchase a poinsettia in spring if it were pastel or white. Two people said that they would not be willing to do this. When asked about alternatives to poinsettia during the winter holidays, the response was "anything red." Some specific suggestions included Lenten Rose (*Heleborus*), Christmas Cactus (*Schlumbergera*), a small holly shrub with berries, and red geraniums.

When asked, "Would you purchase a twelve-inch tall echinacea in bloom in March?" there were several different responses. Some participants said no, that they would be "afraid that it would die." Another participant said that she would make the purchase depending on the price. "If it were $10.00 or less I probably would buy it...I think it would be a very cute window plant." Another woman said, "at that time of year I'll buy anything." Most participants agreed that they

would make the purchase for a special occasion for a table centerpiece. When asked to choose between the echinacea and a cut flower arrangement for a centerpiece, thirteen of the fifteen said they would choose the echinacea.

Expectations

Participants were asked to discuss how they felt about forced herbaceous plants. (Here the term "forced" was used to mean plents that were programmed to bloom out of natural bloom time.) There was a general consensus that forced plants are not "as hardy", and that the term "forced" should be on the label. This was the most frequently voiced concern. All of the participants felt that the label should also have extensive cultural information and the natural bloom time of the plant. One woman said that if she was not familiar with a forced plant she purchased, she would be disappointed when it did not bloom at the same time the following year. The rest of the group agreed. They also wanted the label to say how long the blooms would last. Another woman said, "if I could get the same amount of bloom time as other disposables (plants forced for one time use such as mums and poinsettias), I would buy it.

Among the participants there seemed to be a feeling of failure or dissatisfaction with throwing out herbaceous perennials. While the majority of the participants said they throw away poinsettias after the winter holidays, there was not the same willingness to throw out perennials. One woman said "I know that echinacea is a perennial plant" and that she would "feel bad" about throwing it out. When asked, "What would encourage you to purchase a non-traditional, forced potted flowering plant?" the two responses were price and uniqueness.

Significance to Industry: This focus group gives us insight into how consumers, specifically Master Gardeners, consider purchasing flowering potted plants. As Michigan State University researchers force perennials to flower at any certain time, marketers turn their attention to best positioning these "new products". Inexperienced gardeners may make purchases differently, but knowing what experienced gardeners are thinking gives marketers a good place to initiate a marketing strategy. In fact, turning attention to Master Gardeners as the first line of consumers to market to may have a serious impact on what purchases other gardeners make and how they make them. "Virtually all gardeners say that other gardeners are their most important source of information about their hobby, and Masters are asked about gardening more than any other segment". (Waldrop, 1993).

Throughout the focus groups the Master Gardeners showed a willingness to purchase forced plants. They reiterated a desire to have proper care and habit information about the plant. They also expressed interests in unique plants and alternatives to traditional indoor and seasonal plants. This gives growers an opportunity to address a new need among garden consumers. If Master Gardeners are willing and even desirous of these "new products", then it is likely that other gardeners will follow.

Literature Cited:

1. Cowley, James. 1999. "anyone can hold a focus group, right?" Marketing News. Mar.: 15.

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APPENDIX F

The following page includes 2 perceptual maps from various sub-samples of the survey taken in 2000. The survey was conducted at Detroit's Cobo Hall Bloomfest Flower Show, April 7-8,2000.

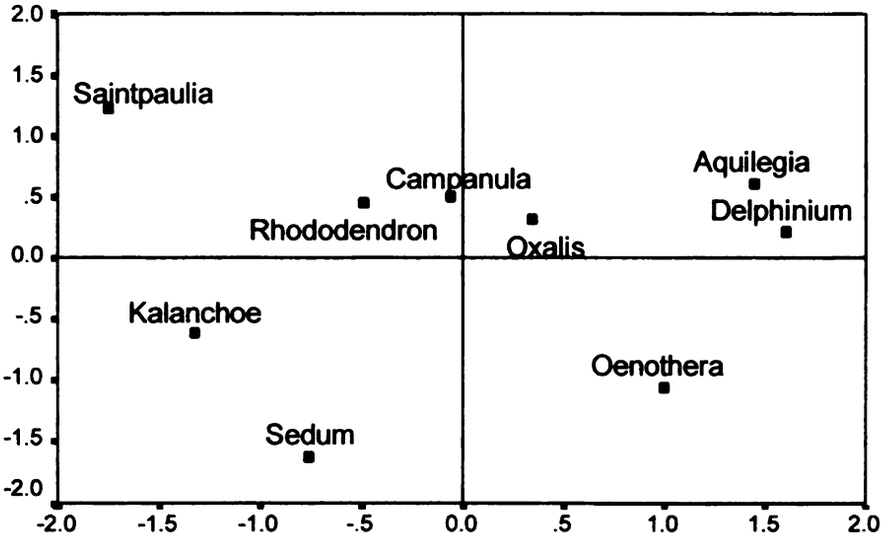

Figure 1. Perceptual map of 9 flowering plants as determined by paired comparison ratings of the female survey sub-sample. The axes help to determine clusters that define pre-determined attitudes of consumers

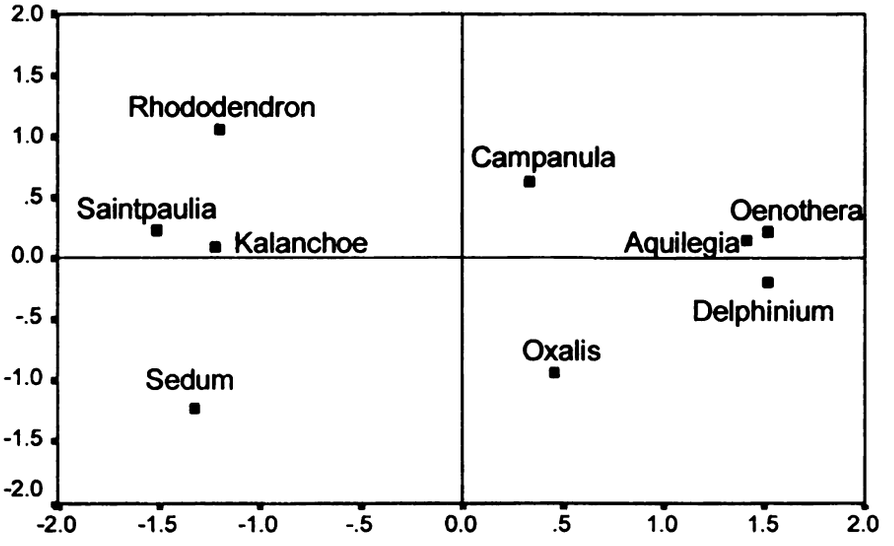

Figure 2. Perceptual map of 9 flowering plants as determined by paired comparison ratings of the male survey sub-sample. The axes help to determine clusters that define pre-determined attitudes of consumers toward flowering plants.