Repositioning Selected Herbaceous Perennials as Indoor Flowering Potted Plants Using Perceptual Mapping

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Abstract. The U.S. wholesale market for flowering potted plants, valued at \$701 million in 2000, is growing much slower than the \$2.1 billion bedding plant market, indicating the product life-cycle of the former may have matured. A mature product yields little profit. Customers who purchase flowering potted plants for indoor enjoyment may have expectations about them, including that plant life is finite and there is no opportunity for outdoor use. Because scientists have discovered how to force selected perennials to flower, marketers may reposition them as indoor flowering potted plants, creating a new product and potentially stimulating sales of this lagging floral category. One method for relating customer perceptions of new products to familiar ones is perceptual mapping, which shows how consumers implicitly categorize products. Defining how consumers perceive the relationships between the selected flowering plants enables marketers to select the best opportunities for product positioning, merchandising, and pricing. We surveyed 200 self-selected visitors at a Michigan flower show in Apr. 2000 to determine their uses for, preferences for, and perceptions of three traditional indoor flowering potted plants and six traditional outdoor perennials. Perceptions were recorded on a seven-point scale. Squared Euclidean distances were calculated to derive the map in which two major dimensions emerged: use (indoor/outdoor) and flower color. *Campanula carpatica* Jacq. 'Blue Clips' and *Oxalis crassipes* Urb. were mapped centrally, indicating participants had no strong perceptions for how these plants should be used. This suggests that *Campanula* and *Oxalis* have the greatest potential to be positioned for dual indoor and outdoor enjoyment, which may also yield some enhanced profitability.

Sales of redesigned products can profitably restart a mature or declining product life cycle yielding negligible profits for sellers. However, launching new or redesigned products into an existing market creates difficulties. Consumers may have preconceived notions that will affect the sale and acceptance of new or repositioned products. Their experience with similar or related products will have created expectations and perceptions that need to be addressed along with product changes. Gaining a better understanding of customers' product perceptions and preferences can help marketers anticipate necessary changes. Research results can also give marketers pricing and promotional ideas.

Growers now have the capability to manipulate temperature and photoperiod to program selected plant species to flower on a

specific date, within relatively concise limits. The ability to program species is not limited to traditional flowering plants, such as *Euphorbia pulcherrima* Willd. ex Klotzsch or *Dendranthema morifolium* (Ramat) Tzvelev. Now,

herbaceous perennials can be programmed to flower on a specified date (Niu et al., 2001; Runkle et al. 1998). Moore (1999) showed that *Campanula carpatica* Jacq. 'Blue Clips,' *Campanula portenschlagiana* Roem. & Schult., *Coreopsis grandiflora* Hogg ex Sweet 'Sunray,' *Echinacea purpurea* (L.) Moench 'Magnus,' *Lavandula angustifolia* Mill. 'Hidcote Blue,' *Leucanthemum xsuperbum* Bergmans ex J. Ingram 'Snowcap,' *Gaura lindheimeri* Engelm. & A. Gray 'Whirling Butterflies,' *Geranium dalmaticum* (G. Beck) Rech. f., *Pennisetum setaceum* (Forssk.) Chiov 'Rubrum,' and *Veronica spicata* L. 'Red Fox' forced into bloom for 1 June, stored for 0 or 10 d, and planted outdoors suffered no detrimental effects from forcing or storing. Some of these forced herbaceous perennials exhibit a compact habit and modest postharvest life, making them potential indoor potted plants that can be enjoyed outdoors in the home garden. These plants are good candidates to be positioned as dual use plants performing well in the home and then in the garden.

The product life cycle. Products, like biological organisms, pass through four distinct stages: life-cycle introduction, growth, maturity, and decline, with each stage requiring different marketing strategies to promote sales (Kotler, 1997) (Fig. 1). When a product is launched, sales growth is slow and profits are nonexistent. During the growth stage of the life cycle, rapid market acceptance and sales spur substantial profit generation. The maturity stage is characterized by leveling sales and declining profits, often because the market has become saturated with substitute products or undifferentiated products that are essentially commodities yielding minimal profits. Finally, in the decline period, profits and sales dramatically drop and the product category is in danger of extinction. If marketers take action to rejuvenate the product or introduce new products into the category, then the life cycle can begin anew.

Flowering plant market. In 1980, the total wholesale floriculture market was valued at \$953 million (U.S. Dept. of Commerce,

Product Life Cycle

Fig. 1. Product life cycle.

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1988). By 1995, the value had increased to \$3.72 billion and rose further to \$4.57 billion in 2000 (National Agricultural Statistics Service, 2001). This market grew at an average of 10% annually over 20 years yet slowed to an average of 3% annual growth over the last five years (all values were adjusted for inflation using Consumer Price Index, 2000). Two of five distinct divisions of floriculture production are bedding plants and flowering potted plants. Bedding plants have grown from a wholesale value of \$180 million in 1980 to \$1.35 billion in 1995 and to more than \$2.1 billion in 2000 (National Agricultural Statistics Service, 2001). Annual growth averaged 23% over the last 20 years but has slowed to 8% annually over the last 5 years. This modest growth rate is indicative of a product in the growth stage of the product life cycle.

Growth in the value of flowering potted plants has not been as dramatic. Wholesale value increased from \$210 million in 1980 to \$662 million in 1995 and to \$701 million in 2000, or 4% growth annually over the last 20 years, slowing to merely 0.3% annual growth in the last 5 years when adjusted for inflation. Growth rate increases approaching zero are indicative of a product in the mature stage of the product life cycle.

Within the category of flowering potted plants, specific examples of stalling and decline in growth are evident. Plants such as African violet (*Saintpaulia ionantha* H. Wendl.), florists' azalea (*Rhododendron* sp. L.) and kalanchoe (*Kalanchoe blossfeldiana* Poelln.) have experienced limited to negative growth in the past 5 years. African violet has declined in value from \$25 million in wholesale sales 1995 to \$18 million in 2000 (34% decrease, 6.7% annual average decline) and azalea has decreased in value from \$57 million in 1995 to \$55 million in 2000 (15% decrease, 3% annual decline). These examples contribute to the notion that flowering potted plants have reached the mature stage of the product life cycle.

Multidimensional scaling. One research method that could help marketers understand how to position perennials as new flowering plants is perceptual mapping. Through the use of multidimensional scaling (MDS), researchers can form a spatial map that represents consumers' perceived relationships among products, or a perceptual map (Kotler, 1997). A perceptual map can be defined as "an attempt by a researcher to determine the perceived relative image of a set of objects" (Hair et al., 1992). Maps are developed using paired comparison data and estimate a spatial representation of products and positioning options (Baier and Gaul, 1999). The two-dimensional space is depicted by two axes on which objects are distinguished from one another (Hair et al., 1992). Knowing what interests the consumer about a product gives the marketer an opportunity to influence purchase habits (Simonson, 1992). A perceptual map gives marketers the ability to see in a 2-dimensional space how consumers think about products. Used extensively in non-agricultural businesses, perceptual mapping is an accepted methodology for investigating consumer perceptions of a group of products

(Bigne et al., 2002; Drewnowski, 1996; Heymann, 1994; Nelson and Rabianski, 1988). These maps are created by asking consumers to compare pairs of products and rate their similarity. Computer software (for example, the ALSCAL program in SPSS) manipulates the paired comparison "distances" and creates a perceptual map. The map shows researchers the major dimensions by which consumers classified or grouped products. To date, there are no published studies of perceptual maps in the horticultural literature. If perceptual maps can be created with selected flowering plants, horticultural marketers would better understand floral consumers' perceptions of traditional flowering potted plants and more successfully position "new" products. Inviting consumers to be involved in the process of creating new products gives the industry invaluable input and businesses the opportunity to fine-tune the final stages of product development to ensure that a desirable product is placed on the market (Dickenson and Wilby, 1997).

Flower color. One important feature of flowering potted plants is bloom color, often a deciding purchase factor. Behe et al. (1999) showed that flower color was the most important purchase factor when consumers were asked to consider buying geraniums (*Pelargonium xhortorum* L.H. Bail.). When investigating geranium attributes, researchers found that flower-color was nearly three times as important as price. 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 (2000), a group of 650 designers and marketers who determine color trends, "blue will become the most important color of the next decade." Blue flowering plants have become popular, and *USA Today* published an article extolling the virtues of using blue in the landscape (Sell, 1999).

Because no information exists about consumers' perceptions of flowering plants, we wanted to develop a perceptual map to provide marketers with some fundamental information on which to base decisions regarding positioning forced perennials as new flowering potted plants. The objectives of this study included the determination of consumer preferences for plant use and color and the development of a perceptual map. Our hypothesis was that consumers with an interest in gardening would recognize some plants as traditional, indoor potted plants and others as outdoor garden perennials. We hypothesized that the use (indoor/outdoor) associations would appear as a primary dimension on the perceptual map and that flower color might emerge as another dimension. Products mapped centrally would have no strong associations and thus could be excellent candidates to be positioned as new flowering potted plants.

Materials and Methods

We chose nine flowering plants based on their differences in use (indoor or outdoor), plant habit or form, and flower-color. Six plants were traditional outdoor garden plants: *Aquile-*

gia xhybrida Siebold & Zucc. 'Blue Bird' (blue and white), *Campanula carpatica* 'Blue Clips' (blue), *Delphinium grandiflorum* L. 'Blue Mirror' (blue), *Oenothera fruticosa* L. var. *Youngii-lapsley* (yellow), *Oxalis crassipes* Urb. 'Rosea' (pink), and *Sedum spectabile* Boreau 'Brilliant' (pink). Three plants were traditional potted flowering plants: *Kalanchoe blossfeldiana* (yellow), *Rhododendron* sp. (pink), and *Saintpaulia ionantha* (purple).

The complete factorial design to compare all nine plants would require consumers to make 38 comparisons. We divided the 38 comparisons into two separate surveys to reduce participant fatigue. Each survey contained 20 comparison questions with a repeat of the first pair at the end of the survey form to serve as an anchor in analyses. Participants completed only one survey form which consisted of one standard legal-size page printed portrait style with both sides printed to make two pages. We interspersed eight gardening behavioral questions, seven demographic questions, and 13 plant preference questions throughout the survey to reduce boredom. The gardening behavioral questions addressed issues relating to gardening experience and habits: 1) the number of hours per week they spent gardening; 2) the number of plants they purchased for indoor display in 1999; 3) dollars spent on their lawns and gardens in 1999; 4) a rating of how friends saw their gardening experience; 5) a rating of how friends perceived their gardening enjoyment; 6) the percentage of their property devoted to vegetable gardens, flower gardens, and lawn; and 7) dollars spent on perennial and annual plants in 1999. Demographic questions captured participants' gender, age, education level, income level, family status and property size. Preference questions addressed indoor/outdoor use preference among the nine plants as well as which of the nine plants were preferred for: 1) use in an outdoor garden bed; 2) decoration in the home; 3) most preferred flower-color; and 4) use as a gift. The Michigan State Univ. Committee on Research Involving Human Subjects approved the survey in accordance with U.S. federal law and university policy.

Plants were photographed to maintain consistency over the survey period, showing plants with no visible container against a black background. These were displayed on three black 91-cm x 91-cm foam boards. Two boards contained eight pairs of photographs, and the third board contained four pairs of photographs and individual photographs of the nine plants. Boards were rotated every hour so that every other hour the same display order was given to quantify order effect.

Consumer perceptions were measured by using a semantic differential scale, which consisted 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 dissimilar plants received a rating of 7. By transforming participants' judgments of similarity into distances represented in a multidimensional space, the plants were visually clustered on a grid.

We selected Detroit as a site to administer the survey because its population is similar demographically to the entire nation on average and is a viable test market (Waldrop, 1992). Detroit has an annual flower show, Bloomfest, which was a venue where researchers could intercept consumers with a range of interests in flowers and plants. Since 67% of American households participate in lawn and gardening activities (National Gardening Association, 2000), a self-selected sample of visitors to a flower and garden show would provide a sample of potential consumers with an interest in gardening and predisposition to purchase indoor and outdoor garden products. On 7 and 8 Apr. 2000, 200 completed responses were collected at the Flower Show in Detroit, at Cobo Hall Exhibition Center where Bloomfest was held. Completed surveys were coded and entered into a computer spreadsheet (Excel 97) for statistical analysis (SPSS 10.0). The statistical analysis of the paired comparisons was conducted by using a multidimensional scaling program, ALSCAL, 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 and Discussion

Two hundred completed surveys were obtained, with an average completion time of 10 min each.

Gender, age, education, income, and household size. Participants were predominantly female (78.2%) and had completed a mean of 15.4 years of formal education. Fifty-six percent of the participants had completed 16 or more years of formal education, or the equivalent of a bachelor's degree. Only 25% of Americans hold a bachelor's degree or higher (Mitchell, 1998), so more of these participants had a higher education level than the average American. Households included a mode of two adults (63.4%) and zero children (61.7%). The mean 1999 household income category for participants was \$50,001 to \$75,000. Participants had a mean age between 47 and 48 years, while the mode was 54 years old (6.4%). This sample was mainly composed of women in their late forties who likely were college educated and had a middle- to upper-income household. According to the National Gardening Association (2000), gardeners who participated 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; 41% were married with children.

Property and usage. Participants' median property size was 1394 m² (<1 acre), while the mode (6.3%) was 4047 m² (1 acre). Twenty percent of the participants had lawns of 1/4 to 1/2 acre, with 25% having property >1 acre. Fetto (2001) reported that 26% of all single-family dwellings were on lots >1 acre. He also reported that individuals living in residences with land between 1/4 acre (1012 m²) and 1/2 acre (2023 m²) had the highest median annual household income. Survey participants were asked to di-

vide 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, 30% for flower gardening, and 10% for vegetable gardening.

Gardening enjoyment and experience. Participants were asked to rate "how their friends perceived their level of experience and how they would rate their level of gardening enjoyment on a seven-point Likert scale. The mean score for gardening experience was 4.9, indicating that most participants considered themselves to have an average to slightly above average level of gardening experience. The mean for gardening enjoyment was 6.2, indicating that many participants liked to garden. Experience and enjoyment levels were moderately correlated with each other ($r^2 = 0.479$, $P = 0.001$). Experience ($r^2 = 0.187$, $P = 0.012$) and enjoyment ($r^2 = 0.247$, $P = 0.001$) increased with hours spent in the garden. Older gardeners experienced slightly less enjoyment ($r^2 = -0.184$, $P = 0.013$). As annual bedding plant expenditures increased, so did gardening enjoyment ($r^2 = 0.197$, $P = 0.011$).

When gender comparisons were made, more female participants rated themselves higher on gardening experience (chi square, $P = 0.001$) and had more gardening enjoyment ($P = 0.001$) than males in the study. This finding was consistent with that of Hardy et al. (1999), who found that more female gardeners enjoyed gardening enjoyment and considered themselves plant experts than males.

Dollars and time spent in the garden. Participants gave a wide range of responses when asked how much time and money they spent in or on their lawns and gardens in 1999. The mean dollars spent was \$360, the mode was \$200 (17.1%), and the median was \$200. The national average for lawn and garden expenditures was higher in 1999 at \$532 (National Gardening Assn., 2000).

More specifically, participants were asked how much they spent on annual plants in 1999. Answers ranged from \$0 to \$3000, with a mode of \$100 (21.9%). The second most frequent response was \$50 (12.9%). When participants were asked about perennial plant expenditures in 1999, the mode was \$100 (13.5%). The second most frequent response for perennial expenditures was also \$50 (11.2%). Expenditures on annuals and perennials were similar to the expenditures on flower gardening reported for 1999 as \$102 (National Gardening Association, 2000). Their study showed that individuals clas-

sified as professionals spent an average \$127 on flower gardening and individuals ages 30 to 49 spent \$118. Total bedding plant expenditure (annuals and perennials) for 1999 increased as income ($r^2 = 0.202$, $P = 0.013$) and property size ($r^2 = 0.269$, $P = 0.002$) increased.

Participants were asked to quantify how many hours per week they spent in their gardens in a typical spring month, with responses ranging from 0 to 150 h. The mean was 13.5 h, while the median and mode were 10 h (17.3%). The number of hours spent gardening increased as number of adults living in the household increased ($r^2 = 0.302$, $P = 0.001$). People who spent less time in the garden had fewer adults in the home, spent less on bedding plants, lawn, and garden products and had lower levels of gardening experience and enjoyment.

Indoor/outdoor use. Many of the participants had not purchased indoor flowering potted plants in the past year (26%). However, 11% had made one purchase, and an additional 13% had made two purchases. The mean number of indoor flowering potted plant purchases was 3.8, with a median of 2 and mode of 0. Regression tree analysis of indoor flowering pot plant purchases showed insufficient variation to split into actionable customer segments. There was no relationship between purchases of indoor plants and annual expenditures ($P = 0.8490$) or perennial plants ($P = 0.7860$).

Participants were asked to view a plant photograph and indicate where the plant should be used: indoors, outdoors, or both. In every question regarding use of perennials, a majority of participants indicated those plants should be used outdoors (Table 1). However, there was a large group of the sample who identified *Campanula* and *Oxalis* for both indoor and outdoor use. When asked about the traditional indoor plants, responses were not as definite (Table 1). The majority of participants identified *Saintpaulia* 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. A series of four questions asked participants to identify the most preferred among all nine plants in four situations. When participants were asked about plants for use in an outdoor garden bed, the top three responses were *Aquilegia* (25%), *Sedum* (18%) and *Campanula* (14%), which are all herbaceous perennials. When participants were asked about plants for use for decoration in

Table 1. Survey sample responses to use preference of three traditional indoor and six traditional outdoor flowering plants. Use choices were indoor, outdoor, or both indoor and outdoor.

Species	Use			
	Traditional	Outdoor (%)	Indoor (%)	Both (%)
<i>Aquilegia</i>	Outdoor	79	6	15
<i>Campanula</i>	Outdoor	52	6	42
<i>Delphinium</i>	Outdoor	82	5	13
<i>Kalanchoe</i>	Indoor	28	20	52
<i>Oenothera</i>	Outdoor	79	4	17
<i>Oxalis</i>	Outdoor	52	7	41
<i>Rhododendron</i>	Indoor	20	14	66
<i>Saintpaulia</i>	Indoor	4	75	21
<i>Sedum</i>	Outdoor	69	4	27

the home or gift, the top three answers were *Saintpaulia* (32% and 25%), *Kalanchoe* (20% and 13%), and *Rhododendron* (20% and 18%), all traditional indoor flowering potted plants. However, the fourth and fifth most frequent responses were *Campanula* (9%) and *Oxalis* (8%), both herbaceous perennials. The top three responses about preferred flower color were *Aquilegia* (blue with white; 18%), *Campanula* (blue; 18%), and *Rhododendron* (pink; 18%). In total, 52% of the sample preferred plants with flowers that had a blue hue (*Aquilegia*, *Campanula*, *Saintpaulia*, and *Delphinium*), which was consistent with the literature that says blue is a trendy flower color.

Perceptual map. A perceptual map is depicted in two dimensions, indicating the two most significant attributes of the objects, derived subjectively by researchers inferring the manner in which objects were clustered. The x-axis appeared to be a use dimension, with traditional indoor flowering potted plants mapping to the left of the central point and outdoor herbaceous perennials mapping to the right (Fig. 2). Along the x-axis, there were three distinct plant clusters. The first cluster was between -1.88 and -0.72 and included *Rhododendron*, *Sedum*, *Kalanchoe*, and *Saintpaulia*. Three of these four plants are traditionally used indoors. *Sedum*, a herbaceous perennial, is similar in form and color to *Kalanchoe*. The second cluster along the x-axis was between 0.19 and 0.29. The two plants in this group were *Oxalis* and *Campanula*. These plants have a similar compact form or habit, and both are herbaceous perennials used outdoors but with indoor appeal. The third x-axis cluster fell between 1.2 and 1.56 and included *Delphinium*, *Aquilegia*, and *Oenothera*. These three herbaceous perennials are used outdoors.

The y-axis appeared to be a flower-color dimension. Between 2.0 and 0.0 were plants with blue and red hues, while between 0.0 and -2.0 there were yellow hued plants and one red hued plant. *Kalanchoe* and *Oenothera* had very strong yellow association (within 0.03 of each other -0.63 to -0.66). *Sedum* was plotted in the negative y-axis range; however, it was such a pale pink that it might have been perceived as white.

When both axes were examined, definite groups emerged. The most distinct group (third x cluster, y-axis range 0.72 to 0.64) was composed of plants with similar use and color: *Aquilegia* and *Delphinium*. *Oenothera* did not cluster with them but fell alone in the lower right quadrant of the map (1.21, -0.66).

The next noticeable grouping (middle cluster) was composed of *Oxalis* and *Campanula* (second x cluster, y-axis range 0.29 to 0.01). Because of their closeness to the center of the axes (<0.5 x and <0.5 y), the sample group may have had the opinion that these two plants were not exclusively for either indoor or outdoor use. The clustering toward the center may indicate that there is a willingness to accept these types of plants for dual use: both indoors and out. *Rhododendron* and *Saintpaulia* 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 use; however, *Rhododendron* fell much closer to the center of the x-axis indicating it was 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 similar in form and both are succulent plants. More than one-quarter of the sample showed a willingness to use *Sedum* and *Kalanchoe* both indoors and outdoors (Table 1).

Conclusions

The main map dimensions were characterized as use (indoor traditional flowering potted plants vs. herbaceous perennials traditionally used outdoors) and flower color. *Campanula* and *Oxalis* clustered together toward the center and were identified as usable indoors and outdoors by at least 41% of the sample. These plants were also preferred for use as a decoration in the home by a total of 17% of the sample. *Campanula* has trendy blue flowers, which may be more profitable in the marketplace if it is in high demand. *Campanula* can be produced as a flowering potted plant and positioned for use both indoors and out, benefitting growers who are looking for ways to improve sales of potted flowering plants while maintaining sales of bedding plants.

The market for indoor flowering potted plants could benefit from the introduction of new products, stimulating sales and profitability. With no relationship identified here between indoor potted plant purchases and expenditures on annuals and perennials, introducing either *Campanula* or *Oxalis* as new potted flowering plants would not detract from existing sales of perennials. Surveyed individuals in this sample from upper-income households or who expressed a high level of garden experience spent more on outdoor perennials. Positioning these two plants as dual use may increase overall sales of flowers, regardless of where they are used and enjoyed. Future studies should expand the number and type of plants included in the perceptual map to identify additional candidates for dual-use positioning.

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Fig. 2. Perceptual map.

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