Combinations of Colors and Species of Containerized Edible Flowers: Effect on Consumer Preferences

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Abstract. Do consumers prefer certain combinations of edible-flower species and colors over other assortments? Two hundred and sixteen people were self-selected for a survey at a Michigan flower show to rate 15 photographs of edible flowers arranged in 0.24-L, clear, plastic containers. Each container had either an individual species or combinations of Viola tricolor L. ‘Helen Mount’ (viola), Borago officinalis L. (borago), and Tropaeolum majus L. ‘Jewel Mix’ and ‘Tip Top Apricot’ (nasturtium). To determine what color(s) of nasturtium participants would prefer, containers held either orange and crimson, peach and cream, or a combination of all four flower colors. Participants rated photographs using a semantic differential on a 7-point Likert scale (7 being the highest rating) based on their likelihood to purchase each container of edible flowers to serve to family and friends in a meal. Participants were asked an additional 21 questions regarding their attitudes about edible flowers, gardening habits, dining habits, and several demographic questions. Responses were subjected to conjoint analysis (SPSS Inc., Chicago). The addition of other species to nasturtium (viola, borago, viola, and borago) had a greater relative importance (53%) than the color of the nasturtium (47%). A mixture of all four nasturtium colors (peach, cream, orange, and crimson) was awarded the highest utility (0.091). Peach and cream nasturtiums or containers that did not contain any nasturtium flowers at all were least preferred (~0.070 and ~0.083 utilities, respectively). Mean ratings that participants assigned to containers of edible flowers supported these utilities. The container assigned the highest mean rating included nasturtiums of all four colors, yet 66% were unlikely to purchase any container with 10% insect damage. Differences in preferences were noted using selected demographic characteristics, including gender, age, and income.

Several producers now sell edible flowers in small, rigid, plastic containers in grocery and specialty retail stores. Conversations with produce managers have revealed that many of these packages are not sold before the expiration date, and customer requests for packages are usually more prevalent during the Christmas and Easter holidays. Kelley et al. (2001b) showed that consumers prefer a 9-count (0.24-L) container, priced at $2.99, including all three colors tested (orange, yellow, blue) of edible flowers.

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professional chefs awarded the visual and taste attributes of nasturtium with acceptable ratings, with chefs rating visual appeal and desire for nasturtium the highest, 96% and 92%, respectively. Also, nasturtiums are a component of several edible-flower mixes currently sold in retail outlets.

To determine whether participants would prefer light- or dark-colored nasturtiums, packages containing cultivars such as 'Jewel Mix' and 'Tip Top Apricot' were constructed as were packages with mixes consisting of light-colored (four peach nasturtium, four cream), dark-colored nasturtiums (four orange and four crimson), and a mixture of all four colors (two of each color). To test the importance of nasturtium in the mixture, participants also viewed photographs of containers without any nasturtiums. Additional species were added to several containers to determine the relative importance of this dimension. The nasturtium mixes were then further developed to include either: a) 32 viola flowers; b) 32 borage flowers; c) 16 viola and 16 borage flowers; or d) no additional species. When additional species were added, the total number of nasturtiums used dropped from each one of the participants' four containers. Our two-tailed t-test, a two-tailed test and the Kruskal-Wallis test. The experiment was approved by the University Committee on Research Involving Human Subjects, Michigan State Univ.

Results and Discussion

Of the 217 participants, 150 (69%) had eaten edible flowers before, with 96% stating that they would eat edible flowers in the future. Of those who had previously eaten edible flowers, only three participants listed species that were not recognized as being edible. When participants were asked about using edible flowers, 82% were very likely to use edible flowers as a garnish, 72% were very likely to use it as a salad ingredient, and 56% were very likely to use it as an ingredient in a meal.

Participants were also asked how they would acquire edible flowers. Thirteen percent indicated that they had purchased edible flowers prior to attending a Bloomfest, with the majority purchasing the product from grocery or specialty retail stores. Eighty-eight percent indicated that they would be likely to purchase edible flowers in the future. To explore other places where these participants would get edible flowers, they were asked if they grew edible flowers in their gardens. Fifty-two percent percent indicated that they have done so in the past, 72% indicated that they would be very likely to grow edible flowers in their gardens, 5% would be likely, and 23% would be very unlikely to do so. Those who had indicated that they did grow edible flowers in the past had done so within the growing season of 1998 and/or 1999. All participants who answered this question were growing species that authorities listed as being edible.

Participants spent an average of 13 h per week gardening during the spring and summer months. Thirty-seven spent 20 h weekly, three people spent 50 h weekly, and four people did not garden at all. Flowers, vegetables, and lawns occupied a mean of 43%, 12%, and 44% of their garden space, respectively. With a large portion of garden space devoted to vegetables and flowers, homeowners could introduce several species of edible flowers, both those commonly planted for decoration and the flowers of plants used as herbs and vegetables.

When considering edible-flower quality, the participants were asked how likely they would be to purchase edible flowers with 10% insect damage. Only 21% would be very likely to purchase edible flowers with this amount of damage, 11% would be likely, but 66% would be very unlikely. When asked how likely they would be to purchase edible flowers that were grown organically, 73% indicated that they would be very likely, 13% would be likely, and 14% would be very unlikely.

Although the majority of participants want flowers from gardeners, they want them without pesticides. However, no pesticides are labeled for edible-flower production (Kosztolnyik, 1996). Flower quality will be a key factor, as it was in a previous experiment when participants rated edible-flower quality.

With the help of chefs, a product such as edible flowers can be introduced to large numbers of consumers who could then experiment with food and ingredients in their own homes. To determine the likelihood that these participants would be exposed to such creations, participants were asked how often they ate dinner at a restaurant the previous week. Two percent of participants reported eating dinner in restaurants six times during the previous week. The highest percentage, 29%, ate out twice the previous week. Only 21% ate all their meals at home the previous week. With 79% of the 217 participants eating out at least once the previous week, chefs may have a great impact on the cooking style and specialty items that these participants use in their home when entertaining family and friends.

Participants valued additional species slightly more (53% relative importance compared to the average) than flower color (47% relative importance) (Table 1). Only three changes improved perceived value of an edible-flower container, as indicated from the utility scores: a) adding viola; b) full complement of four nasturtium colors; and c) addition of dark nasturtium colors. Adding viola to the nasturtium mix increased that container’s value the most of any modification, because the higher utility score indicates a preference that is more or less over an average or ideal. The positive utility observed from adding species to containers indicated that participants valued these containers more than a theoretical average container. The addition of viola and borage reduced perceived container value by –0.080. Yet, with a utility of –0.080, the combination of nasturtium, borage, and viola was more favorable than no species (single species or no mix) and more favorable than the addition of borage to nasturtium.

A greater combination of colors was valued over a smaller combination. We compared the utilities of nasturtium color to the mixture of all colors (peach, cream, orange, and crimson). The most diverse combination received a utility of 0.091 and was more favorable than the orange and crimson nasturtium (0.062). Participants did not value peach and cream nasturtiums more than the average. This pastel-color combination received the lowest utility of –0.070, lower than the utility for no
nasturtium (–0.083). Our interpretation of these results is that participants prefer at least some nasturtiums in the mix and that a mixture of colors, especially darker ones such as orange and crimson, is more appealing.

When mean ratings for the 15 containers were tested using a one-sample t test, all ratings were significantly different (Table 2). The container with the mixture of all four nasturtium colors had the highest mean rating of 4.9, followed by orange and crimson nasturtiums with borage flowers (4.87). The container with borage flowers had a mean rating of 4.4, which was the next lowest mean. Though the orange, red, and blue mix may have appealed to the participants, all other combinations that included borage and the mixture of viola and borage were in the lower half of the mean ratings.

Third highest mean rating was the mixture of all four nasturtium flowers and viola (4.8). Seventy-three percent of participants noted that they would prefer a mixture of edible flowers as opposed to a container with one species, although a few verbal comments indicated that this perspective was based on usage occasion. For example, a mixture would be preferred when decorating a cake, but a single species may be more desirable to create uniform plates for use in a salad.

Based on results from the experiment conducted at Bloomfest in 1999, participants preferred containers with a mixture of colors (Kelley et al., 2001b). In 1999, the container awarded the highest rating was the 9-count (0.24-L) container that included all colors (orange, yellow, and blue). Second was the smaller container with all three colors (0.47). Data from 2000 confirmed participants’ preference for a mixture of colors when the container with all four colors (peach, cream, orange, and crimson) received the highest mean rating. Containers with only one species/color such as viola and borage had the fourth and 14th highest mean of the 15 containers, respectively.

We found that the inclusion of (blue) borage was perceived as a negative contribution to the container, similar to results from other experiments. This result may indicate that there is some characteristic about the flower that is not appealing to participants. At tastings where consumers evaluated the attributes of three edible-flower species, borage received high visual ratings for appeal, desire, and interest with at least an 81% favorable rating (Kelley et al., 2001a). Therefore, it may be a certain feature of the borage flowers that did not appeal to participants at Bloomfest 2000. Other experiments can be conducted in the future to determine if it is the size of borage, the green sepal, the prominent black pistils, or another facet of the flower that persuaded participants to award borage such low ratings. Inclusion of borage and viola to the mix was also perceived as a negative contribution to the container. Participants in this experiment did not find combinations of these additional species appealing and these same participants may not be willing to purchase a container of flowers with borage or the viola and borage combination.

Table 1. Conjoint analysis of participants’ ratings of flower color and species in 15 photographs.

| Factor | Relative importance | Utility | Significance |
|--------|---------------------|---------|--------------|
| Nasturtium color | 46.88 | 0.091 | * |
| Orange, crimson, peach, and cream nasturtiums | 4.8704 | 0.091 | * |
| Orange, crimson and cream nasturtiums and borage | 4.7593 | 0.070 | * |
| Orange and crimson nasturtiums | 4.7577 | 0.070 | * |
| Orange and crimson nasturtiums and viola | 4.6479 | 0.070 | * |
| Peach and cream nasturtiums | 4.6106 | 0.070 | * |
| Orange and crimson nasturtiums | 4.6106 | 0.070 | * |
| Orange and crimson nasturtiums, viola, and borage | 4.5687 | 0.070 | * |
| Orange, crimson, peach, and cream nasturtiums and borage | 4.5981 | 0.070 | * |
| Peach and cream nasturtiums and borage | 4.4541 | 0.070 | * |
| Orange and crimson nasturtiums, viola, and borage | 4.4465 | 0.070 | * |
| Orange, crimson, peach, and cream nasturtiums, viola, and borage | 4.3821 | 0.070 | * |

Participants with an income of $60,000 and higher were more likely to purchase edible flowers for a meal or for a salad, flowers that were grown organically, and with 10% insect damage. These participants were also more likely to grow their own edible flowers than participants with an income of $59,999 or less.

Participants in a single-family household were more likely to purchase edible flowers for a meal and a garnish, but were less likely to purchase edible flowers for a garnish than were the participants with two or more people in the household. Single participants were more likely to purchase edible flowers if grown organically, were more likely to grow their own edible flowers, and were less likely to purchase edible flowers with 10% insect damage. Single participants ate a higher mean number of meals out the previous week.

Participants with one or more children were more likely to purchase edible flowers for a meal and a garnish, and to use them as a garnish. In addition, they would be more likely to purchase edible flowers that were grown organically, more likely to grow their own flowers, and very likely to purchase edible flowers with 10% insect damage.

Conclusion

Participants in this survey preferred containers of edible flowers with more than one color of nasturtium and/or containers of nasturtiums with an additional species. Contain-
Percent who have eaten edible flowers before 101 103 177 36 76 136 86 106 38 163 55 44

Percent who would consider eating edible flowers 69 73 73 69 58 77 69 72 63 72 65 68

Percent who have purchased edible flowers before 94 99 96 97 95 97 99 93 97 96 94 96

Percent who would consider purchasing edible flowers 12 13 13 11 12 13 9 17 22 11 14 16

Percent who would be very likely to purchase edible flowers for a meal 84 91 91 78 85 90 93 84 96 85 100 85

Percent who would be very likely to purchase edible flowers to eat in a salad 54 48 58 49 54 57 52 54 58 55 57 61

Percent who would be very likely to purchase edible flowers if grown organically 69 75 74 61 68 74 66 76 68 74 71 73

Percent who would be very likely to grow edible flowers 82 81 85 67 89 80 81 81 87 82 78 89

Percent who would be very likely to purchase edible flowers with different types of edible flowers as compared to a single type of edible flower 73 73 72 80 71 75 75 72 62 75 76 59

Percent who would prefer a mixture of different types of edible flowers to grow organically 51 56 53 50 55 52 54 54 60 51 55 39

Mean number of dinners cooked at home the previous week (1 week = 7 days) 4.4 5.1 4.7 4.8 4.7 4.7 4.4 4.9 4.2 4.9 4.7 4.9

Mean number of dinners eaten out the previous week 2.1 1.8 1.9 2.0 1.9 1.9 2.1 1.9 2.5 1.8 2.1 1.9

Mean number of hours spent gardening each week 13.4 13.9 13.2 14.2 16.6 11.7 12.8 13.7 12.6 13.6 12.5 13.2

Mean percent of garden that is flowers 43 44 44 40 45 42 43 42 46 42 44 42

Mean percent of garden that is vegetables 11 13 10 19 15 10 14 10 11 12 12 10

Mean percent of garden that is lawn 44 42 45 38 38 47 40 48 39 45 40 46

Table 3. Effects of age, gender, education, income, number of adults in the household, and number of children in the household on consumers’ responses about edible flowers, gardening habits, and eating habits.

*Difference of variables within categories (age, gender, etc.) significant at *P* ≤ 0.05 based on a two-tailed binomial test, *t* test, and Kruskal–Wallis test.

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