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The most valuable player may not be on the winning team: Uncovering consumer tolerance for color shades in roses

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ABSTRACT

Color is often found to be the most important factor driving consumer purchase decisions for flowers. However due to the sheer number of flower color options available, pinpointing which flower shades to aim for in a breeding program is a complex task. Discussions with local growers revealed discrepancies between color preferences previously identified and actual consumer demand. The present work examines this in further detail by applying two methods of testing consumer flower color preference with the same panel of consumers: conjoint analysis using color categories and a follow-up question asking consumers to pick their 3 most preferred colors from a chart of 60 colors. Consumers were found to have different tolerance ranges for shades across color categories. Consumers have a wide range of tolerance for red colors, making this a safe target as nearly all shades of red tested were well liked by consumers. By contrast, in the yellow category there was one very high performing shade, with consumer preference dropping off sharply with any deviation from this shade. While this particular shade of yellow could potentially be highly successful with consumers, it is a riskier target as breeders would have a narrow range of tolerance in shade variation to achieve consumer success. This study presents a new understanding of consumer preference as it suggests that consumers exhibit not only preference intensity for sensory stimuli, but also a tolerance range for variations on the stimulus. Interestingly, tolerance ranges are not consistent across categories of sensory stimuli (e.g. color categories).

1. Introduction

While examining the factors that impact consumer preference for flowers, flower color is typically found to be a top consideration governing purchase decisions (Behe et al., 1999; Getter & Behe, 2013; Kelley, Behe, Biernbaum, & Poff, 2001; Palma, Hall, & Collart, 2011). However pinpointing the right color to target during flower breeding is a complicated matter. Many flowers, especially roses, are not only available in hundreds of colors, they are also available in two-tone combinations of colors. The vast number of options would overwhelm any consumer panel and make it difficult to draw any conclusions about consumer preference for specific color shades.

A common approach to judging flower color preference in the literature has been to select a handful of specific colors to test and present consumers with live flowers or pictures of such flowers (Behe et al., 1999; Berghage & Wolnick, 2000; Kelley, Behe, Biernbaum, & Poff, 2002; Kelley et al., 2001). This approach has the advantage that the researcher and consumer will both have the same color hue in mind during evaluation therefore if a successful color is identified, the direction for product development is clear. However, the problem arises in the initial selection of the colors to present, as these must be selected either based on current product availability or by arbitrary selection. While this approach is great for producers narrowing down a product line where the handful of color options is already predetermined, it may not be suitable for creating entirely new cultivars with unconstrained color options to select from as it is unknown whether the handful of colors being tested are in fact optimal from the start.

Other studies have approached the flower color issue more broadly by simply naming a color category (i.e. peach-pink, red, yellow) with no visual stimulus to specify the hue or shade (Yue & Behe, 2010; Campbell et al., 2011, *Unpublished results*). In both of these studies, red flowers were the most popular. However, this information is difficult to use for breeding purposes as the color "red" can have many shades and not all may be equally liked.

Personal communications with local growers (Ontario, Canada) revealed that there was some disagreement between the findings of our initial rose study and their observed retail sales.

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Specifically several growers noted consumer demand for yellow roses, however the yellow rose category performed quite poorly in the first conjoint study on rose preferences conducted in our group (Campbell, Mhlanga and Lesschaeve, 2011. Consumer preferences for roses. *Unpublished results*). The poor performance of yellow flowers has also been noted whenever this color category appeared in the literature on consumer flower preferences (Kelley et al., 2001; Yue & Behe, 2010). This juxtaposition between research findings and real-life consumer behavior as well as a need to provide breeders with more concrete direction for rose color selections lead to the present study which takes a more in-depth look at consumer preferences for rose colors.

2. Methods

2.1. Survey

Participants of an online survey were engaged in a conjoint analysis questionnaire and then asked several follow-up questions on roses as well as questions pertaining to their personal demographics. Conjoint analysis is a technique that begins with the researchers selecting product attributes and attribute levels. These product attributes are treated as factors in a factorial design to create a series of hypothetical products consisting of various combinations of attribute levels (Brascamp, 2005). As a simple example, a rose may be determined by the attributes color, habit and price. In this case, a hypothetical product arising from the factorial design could be a red rose on an upright bush priced at $16.99 and another hypothetical product in the series may be a pink climbing rose priced at $9.99. During the course of a conjoint exercise, consumers are presented each such hypothetical product in the series one at a time, according to a randomized design, and asked to express their purchase interest for each product. The consumer data can then be analyzed to elucidate which factors drive purchase decisions and consumer preferences for the factor levels (Asioli, Naes, Granli, & Almli, 2014; Lillywhite & Simonsen, 2014).

In the present study, a ratings-based conjoint analysis was presented to consumers as a series of 32 rose product profiles. These profiles described hypothetical rose plants consisting of various combinations of the factor levels shown in Table 1. Before beginning the conjoint portion of the questionnaire, consumers were instructed to imagine that they are shopping for a standard-sized rose plant in a 2 gallon pot and that the description in the profile is written on the display stall. While considering the description as a whole, consumers were asked to rate how likely they would be to purchase the product on a scale of 0–100, with 0 indicating that they definitely would not purchase and 100 indicating that they definitely would purchase this product.

A particular focus of this study was to achieve a more detailed understanding of consumers' preferences for rose colors. Since this study was exploratory in nature and did not test any existing rose products, the choice of rose colors was unlimited. However, due to design constraints, only a handful of color options could be included in a conjoint analysis. In order to avoid limiting the color possibilities, it was decided to not present individual rose photographs in a handful of digitally manipulated colors. Instead, rose profiles in the conjoint analysis were described as belonging to a color category (e.g. red, pink, white, violet, two-tone, yellow–orange). Rose descriptions were presented to participants with a color chart showing the range of shades that should be considered for each color category. For example, if the rose product was described as "red", a color chart was presented which illustrated 10 different

Table 1
Factors and levels examined in the conjoint study on consumer preference for roses. Note that the "chart above" statement in the flower color factors refers to a chart similar to Fig. 1 (without instructions) that was presented with each product profile during the conjoint analysis.

Flower color	Habit	Blooming type	Price	Number of petals	Low-maintenance features
Any shade of pink shown in the chart above	Grows close to the ground and acts like groundcover	Blooms once per season	$13.49	Single or semi-double petals (4–16)	Resistant to black spot, a disease that may defoliate the plant
Any shade of red shown in the chart above	Usually grows on a trellis or a fence (climber)	Blooms several times throughout the season	$16.99	Double petals (17–25)	Resistant to powdery mildew, a disease that would leave white spots on the leaves
Any shade of two-tone/bi-color shown in the chart above	Upright bush	Blooms continuously throughout the season	$19.99	Full petals (26 or more)	Self deadheading (withered flowers fall off on their own)
Any shade of violet shown in the chart above	Suitable for container gardening (patio garden)		$23.99		Blank
Any shade of white shown in the chart above					
Any shade of yellow-orange shown in the chart above					

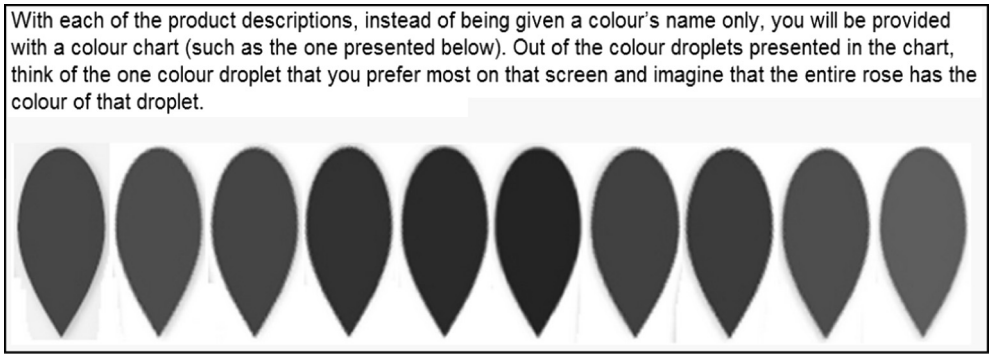

Fig. 1. Color chart with instructions provided to survey participants presented with each rose profile in the ensuing conjoint analysis.