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Cover Page Footnote

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Buzzworthy Messaging: Assessing Residents' Perceptions of Labels to Better Promote Pollinator Gardening

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Abstract. Consumers appear more likely to purchase plants with labeling indicating pollinator-friendly production or high pollinator resource value. No standardized label for pollinator-supporting plants or landscape practices exists in the United States, which has proliferated the variety of labels used by the industry. This mixed-methods study aims to provide insight into residents' preferred pollinator-related labelling for plants and landscape practices in order to help Extension professionals and green industry stakeholders improve outreach, marketing, and communications efforts. Findings suggest a butterfly-friendly label would be most effective for marketing while residents would accept and favorably perceive labels emphasizing either pollinator-friendly or bee-friendly attributes.

INTRODUCTION

Protecting pollinator populations has become increasingly critical. Wild and domestic bees are responsible for the majority of global pollination, which sustains biodiversity, ecosystem services, and human food security (Barrett et al., 2018; Klein et al., 2018; Patel et al., 2021). Land-use changes and urban expansion have diminished the health and density of bee populations through reduction and fragmentation of green space, increased chemical exposure, and decreased flowers and vegetation (Baldock, 2020; Theodorou et al., 2020). However, developed and urban landscapes—including residential yards—can be alternatively designed and managed to promote pollinators (Baldock, 2020; Theodorou et al., 2020).

For residential gardening to contribute to pollinator conservation, gardeners must be able to identify and obtain plant materials known to host and/or support pollinators. Research has suggested that consumers are significantly influenced by store labeling indicating whether plants can support pollinators (Campbell et al., 2017). For plant suppliers and retailers, a “pollinator-friendly” label can boost perceived value, enabling higher prices/revenues for these plants (Palma et al., 2012). Currently, no standardized or required label for pollinator-supporting plants exists in the United States, which has proliferated the variety of labels used by the industry (Khachatryan et al., 2017). Similarly, an online search produced a range of signage options for residents to indicate or certify that their yards support pollinators or wildlife. This study aimed to provide insight

into residents' preferred pollinator-related labeling for plants and landscape practices to help Extension professionals and other green industry stakeholders improve their pollinator gardening outreach, marketing, and communications efforts. Underscoring the research need, only one study was identified that compared consumer preferences for retailers' pollinator-focused plant labels (i.e., Rihn & Khachatryan, 2016), and no research was found on perceptions of labels for pollinator-related landscaping.

METHODS

As part of a broader sociotechnical project examining factors influencing conservation of managed and wild bees in developed and residential landscapes, we used an exploratory sequential mixed methods research design, first collecting qualitative data that informed the subsequent collection of quantitative data (Creswell & Plano Clark, 2018). We randomly selected 20 Florida adult gardeners for three focus groups from a frame of 1,352 eligible people who filled a recruitment and screening survey posted on social media. For the quantitative phase, we used nonprobability purposive sampling, with assistance from a survey sampling company, to collect data from 1,598 Florida residents through an online survey. Quota sampling targeting demographics reflective of the state's census data was used to decrease potential error (Lamm & Lamm, 2019).

Two open-ended qualitative prompts gathered participants' perceptions and knowledge regarding how they

defined pollinators and pollinator plants. The quantitative instrument then gathered residents' preferred labeling and terminology for plants and landscaping practices that support pollinators. Our quantitative modalities included drag-and-drop ranking of preferred terms for plant labels and randomized message testing. Respondents were assigned (~50/50) to view one of two visual messages for at least 5 seconds with "Is your landscape Bee-Friendly?" or "Is your landscape Pollinator-Friendly?" overlaying the same image of a bee on a flower (see Figure 1). We then asked questions to gauge respondents' emotional reaction to their message as well as their perceptions of and resonance with the bee-friendly and pollinator-friendly labels for landscaping and purchasing practices. All Cronbach's alpha measures of reliability exceeded the minimum threshold for these indices (> .80).



Figure 1. Visual message treatments randomly assigned to survey respondents.

Focus group transcripts were reviewed for accuracy and then imported into the qualitative analysis software NVivo (Version 12), where we applied thematic analysis to inductively compare and consolidate data within cohesive themes (Creswell & Plano Clark, 2018). We analyzed the quantitative data by using descriptive statistics (frequencies and central tendency measures), rate ratios, and independent and paired *t* tests. The rate ratio provided a measure of how likely a person was to respond to one treatment compared to another (Coggon et al., 2009) and was used to compare rankings of different terms.

FINDINGS

Bees were central to many focus group participants' definitions of a pollinator, while other flying organisms were also mentioned (see Table 1). Participants also described hosts for pollinators (e.g., flowers and plants) as well as the products of pollination that humans consume.

Multiple participants defined a pollinator plant based on flower structure and characteristics including pollen accessibility, coloring, and scent (see Table 2). A range of types of plants, including many consumed by humans, was

Table 1. Representative Qualitative Responses for the Definition of a Pollinator

Selected quotes from 18 documented in response to this prompt
First thing would definitely be bees. Followed by flies and wasp and moths and butterflies.
Definitely bees, flowers, plants, living things.
Buzzing things is how I classify it because I feel like everything that pollinates buzzes in some fashion.
Something that helps something else to grow. I also think about lots of the fruits that we eat that won't exist if we don't have pollinators. So, I guess, about the thing more so than the actual beings that do it or elements that do it.
...bees, wasps, anything that flies and carries pollen.

Table 2. Representative Qualitative Responses for the Definition of a Pollinator Plant

Selected quotes from 21 documented in response to this prompt
I don't know what the actual botanical name is, but basically it doesn't have a whole lot of petals and crap that they have to get into to get the pollen out. Like zinnias are perfect because the pollen is right there on top, and tomatoes and that kind of stuff. Fruit plants, or tomatoes, zucchinis, anything that needs to be pollinated.
I'd say bright color for one to attract. Plenty of scent, generally, they like to kind of draw them in. For hummingbirds if it's got a nice long tube, so they can have something to dip down into, and just abundance of food there so that they can bring in the family and feed the whole family so that we get a lot more of them so they can go elsewhere and keep pollinating.
I agree with her about the native. I actually let some of my weeds grow, because the bees love them. Even the grass, sometimes I cut around them. And I think when I buy flowers to help the bees come, I usually get the flat-top flowers, because I think it's harder for the bees to get. I hardly see any hummingbirds in my area. So, I try to get them all flat. That's mostly native and flat-looking flowers for the bees and the smaller pollinators to get to it.
So, they do look a lot like weeds, but they have their purpose. I don't know what I think about them. We just have an area where they are. They're definitely not always something that you cut and give to somebody in a bouquet.

Table 3. Ranking of Plant Labels (Most Likely to Purchase With Label)

Term	f	%
Butterfly-Friendly	435	27.2
Bee-Friendly	314	19.6
Wildlife-Friendly	306	19.1
Biodiversity-Certified	191	12.0
Pollinator-Safe	177	11.1
Pollinator-Friendly	175	11.0

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Table 4. Rate Ratios Comparing First-Ranked Term Preference

	Butterfly-Friendly	Bee-Friendly	Pollinator-Friendly	Pollinator-Safe	Wildlife-Friendly	Biodiversity-Certified
Butterfly-Friendly	1.00	1.39	2.47	2.45	1.42	2.27
Bee-Friendly	0.72	1.00	1.78	1.77	1.03	1.63
Pollinator-Friendly	0.40	0.56	1.00	0.99	0.58	0.92
Pollinator-Safe	0.41	0.57	1.01	1.00	0.58	0.93
Wildlife-Friendly	0.70	0.97	1.74	1.72	1.00	1.59
Biodiversity-Certified	0.44	0.61	1.09	1.08	0.63	1.00

Note. Numbers correspond to the rate ratio using the frequencies for the top-ranked choice for most likely to purchase plants with that label (see Table 3). Each value was calculated by comparing the column-heading frequency against the row-heading frequency.

discussed. Participants claimed that pollinator plants may have an unkempt or weedlike appearance but still be essential for attracting pollinators.

Survey respondents indicated that they would be most likely to purchase plants labeled “Butterfly-Friendly,” followed by “Bee-Friendly” and “Wildlife-Friendly,” which were both closely ranked (see Table 3). The fewest people ranked “Pollinator-Safe” and “Pollinator-Friendly” as their top choices.

The rate ratio values in Table 4 represent how much more likely a respondent was to select the respective row term as their top rank, for most likely to purchase, instead of the column term being compared. Respondents were nearly 2.5 times more likely to choose “Butterfly-Friendly” over “Pollinator-Friendly” and “Pollinator-Safe.” Respondents were 1.78 and 1.77 times more likely to choose “Bee-Friendly” over “Pollinator-Friendly” and “Pollinator-Safe.”

In contrast to top-choice rankings, Table 5 presents frequencies for the least-favored plant label rank. More respondents selected “Biodiversity-Certified” as their least-favored label. “Bee-Friendly” was the second-least-preferred label. Fewer people selected the pollinator labels and “Butterfly-Friendly” as their lowest rank.

In conjunction with the message testing, we assessed respondents’ emotional reactions to their assigned messages by using a bipolar Likert-type scale listing different feelings (see Table 6). Both messages (i.e., “Bee-Friendly”

Table 5. Ranking of Plant Labels (Least Likely to Purchase With Label)

Term	f	%
Biodiversity-Certified	626	39.2
Wildlife-Friendly	273	17.1
Bee-Friendly	230	14.4
Pollinator-Safe	170	10.6
Pollinator-Friendly	153	9.6
Butterfly-Friendly	146	9.1

and “Pollinator-Friendly”) evoked emotions closer to the “positive” or higher end of the 5-point scale. The overall means of the scales for the two groups were not significantly different (both 4.11) on the 5-point scale.

Using two additional randomly presented 5-point bipolar Likert-type scales, all respondents were asked to indicate their resonance with and perceptions of “Bee-Friendly” and “Pollinator-Friendly” labels for plants and landscaping activities (see Table 7). Across the statements, means were higher for “Pollinator-Friendly.” However, understanding the meaning of the term was slightly higher for “Bee-Friendly.” A paired sample *t* test revealed that the overall resonance with and perceptions of “Pollinator-Friendly” were significantly higher ($M = 4.03$, $SD = 0.89$) than “Bee-Friendly” ($M = 3.98$, $SD = .97$), $t(1,596) = -2.99$, $p = 0.003$, $d = 0.597$.

Table 6. Emotional Reactions to Randomly Assigned “Bee-Friendly” and “Pollinator-Friendly” Message Treatments

Negative feeling (scale value = 1)	Positive feeling (scale value = 5)	“Bee-Friendly” (n = 803) M	“Pollinator-Friendly” (n = 795) M
Unhappy	Happy	4.33	4.31
Indifferent	Curious	3.95	3.97
Unmotivated	Motivated	3.90	3.93
Uninspired	Inspired	4.03	4.01
Uninterested	Interested	4.11	4.12
Negative	Positive	4.34	4.29
	Overall	4.11	4.11

Table 7. “Bee-Friendly” and “Pollinator-Friendly” Label Resonance and Perceptions

Negative resonance/perception (scale value = 1)	Positive resonance/perception (scale value = 5)	“Bee-Friendly” M	“Pollinator-Friendly” M
I would not buy plants or seeds labeled as [Bee/Pollinator]-Friendly.	I would buy plants or seeds labeled as [Bee/Pollinator]-Friendly.	4.09	4.17
I would not engage in [Bee/Pollinator]-Friendly gardening.	I would engage in [Bee/Pollinator]-Friendly gardening.	3.97	4.00
I would not be proud to have a [Bee/Pollinator]-Friendly certified yard/planting area.	I would be proud to have a [Bee/Pollinator]-Friendly certified yard/planting area.	3.94	4.04
I don’t understand the meaning of [Bee/Pollinator]-Friendly.	I understand the meaning of [Bee/Pollinator]-Friendly.	3.92	3.90
	Overall	3.98	4.03

DISCUSSION AND IMPLICATIONS

Research has shown that labeling plants as supportive of pollinators can positively influence consumers’ purchasing habits and that pollinator-related yard signage can encourage pollinator gardening by explicitly educating about landscaping that could otherwise be perceived as unkempt or clashing with neighborhood norms (Burr et al., 2021; Khachatryan & Rihn, 2018; Khachatryan et al., 2017). This study’s mixed methods findings contrast with previous research and provide new insights about tailoring labels and signage to peoples’ preferences and perceptions.

Our findings diverge and converge with a study by Rihn and Khachatryan (2016), which assessed 921 U.S. consumers’ likelihood to purchase plants with pollinator labels. The researchers found the following order in preferences: pollinator-friendly (44%), plants for pollinators (34%), bee-friendly (34%), pollinator attractive (26%), bee safe (26%), butterfly friendly (26%), and bee attractive (20%). In the present study, more participants ranked “Butterfly-Friendly” as most likely to convince them to purchase a plant. “Bee-Friendly” ranked second, and “Pollinator-Friendly” and “Pollinator-Safe” ranked last—results differing from Rihn and Khachatryan’s (2016) study. Respondents were nearly 2.5 times more likely to pick “Butterfly-Friendly” compared to the pollinator labels. Our analysis of the least-likely-to-purchase ranks more closely aligns with the Rihn and Khachatryan rankings. Although “Butterfly-Friendly” was still most preferable, the two pollinator labels appeared more favorable than “Bee-Friendly.” Comparing our two analyses sheds light on potential divisiveness about the labels: People seem more polarized about purchasing “Bee-Friendly” plants, while “Pollinator-Friendly” and “Pollinator-Safe” may be more widely appealing or neutral labels.

The equal overall emotional reaction means (4.11 on a 5-point scale) following randomized exposure to the visual “Bee-Friendly” or “Pollinator-Friendly” messages suggest that

the two terms are perceived positively. When applied to their landscapes, people may be amenable to the terms without a significant preference. When we broadened the inquiry to the range of perceptions and resonance, a significantly more favorable mean was found for “Pollinator-Friendly” compared to “Bee-Friendly,” which corroborates past research (Rihn & Khachatryan, 2016). However, both terms were perceived favorably based on the scale, and respondents indicated a slightly better understanding of “Bee-Friendly.” Therefore, although “Butterfly-Friendly” came out on top for plant-purchasing likelihood, it appears that either the pollinator or bee labels would be accepted by residential gardeners. Future visual message testing research, using longer viewing times, multiple exposures, and an authentic setting, such as social media, could increase ecological validity and produce useful findings for environmental outreach specialists, communicators, and green industry stakeholders (Andrade, 2018; Silvert et al., 2021).

The “flagship species” concept is relevant when considering this research and its implications. Essentially, people do not perceive all species equally, and thus marketing and behavioral-change campaigns can be more effective by using a certain “flagship animal” rather than a generic term (e.g., biodiversity-certified) to symbolize a conservation issue (Macdonald et al., 2007). Focus group participants immediately thought of bees as pollinators and less frequently mentioned butterflies, yet butterfly labels were widely preferred when ranking by purchasing likelihood. However, there were still generally favorable perceptions of bee terminology, although some divisiveness was evident, possibly in part due to bee allergies and perceived threats. As people may more accurately understand the implications of their gardening decisions when visualizing bees, which play a paramount role in global pollination and face significant conservation threats (Patel et al., 2021), using bees as a flagship species for residential pollinator conservation should be further explored.

STATEMENTS AND DECLARATIONS

ETHICS APPROVAL

Prior to collecting any data, the study protocol was submitted to and approved by the University of Florida Institutional Review Board (IRB202003051).

COMPETING INTERESTS

The authors have no relevant financial or non-financial interests to disclose.

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