

LANDSCAPE PERCEPTION OF A NATURALISTIC PLANTING IN AN ECOTOURISM SPACE

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ABSTRACT

Naturalistic gardens have recently sparked growing interest due to the social and environmental benefits they offer. This type of garden is characterized by the use of native plants, an organic and fluid design, and layouts that avoid straight lines that recreate patterns found in nature, such as flower meadows. In contrast, conventional gardens prioritize aesthetic criteria without considering the required inputs or their environmental impact. The aim of this study was to evaluate visitors' perceptions of a naturalistic planting with herbaceous species in an ecotourism space in order to propose more sustainable and socially relevant alternatives, while contributing to the discussion on the social acceptance and potential of naturalistic landscaping in Mexico. The study was conducted at the Playa La Junta tourism development in the municipality of Amatlán de los Reyes, Veracruz, to assess the feasibility of its implementation as an ornamental resource that contributes to the area's tourist appeal. In January 2018, a planting was established, consisting of five ornamental herbaceous plant species: *Lantana camara* L., *Salvia coccinea* Buc'hoz ex Etl., *Salvia leucantha* Cav., *Ruellia simplex* C. Wright, and *Zinnia elegans* Jacq. In March 2018, during the flowering period, a survey was given to 150 on-site visitors to assess their perceptions. The data were analyzed using descriptive statistics and analysis of variance. The results revealed statistically significant differences ($p \leq 0.05$) in perception levels of the naturalistic planting. Favorable perceptions were found among females and people between the ages of 30 and 60. The most highly valued aspects were the variety of colors and species diversity. The flower meadow obtained a high rating in terms of perception, which highlights its ornamental potential for nature tourism ventures and its capacity to attract more visitors.

Keywords: garden, ornamental potential, landscape design, landscaping.

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INTRODUCTION

The perception of green areas is key to understanding the relevance of naturalistic gardens. This perception is based on people's senses and feelings, influenced by their natural and cultural identity. This connection generates a sense of ownership and belonging, promoting emotional and physical balance (García-Serrano *et al.*, 2023). Previous studies have shown that green areas with trees and shrubs improve the visual quality of the environment, which is directly associated with psychological and emotional well-being, while also promoting the restoration of physical health of those who observe or interact with them (Zhang *et al.*, 2024). Interaction with and contemplation of natural green areas promotes a more active and healthier lifestyle, positively impacting quality of life (Guarda-Saavedra *et al.*, 2022). This physical and psychological well-being is a fundamental criterion to consider in landscape design. While landscape design often focuses on enhancing the aesthetics of a site, it is essential that it also fulfills relevant ecosystem and cultural functions (Nassauer, 1993). From this perspective, naturalistic-oriented design incorporates wild vegetation, especially herbaceous plants of varied colors, in organic arrangements that alternate flowering periods, generate textural nuances, and apply ecological design principles. This approach seeks to enhance ornamental value while also contributing to people's quality of life (Southon *et al.*, 2017; García-Albarado and Dunnett, 2009).

Mexico has a wide variety of plants, of which approximately 4220 have ornamental potential (Munguía-Lino *et al.*, 2010). The state of Veracruz, one of the most floristically diverse in the country, is home to around 7855 species (Castillo-Campos *et al.*, 2011), with herbaceous plants accounting for more than 50 % of them. This richness represents a wide range of possibilities for creating plant palettes with a variety of colors and textures for parks and gardens.

Naturalistic planting design has become a growing trend among landscape professionals, considered both an ethical and aesthetic advancements (Özgüner and Kendle, 2006). It is a dynamic style that promotes plant succession and phenological changes throughout the seasons and can generally be established at lower costs than formal systems (Dunnett and Clayden, 2007). Wild plants with ornamental potential have proven to be ideal for these alternative landscapes, as they require less management and agricultural inputs (García-Albarado *et al.*, 2013). Furthermore, in a context of climate change and reduced resources allocated to the maintenance of green areas, naturalistic design has gained relevance by reducing costs and maximizing ecosystem benefits (Hitchmough, 2011).

Naturalistic plantings are not always perceived positively. Some sectors consider them less aesthetic, neglected, or dangerous, preferring formal designs with defined geometries (Özgüner and Kendle, 2006). However, other studies have revealed that municipal technicians and citizens show a preference for more naturalized public spaces, with spontaneous vegetation or meadows that convey a sense of wildness (de la Fuente-de Val, 2022). To improve social acceptance, the design should demonstrate its intentional nature through signs of care, such as trimmed edges, sculptural elements, or discreet signage (García-Albarado *et al.*, 2021).

Landscape perception is a complex and multidisciplinary field of study, essential in planning for tourism purposes (Nogué i Font, 1992). Recent research confirms that people associate green spaces with benefits such as creating wildlife habitats, reducing stress, improving mood, and evoking pleasant memories (Nevárez-Favela *et al.*, 2023). Therefore, this study contributes to the debate on naturalistic landscaping in Mexico by providing empirical evidence on the social perception of a planting with wild herbaceous species in an ecotourism context.

MATERIALS AND METHODS

Location of the study area

The study was conducted at the Playa La Junta ecotourism venture (18° 55' 10.05" N and 96° 52' 31.91" W, at an altitude of 740 m), considered one of the most representative nature tourism sites in the municipality of Amatlán de los Reyes, Veracruz (Gobierno del Estado de Veracruz, 2022). Fieldwork was carried out in March 2018, when the site registered a period of steady visitor influx that facilitated the implementation of the perception survey. Playa La Junta is located in the community of Ojo de Agua, 9.3 km from the municipal seat of Amatlán de los Reyes, within a rural setting that favors the development of ecotourism activities. The climate is classified as warm with summer rainfall, with an average annual temperature of 18 °C and mean precipitation of 1807.3 mm. The potential natural vegetation corresponds to a sub-deciduous tropical forest, currently fragmented due to agricultural and ecotourism activities.

Plant palette selection

The selection and propagation of the plant palette included five ornamental species. Although this number may be small, this decision followed a methodological simplification criterion aimed at facilitating experimental management, assessing initial visitor responses, and establishing a representative baseline of the local flora with ornamental and ecological value. Although this number is smaller than what is typically employed in naturalistic gardens, it provided a controlled framework for analyzing public perceptions of this design approach. The selection criteria included: i) preference for local species, ii) diversity in floral forms, iii) variety of colors, and iv) maximum height of approximately 1 m.

The selected species were *Lantana camara* L., *Salvia coccinea* Buc'hoz ex Etl., *Salvia leucantha* Cav., *Ruellia simplex* C. Wright, and *Zinnia elegans* Jacq. The environmental conditions of the site influence the selection of species and the planting layout. Although the species used are all native, questions arise regarding the potential effects of promoting assemblages that do not strictly reflect local natural associations. In this sense, the design corresponds more to the notion of an ornamental "pictorial meadow." Therefore, only a single layer ranging from 80 to 100 cm in height was used. Propagation was carried out using sexual (by seed) and asexual (by cuttings) methods according to each species (Table 1). This phase took place in the nursery at the

Table 1. Species used in the naturalistic planting established in Amatlán de los Reyes, Veracruz, Mexico.

Species	Family	Color	Production	Floral shape	Propagation method
<i>Lantana camara</i> L.	Verbenaceae	Yellow, red, pink	Nectar	Open	Asexual
<i>Salvia coccinea</i> Buc'hoz ex Etl.	Lamiaceae	White, red, pink	Nectar	Tubular	Asexual
<i>Salvia leucantha</i> Cav.	Lamiaceae	Lilac	Nectar	Tubular	Asexual
<i>Ruellia simplex</i> C. Wright	Acanthaceae	Lilac, pink	Nectar	Bell-shaped	Asexual
<i>Zinnia elegans</i> Jacq.	Asteraceae	Orange, red, pink	Pollen and Nectar	Open	Sexual

Postgraduate College Córdoba Campus, located in the municipality of Amatlán de los Reyes, Veracruz, starting in October 2017.

Planting design and establishment

The naturalistic planting was designed and established in January 2018, covering an area of 7.2 m². For the garden design, the plants were randomly distributed, with the tallest and largest species in the center and the smallest ones on the periphery (García-Albarado and Dunnett, 2009). The site was located in an open space near the parking area, allowing easy access and a preferential view from the entrance. The combination of textures, heights, and shades of the selected species created a dynamic and visually appealing composition (Figure 1).

Recommendations established by Nassauer (1993) were considered in the design of the naturalistic planting. Small, discreet signs were placed among the plants, instructing visitors not to cut the flowers, as they were intentionally designed for research purposes. The grass surrounding the planting was also mowed.

The selection of the plant palette was adequately justified in terms of chromatic and formal diversity, which made it possible to create a planting that was attractive to visitors. However, since it was not compared with other types of design (e.g., a conventional ornamental arrangement or an area of spontaneous vegetation), it is not possible to conclusively attribute the rating recorded to the naturalistic style itself. It is possible that part of the positive rating stems simply from the presence of flowering plants at their peak bloom period. Recognizing this limitation is important and suggests that future research should incorporate comparisons between different planting styles to differentiate the effect of the naturalistic approach itself.

Perception study

The perception of the planting was determined based on the participants' assessment of the established naturalistic planting in full bloom. Questionnaires were administered on-site (n = 150) as an evaluation tool. Participants were randomly selected using probability sampling and voluntarily agreed to participate during their visit to the site. The questionnaires were distributed between 10:00 a.m. and 4:00 p.m. on March

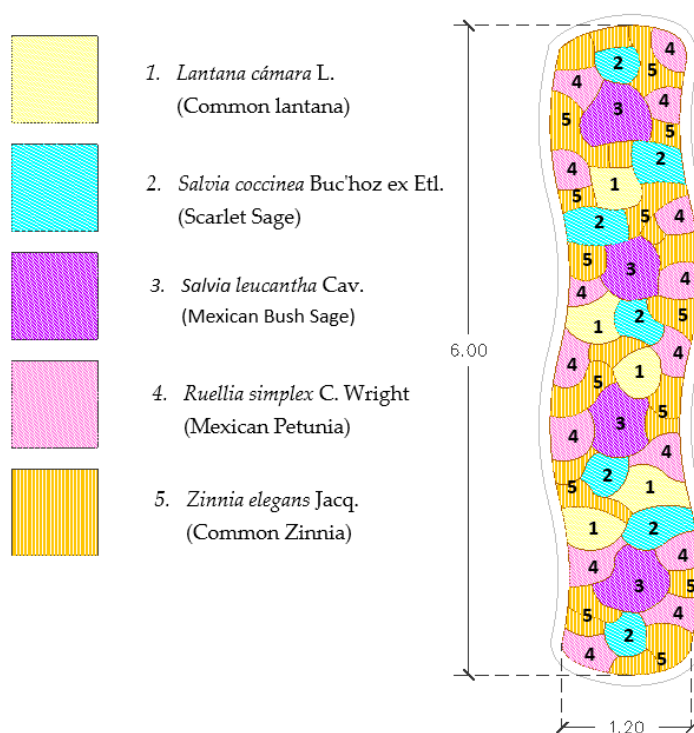


Figure 1. Design and distribution of the plant palette in the naturalistic planting established in Amatlán de los Reyes, Veracruz, Mexico.

25–31, 2018. Before responding, each participant was instructed to stand in front of the planting and observe it for as long as they deemed necessary before answering (García-Albarado and Dunnett, 2009). The level of appreciation was measured on a scale of 1 to 10, with one corresponding to the lowest level of acceptance and 10 to the highest.

Statistical analysis

Statistical analysis was performed using Minitab version 18.1.0, with descriptive statistics, calculation of means, and analysis of variance (ANOVA) to identify significant differences among participants' assessments. The information was classified according to the following variables: color variety, naturalistic appearance, plant diversity, insect diversity, and plant height. Perception assessment was analyzed based on the general characteristics of the visitors, such as age, gender, and development environment (rural or urban). To formally test for statistically significant differences between groups, multiple comparisons were performed using Fisher's method.

RESULTS AND DISCUSSION

The use of ANOVA and *post hoc* tests was adequate for analyzing differences in perception between visitor groups; however, statistical assumptions (normality, homogeneity of variances) were not reported, which constitutes a methodological limitation. The interpretation of the results must be qualified in the case of non-significant differences, as occurred between visitors from rural and urban settings. The absence of statistical differences does not necessarily imply that both groups perceive the planting identically, but rather that, under the conditions and sample size of the study, it was not possible to detect clear contrasts. Future research with a larger number of participants and stricter control of statistical assumptions could provide greater robustness to these types of comparisons.

Perception patterns across age groups

For analysis of the participant profile, age was classified into five groups: 1 = 10–20 years, 2 = 20–30 years, 3 = 30–40 years, 4 = 40–50 years, and 5 = 50–60 years. Group 1 represented 13 % of the total sample, while the remaining groups represented 33, 32, 14, and 8 %, respectively. Regarding the degree of acceptance among the different age groups, significant differences were detected between the means ($p \leq 0.05$) (Table 2).

Table 2. Statistical means of participants' perception ratings of the naturalistic planting across age groups.

Factor	Mean	Standard deviation	<i>p</i> value
10 to 20 years	7.73 a	0.819	0.002
20 to 30 years	7.52 a	0.670	
30 to 40 years	8.93 b	0.692	
40 to 50 years	8.82 b	0.558	
50 to 60 years	9.08 b	0.383	

Mean values in columns with different letters are statistically different ($p \leq 0.05$) according to Fisher's method for comparisons.

The results indicated that people over the age of 30 tended to value naturalistic planting more than younger people. This behavior could be explained by the fact that, over time, people develop a greater awareness of conservation and appreciation for nature (García-Albarado and Dunnett, 2009; Múderrisoglu and Gültekin, 2013). Previous research has shown that accumulated experience and prolonged exposure to natural environments positively influence the aesthetic and functional appreciation of the landscape. Older age groups tend to associate naturalistic landscapes with personal memories and experiences linked to the rural environment (Chiesura, 2004). In the case of age, adults tended to rate the naturalistic planting more positively,

which was interpreted as possible “greater environmental awareness.” While this explanation is plausible, it should be acknowledged that it constitutes a linear and simplified interpretation. Factors such as educational level, previous experience with gardens, or social status could also influence visitors’ assessments, but these variables were not considered in the study design. Recognizing this methodological limitation strengthens the transparency of the results and opens up the possibility for future research to more accurately understand the factors that shape social perceptions of naturalistic gardens.

Perception patterns across genders

The gender variable in the perception of the planting proved significant, with women showing a greater affinity for the naturalistic design. Of the total number of participants who answered the questionnaire, 54 % were women and 46 % were men, indicating a balanced proportion between genders. The results indicated that women gave higher ratings than men for all the attributes evaluated in the planting, including colors, naturalistic appearance, plant diversity, insect diversity, and plant height (Table 3, Figure 2).

Table 3. Statistical means obtained from the participants’ ratings of the naturalistic planting based on gender.

Factor	Mean	Standard deviation	<i>p</i> value
Female	8.79 a	0.819	0.031
Male	7.73 b	0.670	

Means that do not share the same letter denote that they are significantly different using Fisher’s method for comparisons ($p \leq 0.05$).

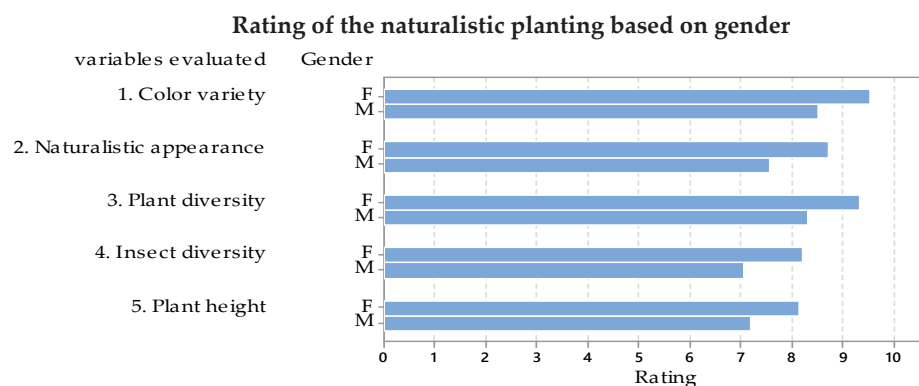


Figure 2. Mean perception ratings of the naturalistic planting variables by gender (1 = lowest rating; 10 = highest).

This pattern is consistent with findings from previous studies indicating that women tend to exhibit greater affinity for green environments and heightened sensitivity toward environmental conservation (Braçe *et al.*, 2021). Most female participants stated that, in addition to being attracted to the colors and shapes of flowers, they appreciated the use of wild species in the planting for its contribution to nature conservation. Prior research has shown that women generally show stronger appreciation for the biodiversity, naturalness, and ecological functions of landscapes, whereas men often emphasize functional or recreational aspects (Tindall *et al.*, 2003).

Likewise, Strumse (1994) reported that women showed greater acceptance of and sensitivity toward natural environments, rating their preference for ornamental meadows in Norway higher than men. This author links his findings to evolutionary theory, proposing that men were mainly engaged in hunting, while women were responsible for gathering food. This role would have favored the development of a greater awareness of and sensitivity to vegetation, a trait that may persist today. These findings suggest that gender differences in the perception of natural environments could be linked to both sociocultural factors and personal experience with nature.

While some previous studies have interpreted this difference using evolutionary frameworks that connected female vegetation sensitivity to an alleged ancestral role as gatherers (Strumse 1994), this type of explanation reinforces stereotypes and posits a biological determinism that is widely contested in contemporary literature. Recent research in anthropology, archaeology, and gender studies refutes these reductionist views. For example, Anderson *et al.* (2024) demonstrate that women have played an active role in productive activities such as hunting, refuting the idea that they were confined solely to gathering. From this perspective, a more robust interpretation of the results would be to consider that the observed differences respond to sociocultural constructions of gender. Women have historically been assigned roles that involve caring for the home, people, and nature, which may influence them to place a higher value on floral landscapes that are symbolically associated with these spheres.

These results are consistent with previous studies, such as that of García-Albarado and Dunnett (2009), who also found greater acceptance of ecological plantings among women. Similarly, recent research in urban settings (Braçe *et al.*, 2021) shows that women value the characteristics of green spaces more highly. Regarding the effect of age, landscape preferences have been documented to vary with experience and cultural memory (Müderrisoglu and Gültekin, 2013), which reinforces the interpretation of the emotional connection of older people with the naturalistic style. In addition, recent findings reveal that the perception of naturalness and biological diversity, such as the presence of birds or plant diversity, increases visitors' mental well-being (Vanhöfen *et al.*, 2025), supporting the importance of the visual and ecological attributes valued in this planting.

Influence of urban and rural origin

Of the total number of participants (n=150), 27 % lived in a rural setting and 73 % lived in an urban setting. Regarding the rural or urban origin of the visitors, the results showed

no statistically significant differences ($p \leq 0.05$) in the perception of the naturalistic planting (Table 4). However, the difference in means (8.92 for rural residents versus 8.07 for urban residents) suggests a trend that, although not statistically confirmed in this sample, could be relevant in a more representative study or with a larger sample size. In this regard, it is more accurate to point out that, under the conditions of this study, no significant differences were identified, but future methodological designs could reveal clearer contrasts based on the origin of the visitors.

Table 4. Mean perception ratings of the naturalistic planting based on participants' development environment.

Factor	Mean	Standard deviation	<i>p</i> value
Rural environment	8.92 a	0.811	0.096
Urban environment	8.07 a	0.597	

Mean values in columns with different letters are statistically different ($p \leq 0.05$) using Fisher's method for comparisons.

These findings suggest that positive perceptions of naturalistic planting may be mediated by shared cultural, aesthetic, and emotional factors rather than the participants' environment. When assessing the acceptance of landscape designs, it may be more relevant to focus on visual and symbolic attributes that transcend the urban or rural context. The degree of acceptance for the naturalistic planting style was high for both rural and urban residents; this could be explained by the benefits that vegetation offers in both contexts. Most participants recognized that this type of planting contributes to ecological functions, particularly the conservation of wild flora and fauna, and many expressed interest in implementing or promoting naturalistic plantings in public spaces as well as in rural and urban gardens (Figure 3).

Rating of the naturalistic planting based on the development environment

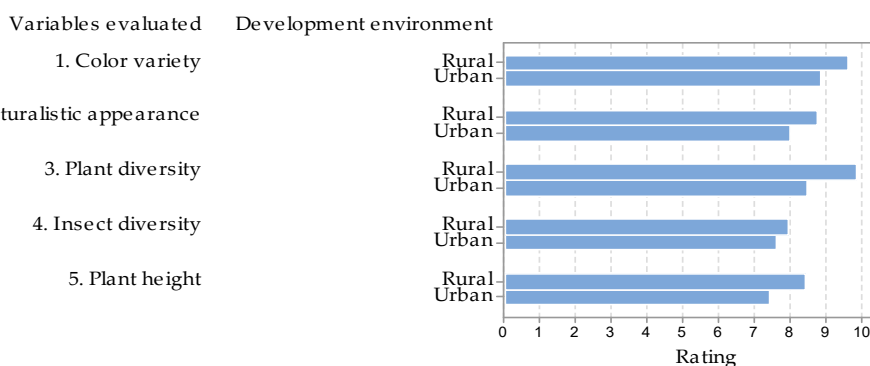


Figure 3. Participants' ratings of naturalistic planting attributes according to their development environment (1 = lowest; 10 = highest).

These findings are consistent with recent studies that observed a convergence in environmental perceptions between urban and rural residents. A systematic review found that more than 50 % of analyses showed no significant differences in the benefits associated with green spaces between urban and rural contexts (Browning *et al.*, 2022). Similarly, research on environmental perception discovered that while there are differences in the factors that influence perceptions, such as the community environment in rural areas versus public policies and infrastructure in urban settings, these do not always translate into significant divergences in the valuation of green spaces (Feng *et al.*, 2025). According to Mendoza-García *et al.* (2011), rural people have a deep-rooted appreciation for vegetation due to the economic benefits their families derive from it. For urban dwellers, vegetation is essential for health and well-being, in addition to helping to conserve biodiversity (Hoyle *et al.*, 2018).

Variables evaluated

Regarding the aspects evaluated in the naturalistic planting, statistically significant differences ($p \leq 0.05$) were found using Fisher's multiple comparisons test. The variables with the highest ratings were "color variety" and "plant diversity" (Table 5). The high ratings for these aspects may be due to the fact that, for most people, visual perception is strongly influenced by color and shape. Both aspects are fundamental to the perception of aesthetics and visual language.

Table 5. Statistical means obtained from participants' general ratings of the variables studied in a naturalistic planting established in Amatlán de los Reyes, Veracruz, Mexico.

Factor	Mean	Standard deviation	<i>p</i> value
Color variety	9.07 a	0.934	0.000
Plant diversity	8.85 a	8.853	
Naturalistic appearance	8.20 b	1.220	
Plant height	7.71 c	7.713	
Insect diversity	7.69 c	7.687	

Means that do not share the same letter denote that they are significantly different using Fisher's method for comparisons ($p \leq 0.05$).

These findings are consistent with research that has identified chromatic richness and floral diversity as key attributes for increasing visual appeal and visitor satisfaction in landscaped settings and naturalistic plantings (Lindemann-Matthies *et al.*, 2010). A study conducted in the United Kingdom by Hoyle *et al.* (2017) on the emotional responses that can be elicited through the perception of different planting styles showed that most people find a colorful planting with bright flowers preferentially attractive and stimulating. This is consistent with the results obtained in the present study, as the highest-rated variable was "color variety." Lindemann-Matthies and Bose

(2008) demonstrated that aesthetic perception is strongly influenced by the presence of multiple floral colors and is also associated with a higher appreciation of biodiversity. Similarly, Southon *et al.* (2017) found that herbaceous species diversity increases visitor preference, as it is associated with greater naturalness, visual complexity, and ecological potential. From a landscape design perspective, these findings reinforce the importance of selecting species that provide a wide range of colors and floral shapes, as well as structuring plantings with variations in height and texture that generate visual interest over time. Furthermore, alternating flowering periods contribute to maintaining ornamental appeal over several seasons while providing continuous resources for pollinating fauna, which can increase the educational and ecological value of the space (García-Albarado *et al.*, 2013).

Integrating aesthetic and ecological criteria into species selection is fundamental to the success of naturalistic plantings in nature tourism contexts. A diverse and chromatically attractive plant palette not only favors social acceptance but also strengthens the role of these spaces as tools for conservation and environmental education. Therefore, taken together, these results suggest that incorporating a diverse plant palette with a wide range of colors can be an effective strategy for improving the social acceptance and ornamental value of plantings oriented toward nature tourism.

Degree of appreciation

Finally, a general analysis was conducted to determine the participants' degree of appreciation for the naturalistic planting style. Of the total number of participants ($n = 150$) who rated the planting on a scale of 1 to 10, a high level of acceptance was found ($\bar{x} = 8.3$). The distribution of ratings showed a pattern close to normal, with one corresponding to the lowest level and 10 to the highest level of acceptance (Figure 4).

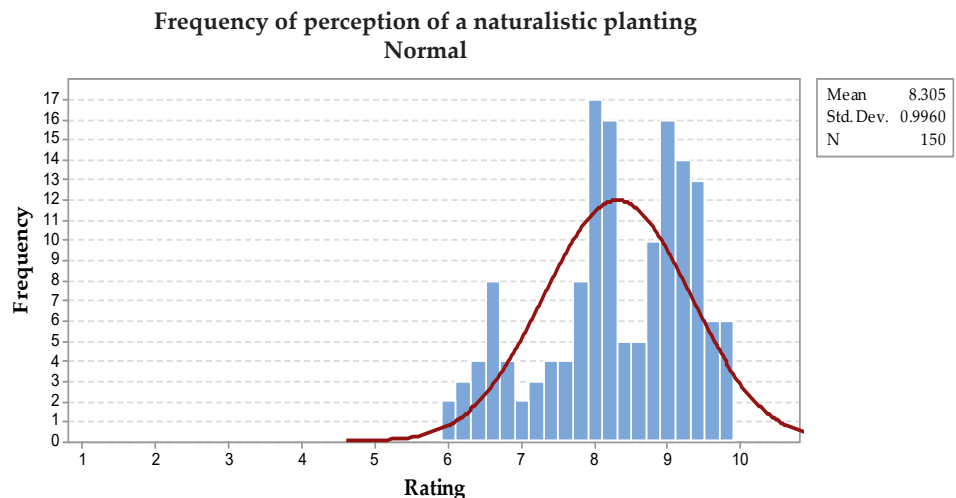


Figure 4. Graph showing the frequency of perception of the naturalistic planting established in Amatlán de los Reyes, Veracruz, Mexico (1 = lowest; 10 = highest).

The high rating indicates that, in general, the naturalistic style of the planting was well received by visitors. When naturalistic plantings present visually attractive attributes, such as color variety, species diversity, and structured composition, their social acceptance tends to increase significantly (Lindemann-Matthies *et al.*, 2010; Hoyle *et al.*, 2017). Furthermore, the generally positive assessment reinforces the evidence that visitors, regardless of variables such as age, gender, or urban/rural origin, can perceive the aesthetic and ecological benefits of this type of landscape design (Southon *et al.*, 2017).

The near-normal distribution of responses suggests homogeneity in perception, which could be attributed to the ability of naturalistic design to generate sensory and emotional experiences shared among different user profiles (Chiesura, 2004). In the context of nature tourism, high social acceptance implies considerable potential for incorporating this type of planting as an ornamental and educational resource, improving the visitor experience and fostering favorable attitudes toward conservation. Furthermore, these results support the recommendation to integrate aesthetic, biodiversity, and ecological functionality criteria into the design of green spaces intended for recreational and tourism use.

Limitations of the study

One limitation of the study was the absence of tourism-oriented questions. Although the planting was developed within an ecotourism context, the questionnaire focused only on aesthetic and ecological aspects. It did not assess their motivation to visit, overall satisfaction, or desire to recommend the site. Considering these variables in future research would allow for better understanding of naturalistic gardens to enhance rural tourism in the region. It is also important to consider whether respondents' perceptions of the associated fauna were based on direct observation or the assumption that they would be present due to the type of plants used. Although pollinators were observed during the experiment, the lack of quantitative records limits the possibility of objectively linking aesthetic perceptions with the actual presence of fauna. Future research could incorporate parallel insect monitoring to link public perceptions with more robust ecological data.

Furthermore, the recorded perception corresponds only to the spring season. Naturalistic gardens, by their very nature, show variations in their composition and attractiveness throughout the year due to the cycles of flowering, growth, and plant succession. For this reason, visitor assessments are likely to change in other seasons, either increasing or decreasing their visual and ecological interest. In future research, it would be advisable to consider inter-seasonal comparisons that allow for a more comprehensive capture of the aesthetic and functional experience offered by this type of planting.

Although the methods employed adequately addressed the stated objective, it is important to recognize the limitation of not having a comparison group. The absence of a control treatment, whether an unplanted area, spontaneous vegetation, or a

conventional ornamental design, restricts the ability to contrast visitors' perceptions and more clearly assess the specific contribution of the naturalistic approach. Future research could incorporate comparison groups that would allow for assessing differences in the aesthetic, ecological, and functional acceptance of different design proposals.

CONCLUSIONS

Visitors positively valued naturalistic plantings made up of wild herbaceous species in an ecotourism context. This perception was mainly associated with aesthetic attributes such as color and order, as well as an appreciation of biodiversity, reflecting the potential for this type of design to be socially accepted. This study provides empirical evidence to the debate on naturalistic landscaping in Mexico, showing that plantings with wild species can be understood and appreciated by visitors in rural and urban settings, expanding their potential for application in rural tourism and landscape conservation projects.

Although the methods used met the objective, the lack of a comparison group, the small number of species used, and the evaluation conducted only in the spring season should be noted as limitations. Future research should incorporate greater species diversity, inter-seasonal assessments, tourism variables, and quantitative records of associated fauna to strengthen understanding of the social, aesthetic, and ecological benefits of naturalistic gardens in tropical and subtropical regions of the country.

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