

Potential use of *in vitro* plants in the decoration of events and spaces

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ABSTRACT

Objective: To evaluate the ornamental potential, technical viability, and acceptance of *in vitro* plant arrangements as a compact, low-maintenance alternative for decorating spaces and events among young consumers.

Design/methodology/approach: Arrangements were created using *Stevia rebaudiana* and three orchid species in glass jars containing colored and gelled MS medium. A total of 100 university students (ages 18-30) were surveyed using Likert-scale items, demographic questions, and three open-ended questions. Data were analyzed using one-way ANOVA (gender), Tukey's test, average rating categorization (>3.5), principal component analysis, price histograms, and linguistic processing of open responses to generate word clouds.

Findings: Perceptions were uniform across genders ($F \leq 2.78$; $p > 0.10$), with only personal purchase intention showing a significant difference ($F = 4.40$; $p = 0.041$). Average scores exceeded 3.5 in aesthetics, innovation, and practicality. Willingness to pay was concentrated in the 100-200 MXN range (one plant) and 150-250 MXN (two or more). The keywords "aesthetic," "innovative," "natural," and "unique" dominated positive responses, while concerns focused on durability, heat, and cost.

Limitations/implications: The study used non-probabilistic sampling limited to young individuals from Jalisco; more diverse populations are needed.

Originality/value: *In vitro* arrangements are perceived as novel, aesthetic, and low-maintenance ornamental products, with minimal gender influence on their evaluation. Adjusting plant density and improving thermal stability may support differentiated pricing strategies and expand commercial adoption in national and international markets.

Keywords: *in vitro* plant culture; ornamental arrangements; consumer perception; willingness to pay; tissue culture.

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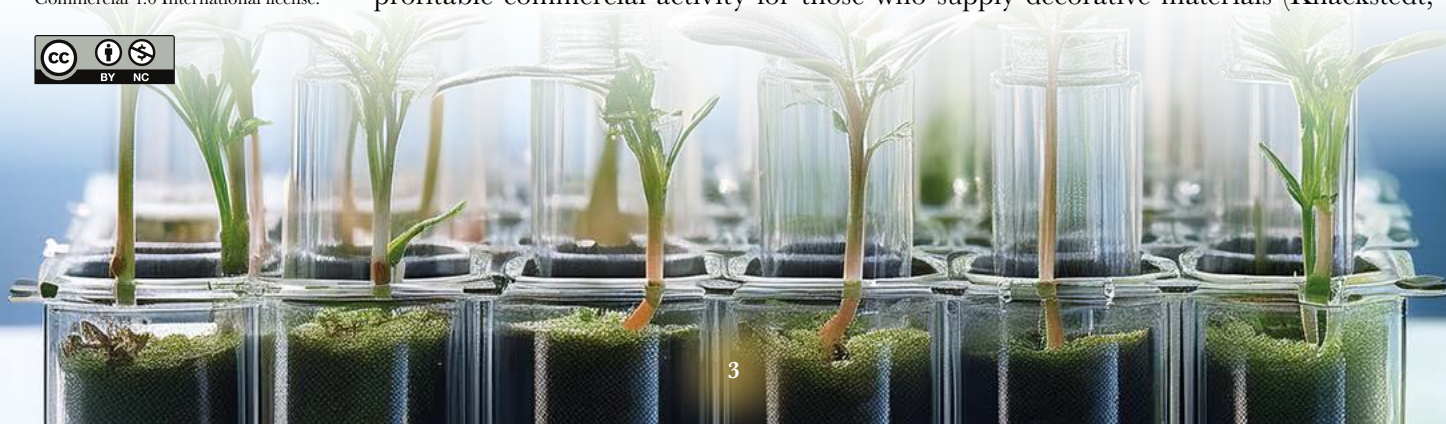
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INTRODUCTION

The ornamentation of physical spaces within homes, offices, social halls, etc., is a recurring practice that, in addition to fulfilling an aesthetic function, has become a profitable commercial activity for those who supply decorative materials (Knackstedt,



2012; Patel and Kharabe, 2023). The use of floral arrangements is one of the space ornamentation practices applied for many years; however, nowadays artificial flowers are used due to their long-lasting nature and minimal care requirements (Paiva *et al.*, 2020). The use of inanimate objects with vibrant colors and peculiar shapes has flooded the market with high demand. Nevertheless, a large portion of the population still prefers living nature, such as plants, due to their visual appeal and positive environmental effects (Dravigne *et al.*, 2008). On the other hand, science has developed tools to cultivate plants and microorganisms under laboratory conditions, almost always inside glass containers (jars, flasks, Petri dishes, etc.) (Phillips and Garda, 2019). For this, various culture media compositions and incubation conditions have been investigated to allow living organisms to be maintained and developed *in vitro* (Sudheer *et al.*, 2022). Specifically, plant tissue culture has enabled the aseptic maintenance and development of plant tissue using artificial culture media and controlled incubation conditions (Mehbub *et al.*, 2022). In this regard, *in vitro* plants (inside a glass jar) grow and develop like normal plants. There are reports in which certain species have even flowered inside the culture jar, particularly some orchids (Kaur, 2022). The growth, development, and *in vitro* flowering characteristics can be harnessed for the creation of ornamental products, enhancing the feature of having a live plant inside a jar with an artificial nutrient medium. Unlike potted plants, *in vitro* arrangements offer a more compact, durable option with lower care requirements, making them ideal for indoor spaces and temporary decorations. Therefore, the aim of this study was to create and analyze the potential of *in vitro* plants for decorating spaces or events, as well as to assess their perception and level of acceptance among a group of young adults.

MATERIALS AND METHODS

Plant material

Stevia rebaudiana Bert. plants of the Morita II variety and three different orchid species (*Laelia anceps* Lindl., *Guarianthe skinneri* (Bateman) Dressler & W.E. Higgins, and *Cattleya dolosa* [Rchb.f.]) that were undergoing micropropagation were used in the preparation of *in vitro* arrangements.

Preparation of *in vitro* arrangements

Culture medium preparation

MS medium (Murashige and Skoog, 1962) supplemented with 30 g L⁻¹ of sucrose was used. McCormick[®] artificial food colorings were added. The selection of each coloring was based on personal preference; however, light-colored dyes are recommended to better visualize root development. The concentration of dyes ranged from 200 mg L⁻¹ to 500 mg L⁻¹, depending on the desired intensity. The pH of the culture medium was adjusted to 5.8±0.1, and 3 g L⁻¹ of Phytigel[®] was added as a gelling agent. Before use, aesthetically pleasing glass jars of various shapes and suitable sizes for proper plant growth were selected. The colored medium was dispensed into the jars. The quantity varied depending on the jar volume, but at least one-fourth of the container was filled with medium. The culture jars were sealed with aluminum caps and self-adhesive food-grade film. Jars with glass lids were

sealed with self-adhesive film. The culture media were sterilized in an autoclave at 1.5 kg cm⁻² and 121 °C for 15 min.

Planting of plant material

Under a laminar flow hood and using sterile surgical instruments (forceps, scalpel, etc.), the plant material undergoing micropropagation (*in vitro* multiplication) was individualized (complete plants with roots). Each plant was transferred into a previously prepared culture medium (only one plant per culture jar was used). The jars were sealed with self-adhesive film only (aluminum lids were removed to improve aesthetics), while those with glass lids were sealed with the lids and self-adhesive film. The jars were decorated with various materials (ribbons, beads, etc.). Cultures were maintained at room temperature (28±2 °C) under natural light (as found in a typical room or interior space).

Ornamental perception analysis of *in vitro* arrangements

A structured survey was administered to a non-probabilistic sample of 100 young adults (aged 18 to 30), all of whom were university students from various regions of the state of Jalisco. The objective was to understand their perception of the ornamental value of *in vitro* arrangements. Participant selection was conducted without discrimination based on race, ethnicity, social status, sexual orientation, or other personal characteristics, ensuring a balanced distribution between men and women. The instrument consisted of 30 items: 21 closed-ended Likert-type questions (numerically coded on a scale from 1 to 6, where 1 indicates the lowest level of agreement or acceptance and 6 the highest), two questions with categorical price intervals analyzed separately, six sociodemographic questions, and three open-ended questions. The Likert scales addressed dimensions such as aesthetic perception, functionality, purchase intent, and perceived disadvantages of the arrangements. Meanwhile, the open-ended questions explored the most attractive features, perceived concerns, and suggestions for improvement related to this form of plant decoration.

Statistical analysis

Analysis of variance (ANOVA) and Tukey Post Hoc test

A one-way analysis of variance (ANOVA) was conducted using RStudio software (version 4.4.2) to assess whether there were statistically significant differences between gender groups (independent variable) across each of the Likert-scale questions (dependent variable). The statistical model used was as follows:

$$Y_{ij} = \mu + \alpha_i + \varepsilon_{ij}$$

Where: Y_{ij} represents the Likert score of participant j in group i ; μ is the overall mean of the responses; α_i is the effect associated with the group (in this case, gender); ε_{ij} is the random error, assumed to follow a normal distribution with mean zero and equal variance.

This analysis was performed individually for each Likert-scale question, considering the assumptions of normality and homogeneity of variances. In cases where the ANOVA result was significant or near the threshold ($p < 0.05$), a Tukey HSD post hoc test was applied to identify specific differences between groups.

Principal component analysis (PCA)

To explore latent patterns in the Likert-type responses and reduce data dimensionality, a Principal Component Analysis was applied to the numerically coded variables (values from 1 to 6) corresponding to the closed-ended survey questions. Prior to the analysis, it was verified that all included variables were numeric. No missing data were imputed, as the selected response set contained no missing values. The PCA was conducted without additional scaling since all variables shared the same ordinal metric. The analysis was performed using RStudio (4.4.2). The PCA function from the FactoMineR package was used, and the visualization was generated with factoextra, including 95% confidence ellipses.

Perceptual trend analysis using likert scale averages

To assess the general perceptual trend toward *in vitro* plant arrangements, average response scores were calculated for each Likert-type question. This coding was based on predefined dictionaries for each type of scale: frequency, agreement, attractiveness, preference, purchase intention, among others. Once the average scores per question were obtained, a new categorical variable named Trend was created, assigning a label of “Favorable perception (mean > 3.5)” or “Unfavorable perception (mean ≤ 3.5)” based on each item’s average value. The threshold of 3.5 was considered the midpoint on the 6-point scale, with a mean above this value indicating a generally positive tendency toward the evaluated attribute. RStudio (4.4.2) and ggplot2 were used to visualize these results.

Differentiated assessment of willingness to pay for *in vitro* plant arrangements

To explore the perceived economic value of *in vitro* arrangements among participants, the questionnaire included two specific items aimed at estimating their willingness to pay:

- (1) How much would you be willing to pay for a standard unit (250 mL jar, single plant)?
and
- (2) How much would you be willing to pay for a standard unit (250 mL jar, with two or more plants)?

Both questions provided predefined price categories in intervals and were analyzed independently. Relative frequencies (%) by category were calculated for each gender, enabling the identification of differentiated behavioral patterns. The use of proportions instead of absolute frequencies was justified by the need to make equitable comparisons between groups of different sample sizes, ensuring a proportional representation of preferences within each subgroup. This approach allowed for the identification of potential gender-

related trends in economic willingness toward these biotechnological products. Analyses and visualizations were conducted using RStudio (v4.4.2) with the ggplot2 package.

Semantic content analysis of open-ended responses using natural language processing

To identify deep, unstructured perceptions of *in vitro* plant arrangements, content analysis was conducted using three open-ended questions from the questionnaire. Responses were processed using natural language processing techniques in RStudio (v4.4.2). For each item, a manual Spanish-to-English translation dictionary was created, focusing on the most frequent keywords and their specific semantic context. A preprocessing routine was then applied, which included dictionary-based translation, conversion to lowercase, removal of punctuation, numeric digits, and English stopwords. From this cleaned text, a *TermDocumentMatrix* was generated to calculate the relative frequencies of each keyword. Word clouds were created using the wordcloud package, graphically visualizing the most recurring concepts in each question. This approach enabled the identification of the most valued aspects, participants' main concerns, and the most common suggestions for improving the *in vitro* arrangements.

RESULTS AND DISCUSSION

***In vitro* arrangement development**

In vitro arrangements were successfully created using the described methodology. Figure 1A shows *Stevia rebaudiana* (var. Morita II) plants in the *in vitro* multiplication phase, which were individually separated under a laminar flow hood for the arrangement process. Figure 1B presents a *Stevia* plant subcultured in a medium dyed blue with food-grade artificial colorants. It is important to note that the intensity or tone of the medium depends on the amount of dye used. In Figure 1C, a decorative element was added as a final step to enhance the aesthetic appeal and ornamental value of the *in vitro* arrangement. These *in vitro*-cultivated plants can survive, grow, and develop for several months without needing subculturing. In some cases, these plants can be removed from the jar (*in vitro* conditions) and transplanted into pots (*ex vitro* conditions) (Figure 1D). However, successful acclimatization to external environmental conditions depends on proper plant growth, strong root system development, and gradual adaptation to conditions outside the jar.

The correct selection of color and tone of the culture medium is a key factor in the aesthetic appreciation of *in vitro* plant arrangements. In Figure 2A, different orchid species are shown growing in media of varying colors, which can enhance the appeal to potential buyers based on their preference for a specific color or orchid species. The choice of containers also greatly influences the aesthetic value of these ornamental products. In Figure 2B, culture vessels of various shapes and sizes are displayed, offering a wide range of options for consumers. Additionally, planting different orchid species increases the ornamental interest of these arrangements.

The analysis of ornamental appreciation using a one-way ANOVA applied to 19 Likert-type items completed by one hundred university students revealed a notably uniform perception between men and women. In 18 of the statements, including evaluations of

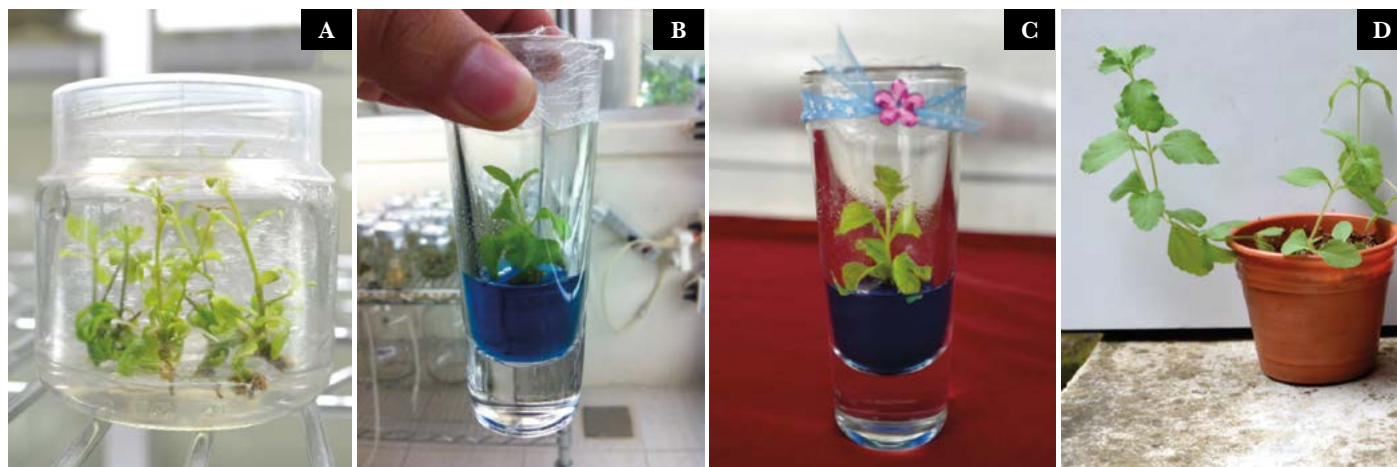


Figure 1. *In Vitro* Arrangement Process. A) *Stevia rebaudiana* plants during *in vitro* propagation. B) Arrangement assembly steps: plant separation, selection of aesthetically pleasing containers, preparation of colored culture medium, and *in vitro* planting. C) Final decoration of the arrangement with external adornments (e.g., ribbons, ornaments). D) Example of a plant successfully transplanted from *in vitro* (inside the jar) to *ex vitro* (potted) conditions.

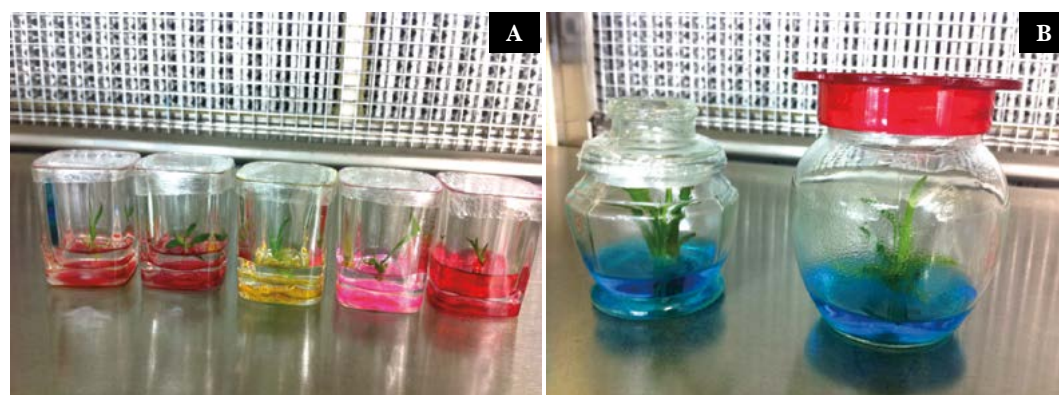


Figure 2. *In vitro* plant arrangements. A) Orchids of different species grown *in vitro*, and B) *In vitro* arrangement made with agave plants.

aesthetic appeal, perceived innovation, practical convenience, and overall willingness to recommend, F-values did not exceed 2.78 and all associated p-values were comfortably above the 0.10 threshold, indicating a clear absence of gender effects. Only the item concerning whether respondents would purchase an *in vitro* plant arrangement for personal decoration deviated from this pattern, as the factor “sex” explained a modest but statistically significant portion of the variance ($F=4.40$; $p=0.041$). Other questions, such as the frequency of using fresh flowers for decoration ($F=3.58$; $p=0.064$) and the price participants would be willing to pay for a 250 mL jar containing two or more plants ($F=3.50$; $p=0.067$), approached statistical significance, suggesting the possible presence of latent differences that a larger sample might confirm. Altogether, these findings describe a consumer landscape in which gender rarely shapes attitudes toward *in vitro* arrangements, although it subtly influences the specific act of purchasing and, to a lesser extent, the habitual use of flowers and price sensitivity. The only significant effect observed indicates

that marketing strategies could benefit from messages tailored to the gender showing greater purchase intent, while the product design itself can remain largely gender-neutral. Trends nearing statistical significance support the collection of additional data to determine whether these differences reflect genuine behavioral divergences or are artifacts of limited statistical power.

Principal component analysis (PCA)

Regarding the principal component analysis (PCA) applied to the Likert-type items, this approach enabled a visual exploration of general trends and latent differences in the perception of men and women toward *in vitro* plant arrangements (Figure 3). The analysis produced a bidimensional projection of individuals along the first two principal components (10.7% and 34.8%), which together accounted for the highest proportion of explained variance in the dataset. Each point represents a participant, coded by gender

Table 1. One-way ANOVA by gender for 21 Likert items on perception and acceptance of *in vitro* plant arrangements.

Questions	Df_Sex	Sum_Sq_Sex	Mean_Sq_Sex	F_value	Pr_F
Would you buy an <i>in vitro</i> arrangement as personal decoration?	1	8.00064935	8.00064935	4.39706823	0.04078867
How often do you use natural flowers for decoration?	1	6.23636364	6.23636364	3.5848945	0.06377191
How much would you be willing to pay for a standard unit 250 ml jar with two or more plants?	1	6.10974026	6.10974026	3.50315066	0.06677542
Would you give an <i>in vitro</i> arrangement as a gift for events birthdays weddings quinceaneras etc?	1	4.26038961	4.26038961	2.78348956	0.10113855
I consider this type of decoration innovative	1	2.4961039	2.4961039	2.50149796	0.11968804
How much would you be willing to pay for a standard unit 250 ml jar with a single plant?	1	2.03636364	2.03636364	1.34237901	0.25180883
The presence of visible roots adds visual interest?	1	3.36623377	3.36623377	1.31626552	0.25641613
How often would you buy this type of arrangement?	1	2.33766234	2.33766234	1.22219945	0.27392273
The color of the culture medium increases the arrangement's appeal	1	1.03896104	1.03896104	1.06010601	0.30786698
I consider it easy to transport the arrangement to an event	1	1.31493507	1.31493507	0.88081775	0.35223532
A single plant per jar conveys minimalism and sophistication	1	0.62402597	0.62402597	0.70788453	0.40392722
It would be easy for me to place the arrangement in my home or office	1	1.04331445	1.04331445	0.69413837	0.40864526
The shape and size of the jar influence its appeal	1	0.47337662	0.47337662	0.41513468	0.52215365
I would prefer this type of arrangement vs potted arrangements	1	0.5461039	0.5461039	0.35110397	0.55600865
How often do you use artificial flowers plastic fabric?	1	0.47337662	0.47337662	0.35022979	0.5564992
I prefer an <i>in vitro</i> arrangement over a bouquet of artificial flowers	1	0.62402597	0.62402597	0.34053635	0.56199507
Combining different species for example orchids on display is more striking	1	0.37402597	0.37402597	0.30324221	0.58417075
I am concerned about the durability of the culture medium in high temperatures	1	0.34350649	0.34350649	0.22177136	0.6396261
Low maintenance no watering is advantageous for me	1	0.0025974	0.0025974	0.00159068	0.96833596

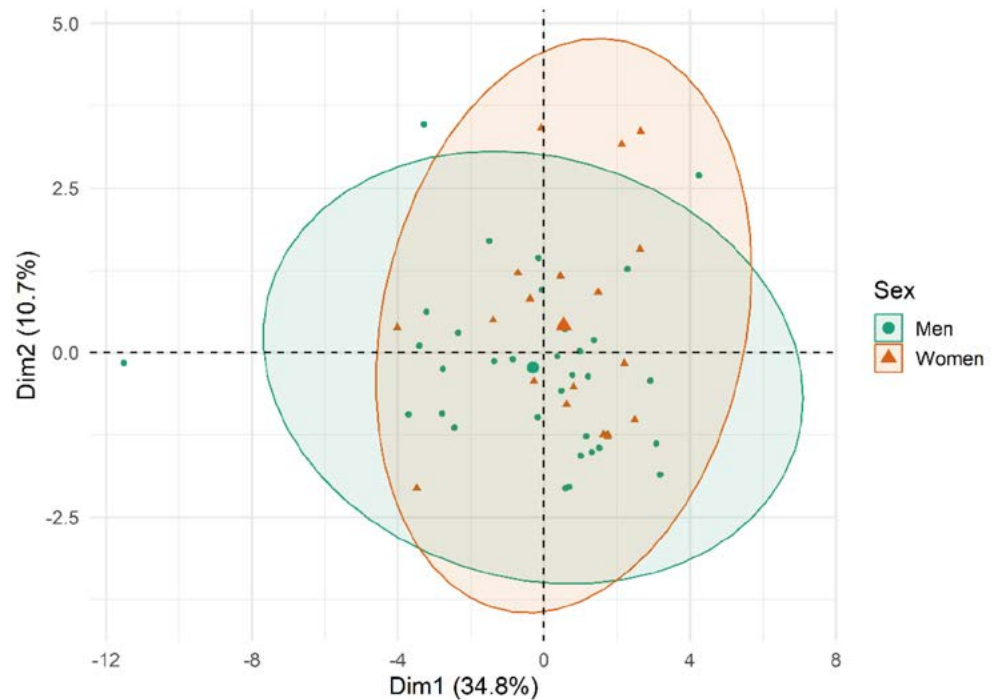


Figure 3. Principal Component Analysis applied to the responses from Likert-type items, differentiated by gender. Each point represents a participant projected in the space defined by the first two principal components. The overlap between groups indicates a high degree of similarity in perceptions between men and women regarding *in vitro* arrangements, aligning with the ANOVA results.

(male or female), and the resulting distribution reveals a significant overlap between the two groups. This convergence indicates a strong homogeneity in responses, consistent with the previous ANOVA results, which showed a minimal influence of gender as a discriminating factor across most of the evaluated variables. Nonetheless, subtle directional trends emerge, suggesting marginal variability in certain perceptual dimensions. For instance, within the quadrants where items associated with purchase intention or the product's visual appeal are clustered, a slight predominance of one gender over the other becomes visible, albeit without forming a clear structural separation. This observation further supports the conclusion that, although minor individual differences do exist, gender does not constitute a primary axis of variation in the overall perception of *in vitro* arrangements.

Analysis of perceptual trends using averages on Likert scales

Complementing the findings from the ANOVA and Principal Component Analysis (PCA), the distribution of responses for the 19 Likert-type items was analyzed through a trend plot (Figure 4). This visualization tool enabled an integrated view of the average ratings assigned by participants to each statement, as well as the overall direction of their opinions. The results revealed a generally positive trend toward *in vitro* arrangements, with most items scoring above the midpoint of the scale (> 3.5). Statements related to aesthetics, perceived innovation, and the intention to give these products as gifts stood out as the most favorably rated, reinforcing the broad acceptance of the proposed concept. In contrast,

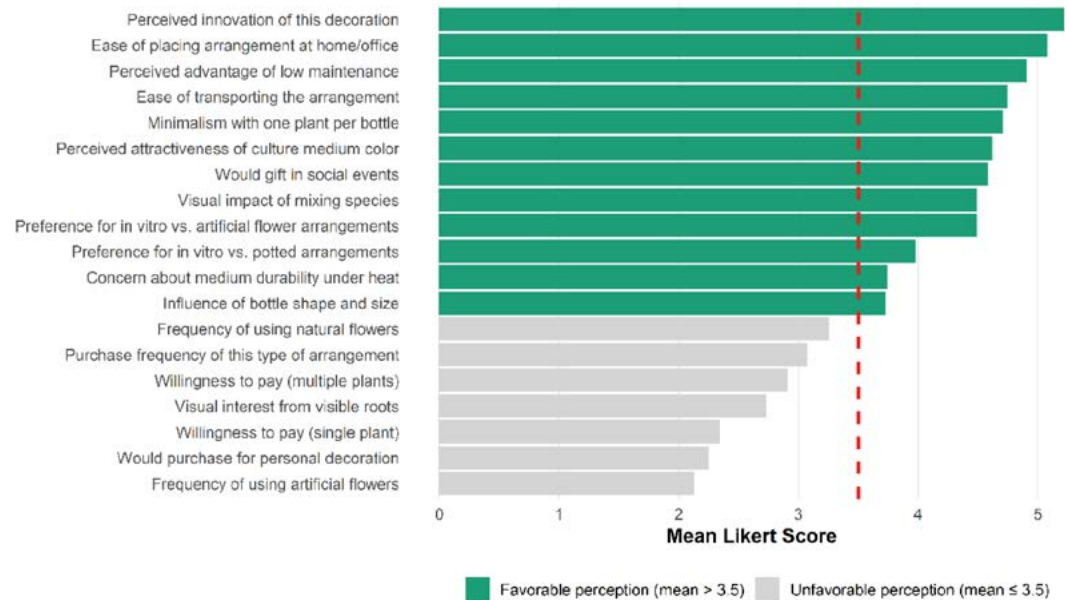


Figure 4. Average trend of responses to the 19 Likert-type items evaluating the perception of *in vitro* arrangements. The scores reflect a predominantly positive attitude toward the aesthetic, functional, and innovative aspects of the product. Values above the midpoint of the scale suggest widespread acceptance, while slight declines in certain items highlight areas that could be improved.

concerns regarding the durability of the culture medium and perceived pricing showed slight declines, indicating potential areas for improvement to enhance commercial appeal. This response pattern, consistent across male and female participants, supports the notion that gender does not substantially influence the overall evaluation. Furthermore, it suggests a favorable and relatively homogeneous perception of the product as an essential factor for its potential integration into the ornamental and personalized gift markets.

Differentiated assessment of willingness to pay for *in vitro* plant arrangements

Building upon the broadly positive and homogeneous perception of *in vitro* plant arrangements where aesthetic appeal, innovation, and ease of placement were highly valued and no significant gender differences emerged this analysis sought to better understand consumer market positioning by exploring willingness to pay under two distinct scenarios: jars containing a single plant and jars with two or more plants (Figure 5A and B). For the single-plant presentation (Figure 5A), responses clustered mostly within the 100-200 MXN range, suggesting a moderate but favorable valuation of the product. This indicates that while consumers recognize the arrangement's attractiveness, they expect its price to remain accessible. In contrast, when examining willingness to pay for jars with two or more plants (Figure 5B), there was a noticeable shift toward higher price categories, with the 150-250 MXN range being the most commonly selected. This change reflects consumers' inclination to assign value proportionally based on plant quantity and ornamental complexity. Comparing both formats highlights the potential of a differentiated pricing strategy: consumers are willing to pay more for arrangements with higher vegetative density, which presents an opportunity to segment offerings and cater to different market

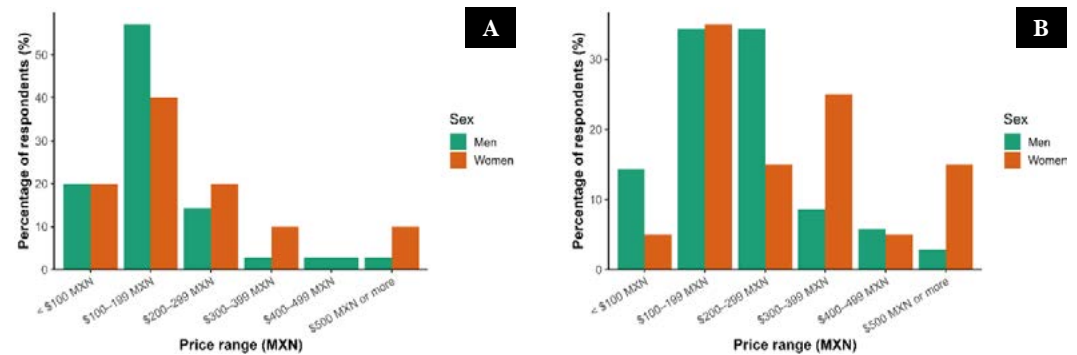


Figure 5. Distribution of responses regarding willingness to pay for a standard 250 mL *in vitro* plant arrangement, under two scenarios: (A) with a single plant and (B) with two or more plants. In both cases, responses clustered around intermediate price ranges, although a shift toward higher price categories was observed when multiple plants were offered per jar. This difference suggests a value perception proportional to the number of plants and provides key insights for establishing pricing differentiation and scaling strategies.

niches without compromising overall affordability. Altogether, these findings deepen our understanding of the aesthetic, functional, and economic factors that shape the acceptance of *in vitro* arrangements as a viable option in the ornamental and personalized gift markets.

Semantic content analysis of open-ended responses using natural language processing

Complementing the quantitative analyses, three open-ended questions were examined to capture a richer, more contextual perception from participants. Their responses were processed via text analysis, standardized, and translated into English, enabling the creation of word clouds that highlight the most frequently mentioned concepts.

In the first question, the semantic analysis revealed that the most recurrent terms were “aesthetic,” “innovative,” “natural,” “unique,” and “minimalist,” thus confirming and expanding the insights from the Likert items. The dominance of these terms indicates that participants value the arrangements not only for their functionality or practicality but also for their ability to evoke visual sophistication and novelty. The word cloud also highlights a strong emotional and symbolic component, where notions such as originality and “alive” carry significance (Figure 6). This result suggests that the appeal of *in vitro* arrangements transcends mere decoration, positioning them as a form of personal expression and connection with nature, even within artificial or urban environments.

In contrast to the positively valued attributes, the second open-ended question explored the main disadvantages or concerns perceived by participants regarding *in vitro* arrangements. The generated word cloud reveals that the most frequent terms were “durability,” “heat,” “fragility,” “evaporation,” and “cost,” highlighting critical dimensions that could hinder their widespread acceptance (Figure 7). Among the most common concerns were the potential degradation of the culture medium under high temperatures, as well as the fragility of the container and its handling in social or transportation contexts. These responses align with survey items that received slightly lower scores, suggesting that

while not predominant, these concerns are consistent and warrant attention in future stages of design and commercialization.

Finally, the third open-ended question invited participants to suggest improvements or additional features they considered important for *in vitro* arrangements. The generated word cloud highlighted “customization,” “color,” “lighting,” “labeling,” and “variety” as predominant terms, providing a clear view of consumer expectations regarding personalization, aesthetics, and product functionality (Figure 8). The suggestions reflect an interest in expanding design possibilities, including more attractive colors in the culture medium, integrated lighting, and labels explaining plant care or symbolism. Additionally, several participants mentioned a desire for a greater variety of species or creative combinations, suggesting a broader potential market if the botanical offering is diversified and adapted to different tastes or events. This set of spontaneous ideas confirms that, beyond being well received, the product sparks interest in evolving toward more versatile and personalized formats, which can be strategically leveraged to strengthen brand identity and increase perceived value.

Plant tissue culture (PTC) techniques have enabled the maintenance and development of plant tissues under controlled *in vitro* conditions, significantly contributing to the clonal propagation of commercially valuable plant species (Phillips & Garda, 2019; Zuzarte *et al.*, 2024). Such is the case of *in vitro* cultivation of *Stevia rebaudiana*, used as an alternative to its low germination and conventional rooting rates (Pande & Gupta, 2013), or orchids, whose micropropagation has facilitated the asymbiotic germination of seeds dependent on mycorrhizal fungi (Rasmussen, 2015; Yam *et al.*, 2018). In this context, the present study proposes an emerging and underexplored application of PTC: the design of *in vitro* ornamental arrangements, whose acceptance and feasibility were evaluated through quantitative and qualitative analyses.

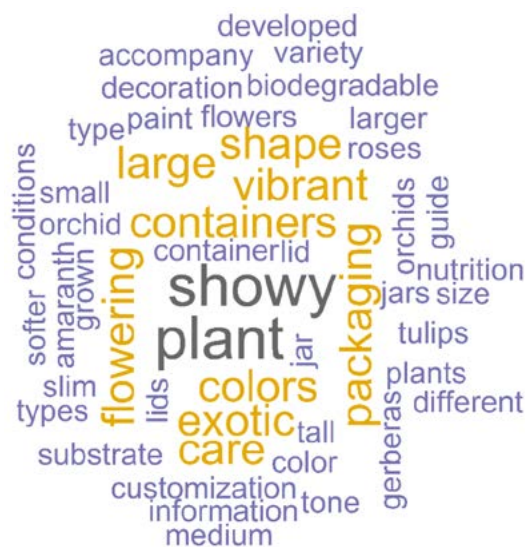


Figure 8. Word cloud generated from responses to the question: “Suggest improvements or additional features you would consider important for *in vitro* arrangements.” The most prominent keywords were customization, color, lighting, labeling, and variety, indicating participants’ desire for more personalized, informative, and visually appealing presentations.

The results obtained from the ANOVA analysis revealed notable homogeneity in responses between men and women, with no significant differences in most items. This uniformity was visually confirmed through principal component analysis, where both groups showed overlapping response patterns. These findings suggest that the product's evaluation is not influenced by gender, broadening its market potential. The analysis of average ratings showed a positive trend toward *in vitro* arrangements, particularly regarding their aesthetics, innovative nature, and practicality as gifts. However, certain items related to the durability of the culture medium and heat exposure revealed slight reservations, reflecting the technical limitations of PTC when used for ornamental purposes. In this regard, it is acknowledged that *in vitro* plants require stable environmental conditions, with temperature being a critical factor; temperatures above 34 ± 2 °C can denature the culture medium (Medina-Esquivel *et al.*, 2008). Nevertheless, placing them in protected indoor environments, such as offices, allows for proper conservation. Another challenge noted is transportation, due to the semi-solid state of the medium, although this can be mitigated by adjusting the concentration of gelling agents, such as Phytigel[®] (2-3 g L⁻¹) or Agar[®] (7-9 g L⁻¹), without compromising nutrient diffusion (Khalid *et al.*, 2024; Beruto *et al.*, 1999). Finally, although transplanting to *ex vitro* conditions is technically feasible, it involves a complex acclimatization process (Chandra *et al.*, 2010), which limits its immediate viability as a post-sale strategy. Regarding perceived economic value, willingness-to-pay graphs showed a preference for mid-range prices, with a higher willingness to pay when the arrangement included more than one plant. This finding allows for pricing strategies to be based on design complexity, maximizing profitability potential. The qualitative results added depth to the analysis. Spontaneous responses highlighted aesthetics, originality, and naturalness as the most valued aspects, while the main concerns focused on durability, heat, and cost. Constructively, participants suggested improvements such as lighting, species variety, and informative labeling, demonstrating not only interest but also clear expectations for product evolution. Overall, this study demonstrates that *in vitro* arrangements, beyond their aesthetic value, represent a viable innovation within the field of plant tissue culture. Their acceptance among young consumers, combined with the potential for scaled production in biofactories (Bello-Bello *et al.*, 2025), suggests that this ornamental application of PTC could become a promising line of development within applied plant biotechnology.

CONCLUSIONS

The results of this study confirm the high potential of *in vitro* arrangements as innovative ornamental products derived from plant tissue culture. Through a mixed-methods approach, integrating statistical analyses and natural language processing, it was demonstrated that this type of product is widely accepted by young consumers, who value it for its aesthetics, originality, naturalness, and ease of use.

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