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Consumers' and Retailers' Attitudes Towards a Mexican Native Species of Aztec Lily as an Ornamental Plant

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Abstract: The use of native ornamental plants in urban landscapes and ornamental consumers' designs is one strategy to preserve biodiversity. *Sprekelia formosissima* (L.) Herb., known as Aztec lily (ALY), is one of the nearly 4000 species of native ornamental plants of Mexico. However, its domestic market is not yet developed and is virtually unknown. The objectives of this study were to: (1) compare consumers' and retailers' knowledge of ALY, and (2) to identify potential clusters of consumers and retailers based on their knowledge and preferences, such that marketing of the ALY could be best tailored to different market segments, leading to its sustainable commercialization. There were 464 interviews conducted in four nurseries in Mexico. Results showed only one consumer knew about the ALY; additionally, we found different behaviors in consumers and in retailers: those not interested in the ALY, but when they know it is Mexican they will acquire it; those interested no matter the ALY origin, and those who dislike the ALY because it is Mexican. Those answers suggest that improving consumers/retailers knowledge about this native flower could lead to a sustainable commercialization in Mexico, helping to ensure its conservation as well.

Keywords: bulbous plants; cluster analysis; environmental education; endemic plants; local consumption; nurseries; sustainable marketing

1. Introduction

Conservation is an environmental, social, and political process, operating in an economic context [1,2]. In developing countries, it becomes important to understand people's perceptions, behaviors, and their social (culture, religion), economic, and political context in which biodiversity protection exists [1,3]. Ornamental plants are important for any ecological system, and for landscape design in different countries [4–6]; however, in developing countries, the use of native species is not common. In recent decades, the use of native plants by landscape professionals has increased due to improved access to information regarding native plants' characteristics, as well as greater availability of those plants in marketing channels [7,8]. Native plants can also provide educational opportunities for residents regarding the importance of their natural environment [9]. Investment in native plants is typically cheaper than for foreign species, as they are well adapted to their region, and their acquisition and maintenance are not dependent on purchasing power.

Floriculture is a very profitable activity; its value per cultivated unit is higher compared with other crops (such as horticulture, fruits, spices, and cereals) [10]. On the other hand, there is evidence that ornamental plants' prices could be less relevant to the final consumer, particularly when flowers are used for religious and festivities purposes. Their acquisition is an ancient human activity linked with our spiritual activities and beliefs [11].

1.1. International Ornamental Challenges and Opportunities

The international scenario in 2014 showed that the Mexican value of live plant and ornamental exports greatly exceeded that of imports (2.5 million USD vs. 7.1 million USD, respectively). Flowers, cocoons, fresh or dried flowers (including rose, chrysanthemums, gladiolas, orchids (mainly *Phalaenopsis, Dendrobium, Cymbidium*), carnations (*Dianthus caryophyllus*), and lily (*Lilium*)), comprised 22.6 million USD of the total exports. Of that amount, fresh or dried flowers were valued at 0.1 million USD, while lily and tulip bulb imports were valued at 2.1 million USD [12,13]. At the international level, Mexico faces significant challenges, like increased floriculture trade competition from the largest world exporters: the Netherlands (52%), Colombia (15%), Ecuador (9%), and Kenya (7%). Despite the economic crises around the world (in 2014–2015), and the general decrease in expenditures on floriculture products in some countries, in 2016, Mexico and Canada showed increases in their US market share. In spite those challenges, the rise of online sales had become an interesting opportunity to explore national and international markets [14,15].

1.2. Mexico's Floriculture Sector at a Glance

At the national level, Mexico has a great diversity of climates that favors the production of ornamental flowers and plants. Nevertheless, its ornamental sector as a commercial activity is considered very "young"; it started in the 1970s [10,11]. The ornamental production contributed only 0.1% of the GDP, and its value rounded $1114.5 million USD [16]. Notwithstanding several scarcities in technology, water, inappropriate transportation, and few centralized domestic markets [11], in 2016–2017 the growth of the Mexican agricultural sector (agriculture, animal, forestry, and fisheries and hunting), was more than 3.3%, higher than the growth in the Mexican Gross Domestic Product (2.3%) [17]. In the past five years, the ornamental production did grow from 20.1 million tons (2012), to 23.6 million tons (2016), an average of 4.4%. In the 2016–2017 period alone, its production increased 20.5%. Of that production, 95% was sold in the domestic market, which reach, annually, a value of $1000 million USD [11]. The floral species consumed in 2016 were primarily comprised of 21,481 tons of chrysanthemums (*Chrysanthemum*), gladioli (*Gladiolus*), and roses (*Rosa*) [17]; however, none of them are endemic [18,19].

Producing these exotic species creates additional challenges to the Mexican economy, including: (1) due the lack of innovation or registration of our own endemic species or breeds, producers have to pay for the use of seeds [11]; (2) raising exotic species can cause a misuse of local land and water; and (3) Mexico is experiencing additional pressure over local resources in terms of resilience [20], as well as potential ecosystem imbalances caused by imported species. Though we will not study those challenges in this research, these arguments are a prelude to enhance the use of local species, and this data suggests that there is still room for growth in the domestic market for ornamentals, particularly due to the availability of over 4000 native, and likely inexpensive, ornamental species [19].

The states of Puebla and Morelos in Mexico are the major producers of ornamentals [21]. However, some of the most cultivated ornamental flowering species (rose, chrysanthemums, carnation, lily, gerbera, and gladiolus) are not native. One Mexican species, *Sprekelia formosissima*, ALY, is a good candidate for commercialization in the flowering plant market. It grows wild in 14 of the 31 Mexican states, and in the capital [18,19]. It is a perennial, bulbous plant with red flowers (Figure 1). The ALY blossoms in the spring during the rainy season. When planted in groups or clumps it offers a showy display in the flowering season; it can also be exhibited on balconies, in parks, and in gardens [22]. Although the species has organoleptic characteristics similar to the tulip (*Tulipa*), lily (*Lilium*), amaryllis

(*Hippeastrum*, and *Amaryllis belladonna*), daffodils (*Narcissus*), and crinum (*Crinum* x *powellii*), extensive commercial production of the ALY has not yet been developed in Mexico, largely due to the lack of knowledge of its horticultural characteristics.

Figure 1. The Aztec lily flower (ALY) (*Sprekelia formosissima*), a Mexican native species. Source: Nicolás Álvarez-Acevedo.

A plant's place of origin can affect its desirability by potential consumers. That is, certain groups of consumers may place more or value on their ecological and cultural characteristics (aroma, height, drought/pest tolerance, for example) of a plant [7,23]. Hence, all efforts to target specific marketing strategies to different segments of the population, to change beliefs and attitudes toward native plants, could contribute to their adoption.

Due the importance of producers, retailers and consumers in the ornamental chain, the purposes of this study were to (1) find out the level of knowledge of the ALY by producers, retailers, and consumers; (2) the attributes they consider (color, height, number or flowers, aroma, price, presentation) in the case they acquire the ALY and/or other bulbous flowers; (3) to compare consumers' and retailers' knowledge of the ALY; and (4) to identify potential clusters of consumers and retailers based on their demographics and knowledge of ALY, in particular, and other bulbous flower's preferences. The information can facilitate the development of new domestic markets for the flower and may help increase the adoption of endemic flowers, enhancing local-cultural production, which potentially generate new and diversified income sources for those who participate in this agricultural chain.

1.3. Marketing Theory Framework: Consumer Behavior and Attitudes, Their Importance in the Floriculture Market

Beliefs, attitudes, values, and culture: A belief is an organized pattern of knowledge that an individual hold to be true about the world [24]. An attitude is a learned tendency to respond in a consistent way to a given object or entity [25]. In that way, attitudes are groups or sets of interrelated beliefs. A value is an enduring belief or feeling that a specific mode of conduct is personally or socially preferable to another mode of conduct. Beliefs, attitudes, and values are related with culture, represented as the way of living, built up by a group of human beings, transmitted from one generation to another, enhanced by institutions (formal and informal) and with material (artifacts, objects) and non-material elements (attitudes, beliefs, and values) [26].

Consumer behavior can be analyzed using planned behavior theory [27]. According to this approach, intentions to perform behaviors of different kinds can be predicted with high accuracy from attitudes toward the behavior, some subjective norms, and perceived behavioral control. However, sometimes actions do not match attitudes and a behavioral gap is said to occur. Thus, it is important to measure if there is a gap between the attitudes towards sustainable products and the real purchasing behavior. There exist three main variables for behavioral intention, relevant to sustainable consumption [28]: (1) values, needs and motivation, which are related to the level of involvement and social norms; (2) information and knowledge, related to uncertainty; and (3) behavioral control, related to availability and perceived consumer effectiveness of the product. Some studies that explore profiles and consumer behavior in the flower market [29,30] argue that there exists a relationship between consumer expenditures on fresh flowers and potted plants, with sociodemographic characteristics, geographic factors, housing status, and seasonal factors in the USA. Another study did use conjoint analysis and eye-tracking to investigate consumers' purchase likelihood, and determined that factors, such as organic production methods and local origin, positively impact participants' likelihood of purchase [31]. Other authors studied the Washington market of cut flowers, determining that the local production (as a variable), and the "Washington Grown" label, affected positive purchase decisions [32]. A project made for the cut flowers market in Ethiopia determined that there is a relationship between willingness to pay and environmental attributes of cut flowers (eco label and carbon footprint) [33].

To complement these theories, we consider it very important to attend to the responsible consumption and production definition, included in the 17 sustainable development goals, which states that "to achieve economic growth and sustainable development requires that we reduce our ecological footprint by changing the way we produce and consume goods and resources" [34]. The consumption and preservation of local flora and fauna can contribute to reducing the footprint, based on solidarity and respect with other species (plants, and animals), not only human, as well as considering the environment's resilience needs (the time it takes to the environment to recover to an equilibrium and return to its original form) [34]. Marketing mix (advertising, promotion, public relations) is a powerful tool and can help, from the societal and holistic perspective [20,35], to change harmful consumer behavior and reduce waste, through assertive information and knowledge. This study harnesses a survey for understanding consumers' and retailers' attitudes towards the ALY, and then uses these findings for establishing a potential cluster analysis in terms of changes in the attitudes once they find new information, in this case, that the ALY is Mexican.

2. Materials and Methods

2.1. Sampling and Survey

This was an exploratory, descriptive, and cross-sectional study [36] conducted in retail nurseries in the cities of Cuautla (state of Morelos) and Atlixco (state of Puebla). They are in the central region of Mexico, at 67.7 and 98.2 miles, respectively, from its capital, Mexico City (19.2 million inhabitants) [37]. With a 65.1 mile distance between them, they rank first and second, respectively, in the production and commercialization of ornamental flowers, encompassing 70% of this activity in the country. Cuautla, with a population of 175,207, is home to 73.1% of the nurseries in Morelos state. Atlixco has a population of 86,690 and 77.8% of the nurseries in Puebla are located there [21]. The study was approved by the Native Plants Research Center and the Research Department of a private University in Puebla, Mexico, where some authors are affiliated.

The study population included: (1) individuals who acquire plants for their personal use and/or as a gift; (2) ornamental plant retailers or nurserymen; (3) ornamental plant producers; and (4) people who engaged in both the production and retail sale of ornamental plants.

To ensure a large number of diversified respondents, a cluster sampling approach was taken at four nurseries, two in each city in April and May 2013. These nurseries were chosen based on: (1) their large walk-in customer base; (2) their interaction with producers who wish to sell to retailers; and (3) their willingness to participate in the research study. Consumers and/or potential buyers, retailers, and producers who entered the retail locations, were chosen through convenience sampling (by nature of the fact that they entered the store) to participate in the study.

Two semi-structured surveys of 23 to 29 closed-ended questions were designed (one for consumers and another for producers and/or retailers). Surveys included questions related to: (1) knowledge of the ALY, in particular, and bulbous plants, in general; (2) willingness to produce or buy the ALY, before knowing that it is a native Mexican lily and after knowing that information, on a four-point Likert scale (where 1 represents definitely yes, 2 = probably yes; 3 = probably not; and 4 represents definitely not); (3) price they would pay for the ALY and other types of bulbous plants; (4) places where they purchase similar bulbous ornamental plants; and (5) factors that influence their decision to purchase bulbous ornamental plants (e.g., scent, color, price, and presentation in a bag or pot).

The sample size was calculated with the infinite population formula [36] with a confidence level of 95.0%, probability of 50.0%, and margin of error 5.0%. We administered 464 surveys face-to-face in four nurseries, two in Cuautla, Morelos, and two in Atlixco, Puebla. Respondents were categorized into three social levels as follows: (1) low—no formal education or up to six years of elementary school, up to one TV, telephone, or car; (2) medium—7 to 12 years of schooling, one or two TVs or telephones, and at least one car; and (3) high—bachelor or graduate level education, more than two TVs, telephones, and cars. These categories were adapted from others used in Mexican marketing research, as there are no official databases, and roughly represents the socioeconomic level of the respondents [38,39].

Participants were first shown a booklet with pictures of seven flower bulb species: lily, tulip, lily, daffodil, crinum, and amaryllis (*Hippeastrum* and *Amaryllis belladonna*), to determine if they could identify each plant. Next, participants were asked if they knew or recognized the ALY in a series of pots holding one, two, or four bulbs of this flower. After the respondents answered all questions, interviewers explained the major characteristics of the ALY, as well as care instructions and gave them a card illustrating its scientific name, and a live plant in bloom. Respondents were asked of their willingness to purchase and/or sell the ALY and other ornamental plants before and after being given the information about this flower.

2.2. Statistical Analysis

Data were entered into Excel® 2011 (Microsoft Corporation, Redmond, WA, USA) and analyzed in IBM® SPSS® Statistics 20 and 23 (IBM, Armonk, NY, USA). We used the χ^2 test (with $\alpha = 0.05$ and confidence level = 95%) to determine if significant differences existed (for all respondents, for those who were only consumers, and for all three retailer groups combined) in their willingness to purchase the ALY before they were given information about its characteristics and after receiving that information. In the cluster analysis, an ANOVA was performed using various types of solutions clusters (two-, three-, and four-cluster solutions), and the criteria for deciding the best one was made with the cluster solution that had statistically significant differences between them.

To compare consumers' and retailers' knowledge of the ALY, and to identify potential clusters of consumers and retailers' willingness to acquire the ALY, two questions were used for measuring interest in buying the plant: before knowing the ALY is a native Mexican lily, and after knowing that information. For that purpose, we choose the cluster analysis given that this technique objective is to partition a set of objects into two or more groups based on their similarity, for a set of specified characteristics [40].

There are two different types of similarity measures in clustering: correlational and distance measures. The first is concentrated to measure the correlation coefficient on several variables, a type of correlation between the profiles of two objects. The distance measure represents the proximity of observations of one another across the variables in the cluster, and is the most commonly used measure of similarity in cluster analysis [40]. We had in the survey only two variables representing preferences for measuring, so given the simplicity of the method and the number of variables for testing, we decided to use the distance approach between cases for the two variables (intention to buy before and after knowing the ALY is Mexican). We selected the Ward method as a measure of distance, which basically calculates the hypotenuse of a right triangle between two objects [40], or calculate the squared Euclidian distance (the straight-line distance). The Ward method is a hierarchical algorithm process used for deriving the clusters. This is an agglomerative method that builds a tree-like structure, adding individual elements or deleting them from clusters [41]. We did choose a hierarchical method (instead of a non-hierarchical one) because of its simplicity and for the measures of similarities that can be applied to almost any type of research question [40]. The Ward method differs from other methods in that the similarity between two clusters is the sum of squares within the clusters summed over all variables. The selection of which two clusters to combine is based on which combination of clusters minimizes the within-cluster sum of squares across the complete set of disjoint or separate clusters. At each step of the hierarchical process the two clusters combined are those that minimize the total sum of squares across all variables in all clusters [40,42].

To measure the potential problem of multicollinearity [41], the Pearson coefficient of correlation was tested for the variables "interest after" and "interest before" for consumers' and retailers' data base. In both cases, the low levels obtained (for consumers, the coefficient was 0.156 and the significance level was 0.005, and for retailers the coefficient was 0.189 and the significance level was 0.073), which means that there is no information of one variable present in the other variable, and are consistent with the usage of the Euclidean Distance Method instead of other distance methods (like Mahalanobis distance). There was no need to standardize variables since both questions were asked using a Likert scale from one to four.

The potential risk of combining clusters with small numbers of observations, and that the method can be distorted by outliers [40], was not present in our study as we used four types of answers, or combinations: (1) low willingness before and after; (2) low willingness before and high willingness after; (3) high willingness before and low willingness after; and (4) high willingness before and after. If there were more possible combinations (like with a larger number of variables tested), the technique could represent a potential problem by not representing very small and with very specific groups of characteristics. In our research, our sample size was not that small for generating problems of representation or the possibility of outliers in the potential clusters. In our case, it is interesting that the same number of clusters appears in both retailers and consumers, with similar sizes and scores, avoiding the risk of reliability, as well [41].

3. Results

3.1. Descriptive Analysis

Demographics profiles of respondents: The final participant group included 357 consumers, 59 ornamental plant retailers or nurserymen, six ornamental plant producers, and 42 individuals who engaged in both the production and retail of ornamental plants. Approximately 39.0% of participants were surveyed in Cuautla and 61% in Atlixco. Production and/or retail activities were mainly performed by men 31 to 60 years of age. Although a majority of these respondents had attained only a high school education or less, some had a college degree in agriculture, and few respondents had bachelors and graduate studies. Just over half of the consumers were women. These consumer respondents ranged in age from less than 20 to over 60, however nearly half of them were between 31 and 50 years. Most consumer respondents had attained a high school degree or higher and, to a lesser extent, a bachelor degree (Table 1).

For other results, participants were grouped in two ways: (1) those respondents who were only consumers, hereinafter called consumers; and (2) those who sold plants—whether they were producers who sold to retailers, whether they were just retailers, or whether they were both producers and retailers, hereinafter called "retailers". As mentioned, respondents were shown pictures and asked to identify different bulbous ornamental plants. The bulbous plants best identified by consumers included: amaryllis (*Hippeastrum)* [21.9%], tulip (21.9%), lily (21.4%), and crinum (15.6%). Other species less identified were: amaryllis (*Amaryllis belladonna*) (9.2%), daffodil (8.1%), and others (2.0%), including gladioli, African lily (*Agapanthus africanus*), as well as Society garlic (*Tulbaghia violacea*). Interestingly, only one consumer (0.2%) recognized the ALY.

A greater percentage of retailers were able to identify different species (but no native ones). Retailers most often identified lily (23.1%), tulip (21.6%), amaryllis (*Hippeastrum)* (19.8%); then, to a lesser extent, daffodil (10.8%), amaryllis (*Amaryllis belladonna*) (9.0%), and crinum (5.2%). No retailers could identify ALY.

Table 1. Demographic profile of all respondents (consumers, retailers, producers, and those engaged in both production and retailer activities), in four nurseries in Mexico.

Category	Answers	Consumers (n = 357)	Retailers (n = 59)	Producers (n = 6)	Producer-Retailer (n = 42)	Total (n = 464)	%
Gender	Women	238	17	3	8	266	57.3
	Men	119	42	3	34	198	42.7
Age	<20	2	0	0	1	3	0.6
	21–30	53	4	2	11	70	15.1
	31–40	81	19	3	18	121	26.1
	41–50	91	15	1	4	111	23.9
	51–60	67	16	0	6	89	19.2
	>60	63	5	0	2	70	15.1
Education	No studies	4	4	1	0	9	1.9
	Elementary	59	16	2	6	83	17.9
	Jr. High	62	18	0	15	95	20.5
	High school	93	13	1	14	121	26.1
	Bachelors	116	7	2	5	130	28.0
	Graduate	23	1	0	2	26	5.6
Social level [a]	Low	83	na	na	na	na	23.2
	Medium	133	na	na	na	na	37.3
	High	141	na	na	na	na	39.5
Point of sale	Puebla	141	25	1	15	182	39.2
	Morelos	216	34	5	27	282	60.8

n = sample size. na = not asked to those respondents. [a] Social level was asked only to consumers.

All respondents were asked whether they would be willing to purchase the ALY, on a four-point Likert scale. This question was asked both before learning about the characteristics and origin of the ALY and again after. In general, consumers raised their willingness to purchase the ALY (to "probably yes" and "definitely yes") after learning of its origin, from 89.2% to 91.7% (p-value < 0.0001); retailers responded 85.0% before, and 90.1% after the same question (p-value < 0.045). Consumers not interested in purchasing ALY explained that the flowering time seemed very short (50.0%), they just did not like it at all (18.8%), the plant looked very fragile (15.6%) or seemed too plain, and/or they have other plants already (15.6%). Likewise, retailers not interested also said the flowering time was short (60.0%), they did not like it (20.0%), or they did not know enough about it (20.0%).

Opinions also differed by location. Even though Morelos is more important to the nation for ornamental production, a greater percentage of consumers (p = 0.003) and retailers (p = 0.014) were willing to purchase or sell the ALY in Morelos, respectively. One major difference between consumer's and retailer's clusters was the existence of educated women: there were more in the consumer's groups than in the retailer's groups. Additionally, retailers have a prevalence of men compared with women.

3.2. Cluster Analysis

The cluster analysis was conducted on the "after" responses to the willingness to purchase question. For both consumers and retailers, three different clusters arose (Table 2) so the strategies for marketing to these groups could differ.

There exists a significant correlation (0.01) between the number of species known by consumers and interest in ALY after knowing its origin. The correlation of −0.158 means that the higher knowledge of different species of flowers is, the higher the interest in acquiring the ALY after knowing that is Mexican. The sign is negative because our Likert scale variable moves from 1 = definitely would buy, to 4 = definitely would not buy. Similarly, in terms of socioeconomic level, there is also a significant correlation of −0.166, meaning that the higher the socioeconomic level, the higher the interest in the flower after knowing that it is Mexican.

Table 2. Three groups derived from the cluster analysis of consumers and retailers, based on their willingness to acquire the Aztec lily (ALY), before and after learning it is a Mexican ornamental flower (percentages and frequencies). We can confirm their willingness to acquire the ALY, as cluster 3 is larger in both type of respondents and the three types of clusters.

Type of Respondent	Variables	Cluster 1 (Less Interested Once They Know the ALY Is Mexican)	Cluster 2 (Always Interested, No Matter the ALY's Origin)	Cluster 3 (More Interested Once They Know the ALY's Origin)
Consumers (n = 357)	Number of participants	26	137	148
	% of participation	8.4%	44.1%	47.6%
	Average number of species known [a,b]	3.2	3.8	3.4 [b]
	Interest before (average) [b]	1.5	1.0	1.9
	Interest after (average) [c]	3.8	1.0	1.4
Retailers (n = 107)	Number of participants	9	31	51
	% of participation	8.8%	34.4%	56.7%
	Average number of species known	2.8	2.8	2.6
	Interest before (average) [b]	1.8	1.0	1.9
	Interest after (average) [b]	3.8	1.0	1.2
	If the consumers know that the ALY is Mexican, it could increase its sales (average)	3.22	1.44	1.66

[a] The number of bulb flowers they mentioned was up to six. [b] Significance at 0.01, Spearman correlation coefficient of −0.158. [c] Where 1 = definitely yes; 2 = probably yes; 3 = probably not; 4 = definitely not.

Two statistical tests (F statistic and chi-squared values) were used to test the different clustering schemes (Table 3).

Table 3. Different cluster solutions and F-Fisher (From ANOVA analysis), chi-squared values and significance for three different types of solutions (two, three, and four cluster solutions, for retailers and consumers).

Type of Respondent	Types of Cluster Solution	F-Fisher Test and Significance	Interest Before	Interest After	F-Fisher Test and Significance	Interest Before	Interest After
Consumer Clusters n = 311 valid cases	Three Clusters	F–Fisher	400.928	675.848	Chi-Squared Pearson	237.845	384.557
		Significance	0.000	0.000	Significance	0.000	0.000
	Two Clusters	F–Fisher	0.253	999.925	Chi-Squared Pearson	0.634	311.000
		Significance	0.615	0.000	Significance	0.889	0.000
	Four Clusters	F–Fisher	297.544	5265.12	Chi-Squared Pearson	249.818	622.000
		Significance	0.000	0.000	Significance	0.000	0.000
Retailer Clusters n = 91 valid cases	Three Clusters	F–Fisher	126.297	234.612	Chi-Squared Pearson	78.371	100.482
		Significance	0.000	0.000	Significance	0.000	0.000
	Two Clusters	F–Fisher	0.813	423.573	Chi-Squared Pearson	3.721	91.000
		Significance	0.370	0.000	Significance	0.156	0.000
	Four Clusters	F–Fisher	89.389	1237.9	Chi-Squared Pearson	79.604	182.000
		Significance	0.000	0.000	Significance	0.000	0.000

Both three- and four-cluster solutions had statistically significant differences among the clusters for the variables (interest before and interest after knowing that the flower was Mexican). However, given that in the fourth cluster solution there were clusters with similar averages and interpretation (clusters 1 and 2 for retailers and clusters 1 and 3 for consumers), the best solution for the analysis was the "three-cluster solution" (Table 4). We acknowledge that taking an average of a Likert scale variable is mathematically questionable, however, the approach is used here to simplify the presentation.

Table 4. Average answers by cluster and type of respondent (retailers and consumers) regarding interest in buying the ALY before knowing the flower is Mexican and after knowing that information (1 means I definitely not buy the ALY, and 4 means definitely yes, I would buy it) in a four-point Likert scale.

Type of Respondent	Type of Cluster (Four Cluster Solution)	Average Interest in the ALY Before	Average Interest in the ALY After
Retailers n = 91 valid cases	Cluster 1	1.78	3.78
	Cluster 2	1.83	2.00
	Cluster 3	2.03	1.00
	Cluster 4	1.00	1.00
Consumers n = 311 valid cases	Cluster 1	1.54	3.81
	Cluster 2	1.00	1.00
	Cluster 3	1.79	2.00
	Cluster 4	2.02	1.00

For cluster 1 (those interested in purchasing the plant before knowing it was Mexican, but not after), the strategy might focus on marketing the ALY without telling them it is Mexican. The members of this cluster are mainly women from 21 to 40 years old (Table 5). For cluster 2 (those always interested in the flower no matter its origin) full information about plant origin and environmental benefits might boost sales. For cluster 3 (interested before and even more after knowing the plant is Mexican) the marketing strategy recommended is to emphasize it is Mexican. In this cluster, there was the greater percentage of men of the study. Regarding the place of purchase, nurseries were preferred (66.1%) over public markets (17.1%), supermarkets (8.8%), street vendors (3.5%), and flower shops or other places (3.7%).

Table 5. Three groups where found derived from the cluster analysis, now based on consumers' and Retailers' demographics, and their willingness to acquire the Aztec lily (ALY) before and after learning of its origin (percentages).

Type of Respondent	Variables	Cluster 1 (Less Interested Once They Know the ALY Is Mexican)	Cluster 2 (Always Interested, No Matter the ALY's Origin)	Cluster 3 (More Interested Once They Know the ALY's Origin)
Consumers (n = 357)	% of Women	84.6	71.1	60.5
	% of high and medium socioeconomic level [a]	84.6	78.1	73.0 [a]
	% of 21–40 year olds	50.0	31.4	41.0
	% >41 years old	50.0	67.2	58.0
	% of elementary or no education	30.8	28.5	41.0
	% of junior high and high school [b]	61.5	64.2	51.0 [b]
	% of people who would like to purchase the ALY in a nursery	74.2	62.0	69.0
	% of people who would like to purchase the ALY in a supermarket	3.2	23.4	13.0
Retailers (n = 107)	% of women	33.3	29.0	23.5
	% of 21–40 year olds	44.4	35.5	54.9
	% of >41 years old	55.5	58.0	39.2
	% of elementary or no education	44.4	64.5	47.0
	% of junior high and high school	33.3	22.6	47.0
	% of people who would like to purchase the ALY in a garden centre	55.6	33.3	30.6
	% of people who would like to purchase the ALY in the mall	22.2	43.3	42.8

[a] Significance at 0.01, Spearman correlation coefficient of −0.166. [b] Significance at 0.01, and a Spearman correlation coefficient of −0.171.

For retailers, three clusters emerged, as well (Tables 2 and 5). For cluster 1, the ALY Mexican origin discourages its purchasing; but for clusters 2 and 3, the ALY's origin has less influence on purchasing, especially for those in cluster 3. When we asked retailers "if they think that if consumers will be informed that the ALY is Mexican, it would increase its sales?", those retailers' clusters who sell a greater amount and variety of flowers (2 and 3), answered "definitely yes" to "probably yes" (1.44 and 1.66, respectively), which suggests that, as the amount of ornamental species knowledge and availability in nurseries increases, the interest for producing/selling the ALY in retailer's nurseries' is greater. This could be very useful for marketing strategies, and encourage contacting larger nurseries in a first effort to promote the ALY's knowledge, as diversity in species attracts more clients, as well.

Consumers (Table 6) and retailers (Table 7) were asked about their reasons for purchasing bulbous plants. Both consumers and retailers listed: plant aroma, color, and height among the most important features. Most interestingly, price was less important than those physical characteristics in the purchase of ornamental plants. Despite the ALY having no aroma, its desirable color (showy red flowers) and height (24.5–29.5 cm plant height with flowers roughly 10 cm height and width) suggest the plant holds the characteristics that are appealing to retailers and consumers.

Table 6. Consumers' preferences regarding physical attributes (aroma, color, height, number of flowers, price, presentation), when they purchase a bulb flower (percentages).

Presentation	Species					
	Tulip (*n* = 138)	**Lily** (*n* = 80)	**Daffodil** (*n* = 18)	**Amaryllis (*Hippeastrum*)** (*n* = 76)	**Crinum** (*n* = 32)	**Amaryllis (*Amaryllis belladonna*)** (*n* = 21)
Aroma	6.5	27.5	22.2	9.2	15.6	9.5
Color	52.2	43.8	55.6	48.7	43.8	42.9
Height	10.1	8.8	5.6	7.9	18.8	23.8
No. of flowers	5.8	8.8	11.1	9.2	9.4	19.0
Likeability	2.9	1.3	0.0	2.6	3.1	0.0
Price	4.3	0.0	0.0	1.3	0.0	0.0
Presentation	6.5	6.3	0.0	9.2	6.3	4.8

n = sample size.

Table 7. Producers and retailers' physical attributes they search in different bulb flowers (aroma, color, height, number of flowers, price, presentation), when they decide to include them in their nurseries (percentages).

Presentation	Species					
	Tulip (*n* = 138)	**Lily** (*n* = 80)	**Daffodil** (*n* = 18)	**Amaryllis (*Hippeastrum*)** (*n* = 76)	**Crinum** (*n* = 32)	**Amaryllis (*Amaryllis belladonna*)** (*n* = 21)
Color	60.0	40.0	33.3	41.7	100.0	50.0
Height	0.0	0.0	0.0	16.7	0.0	50.0
No. of flowers	10.0	20.0	0.0	16.7	0.0	0.0
Likeability	0.0	0.0	0.0	8.3	0.0	0.0
Price	10.0	0.0	0.0	8.3	0.0	0.0
Presentation	0.0	0.0	33.3	0.0	0.0	0.0

n = sample size.

Another cluster analysis was conducted to determine whether the importance of these characteristics varied by cluster and type of respondent, but there was no statistical difference using χ^2 (Table 8). However, while color, smell, and size were typically found to be most important for consumers, for the retailers the number of plants in a pot were more important than the size of the plant. This difference could be relevant in terms of product development (package, appealing, advertising, promotional tools, point of purchase, and so on).

Table 8. Importance of different bulb species characteristics by respondent type and cluster, where the color and aroma influences most of the preferences regarding acquiring a bulb plant, no matter the type of respondent (percentages).

Bulb Species Characteristics	**Consumers**				**Retailers**		
Cluster	1	2	3	Total	2	3	Total
Aroma	15.4	19.4	10.1	15.0	50.0	0.0	28.0
Colour	50.0	55.2	53.8	54.0	45.0	53.0	49.0
Height	15.4	7.5	11.8	10.0	0.0	6.0	3.0
Number of flowers	8.0	5.0	4.0	5.0	5.0	29.0	15.0
Price	4.0	1.0	3.0	2.0	0.0	6.0	3.0
Presentation	8.0	4.0	11.0	7.0	0.0	0.0	0.0
Other	0.0	7.0	7.0	7.0	0.0	6.0	3.0

3.3. Aztec Lily Prices

In case the producers decide to sell the ALY, we suggest calculating an average of four variables: (a) similar bulbous flowers' prices on the domestic market, as the species was not sold in the nurseries visited or in any national market. For instance, a tulip's small pot in the nurseries visited did cost 4.00 USD, and can be sold in the wholesale market in a bouquet, at 25 USD; a lily bouquet costs 35 USD in the same wholesale market; (b) taking international prices from different websites; (c) consumer's opinions: of all consumers interviewed 41.0% were willing to pay up to 2.86 USD per ALY flower; only 16.0% were willing to pay more than 5.72 USD. Of all retailers surveyed, 59.0% were willing to pay up to 2.8 USD for an ALY flower as well; and, finally, (d) this has to be contrasted with the production costs, which rounded to 1.5–1.8 USD per flower. Considering this, the estimated ALY's sale price to the consumer in Mexico could range from 0.85–1.75 USD per bulb, and 2.25 USD per flower. As a new product, a value pricing strategy [23,26,28,35], and a fair price strategy, according to its ascetic and environmental benefits, is recommended. The supply and the demand will be low in the short-term, due its lack of knowledge and other competing species. Its ecological value, enhanced with communication and educational efforts, could increase its sales in the medium- and long-term.

4. Conclusions

This research aimed to help capture the perceptions and behaviors of individuals in order to improve both the economic development of a native bulbous plant which can, in turn, help ensure its preservation. To design a suitable strategy in the short-term, we propose addressing consumers, retailers, and producers, as presented in the cluster analysis, which revealed six groups (three of consumers, and three of retailers or producers), with different interests in purchasing or selling the plant. This research showed that while most producers and consumers held similar flower preferences when selling or purchasing flowers, respectively (aroma, color, and height), their perceptions regarding the desirability of an ornamental flower based on its country of origin can, and do, differ.

In this research, interestingly, the same type of clusters emerged in both consumers and retailers, with a similar proportion, as well: "those always very interested in the ALY no matter its origin", "less interested in the ALY once they know is Mexican", and "more interested in the ALY once they know is Mexican". This shows that, no matter whether the market role is purchasing or selling, there are similar beliefs in terms of the origin of the plant as a valued (or not) attribute for buying or selling it.

A better usage of the limited marketing resources for the retailers could be, for example, for consumers like those in cluster one, the strategy might focus on highlighting the Aztec lily's color and height rather than its national origin (women from 21 to 40 years old). At the point of sale, a given retailer could be advised that with customers with this demographic profile, they are going to be less interested in the fact that the flower is Mexican, so they can concentrate in the physical characteristics of the flower. For consumers like those in cluster two, the interest in the flower is always high, and this interest is also reflected in the knowledge of the number of species, which is the highest. This suggest that persons with a higher knowledge of flowers are possibly going to be interested in the flower no matter its origin, something that we believe retailers, with a few questions, can know about the customer at the point of sale, and also suggest that increased information about all plant characteristics, including origin, may boost sales. Similarly, for cluster 3, which is the one with more men, has a higher level of education compared to cluster 1, and has medium and high economic level, the fact that the flower is Mexican can be something that increases their interest in purchasing the flower. Thus, when approaching men, a useful tool for retailers could be to sell the flower mentioning its origin as a positive factor. Perhaps the most important of these findings is to establish the debate on the necessity and importance of more targeted strategies for producing and commercializing flower species in the Mexican market.

In the case of retailers, belonging to a given cluster is not going to be easily identified, but is helpful to understand that there is a trend in the market in terms of preferences: there are people not interested in the plants origin, other whose interested could be influenced with the origin and, finally, people that will always be interested in the flower no matter its origin. Given that there is a positive relationship between the number of species that the retailer knows and the disposition to purchase the ALY after knowing that it is Mexican, part of the future strategy for the producers could be an education campaign for increasing the knowledge of flowers, in general, which could have the potential of generating a positive attitude towards the ALY and a greater interest in purchasing it. The ALY could be part of small retailers' products, as well (for example, they could include them in their bouquets), or part of landscape professional works in public courtyards, hotels, restaurants, and residential projects. However, this will not happen immediately, and it is possible that other factors, such as the risk that represents a new crop, could also prevent the retailers from producing it. The same idea can be applied to the customer as well: the seller may not identify the type of consumer he/she has, until he/she interacts with the consumer. However, producers and retailers could design different strategies such as "pushing" [35] the ALY flower through different ornamental channels; this strategy is recommended to those products that do not have a brand position right now. In our research, we found, as well, that distribution is a very powerful tool to sell other bulbous species; the preferred places to buy them were urban areas, along with nurseries, public markets, street vendors, supermarkets, and online websites. Additionally, this has to be complemented with a variety of messages that emphasizes the local flowers' strengths, and to approach a certain demographic consumers' profile. For example, a targeted Facebook campaign, combined with publication in a specific magazine (floriculture, landscape houses, and sustainability magazines), could help to put the ALY close to the consumer, increasing its knowledge, interest, and favourable attitudes. The purpose of a targeted marketing strategy is to better attract each one of the agents in the ornamental chain. Different stimulus has to be designed to different audiences, and can be complemented with those traditional and current ones that certain audiences have attended (customers and retailers) in a market as large and diverse as the Mexican market, an integrated communications marketing strategy, combining push actions, such as face-to-face communication at the point of purchase, and pull actions, like the segmented communications via Facebook adds, could also work [35]. Using cluster analysis is another way that should be explored in the future for understanding consumer behavior and for designing newer approaches to customers, as well, with the objective of improving the effectiveness of marketing in specific groups. Testing strategies based on a previous cluster analysis in this region, and with ALY, or other crops, could be a way of proving information with regard to improvements in the knowledge, disposition to buy or sell the ALY, as well as other native flowers.

Some studies show the way consumers value the ethical aspects of sustainable products [28,43,44], and how perceptions of the local origin of the product influence its acquisition. In the present research, a higher knowledge in terms of species is related with a higher preference for the ALY when they know that it is Mexican. If we can adopt this to different ornamental local species, it would be possible that a higher knowledge of the given species could increase the endemic flowers' demand, focusing on its advantages of been a locally-produced flower (lower costs, help to local communities, strengthening our culture, and creating more employees, among others).

Investment in dissemination, outreach, and awareness mechanisms with retailers and consumers to modify their purchasing behavior, change perceptions, and educate the knowledge of the appreciation of native plants for their conservation may help develop local markets for the plant and help ensure its long-term conservation. A promotional communication strategy is recommended to spread the importance and use of endemic plants and the ALY in different markets, such as landscape architects, who can act as innovators [35] by incorporating the plant in their projects and functional designs. Furthermore, niche consumers (characterized by assuming a lifestyle oriented to the conservation and rescue of the environment and cultural respect) could be treated as early adopters. There is evidence that the presence of natural areas contributes to the quality of life in many ways, providing social and psychological benefits which fulfill non-material needs [4–6]. The attributes of the product (less specialized care needs than imported plants), its presentation and broader distribution in nurseries, supermarkets, street vendors, and florists, will help to adjust the price and repositioning of ornamental native plants [4,5,22]. Future research could develop specific strategies in distribution channels to boost both public (such as in parks) and private (consumer purchases) consumption, as well as yonger generation's buyers, needs, attitudes, and perceptions towards native ornamental plants.

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