

## Marketing study of a natural sweetener derived from stevia

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### Abstract

The stevia (*Stevia rebaudiana* Bertoni) plant is a natural non-nutritive non-caloric sweetener with various beneficial properties, among which its hypoglycemic, caloric and anxiolytic activities stand out. In Mexico, type 2 diabetes mellitus and obesity are some of the main public health problems. The objective of this study was to determine the feasibility of marketing an infusion made with dried and ground stevia leaves to people with type 2 diabetes mellitus and people with obesity in the locality of Córdoba, Veracruz, in 2022. To this end, a cross-tabulation was carried out with three variables (they would buy a stevia infusion, sex and age), and the market was segmented through a cluster analysis; likewise, the stevia infusion was made in the food science laboratory of the College of Postgraduates-Córdoba Campus and offered in 0.25 and 0.5 g filter bags for doses of 250 and 500 ml cups. As a result, 14% of both people with diabetes and people with obesity mentioned that they have knowledge about stevia and 6 and 3% of both groups have tried the plant. In conclusion, the general public had limited knowledge about the stevia plant; nevertheless, there is a potential demand for stevia infusion; therefore, the proposal to develop a stevia infusion for marketing to the target audience is viable.

### Palabras clave:

non-nutritive to caloric supplement, stevia consumption, stevia dosage, *Stevia rebaudiana* Bertoni.



## Introduction

*Stevia* (*Stevia rebaudiana* B) is a semi-shrubby perennial herbaceous plant native to Paraguay, which, in its leaves, contains a mixture of diterpene steviol glycosides (stevioside; rebaudiosides A, B, C, D and F; steviolbioside, rubusoside and dulcoside A) with sweetening properties greater than sucrose without causing an increase in the consumption of kilocalories in people who consume it or serious adverse effects considering the minimum lethal dose of 0.5 g kg<sup>-1</sup> of weight in humans (Ahmad and Ahmad, 2018); this makes it a species of great economic potential as a natural non-caloric sweetener (Mogra and Dashora, 2009; Thomas and Glade, 2010; Ainapur *et al.*, 2025).

All these glycosides are found in variable percentages, depending on the species consumed, growth conditions, and agronomic management, reaching up to 15% of the composition, between steviosides and rebaudiosides (Gilabert and Encinas, 2014; Salvador-Reyes *et al.*, 2014; Xu *et al.*, 2024). Of the various beneficial properties of products made from stevia, the beneficial effects in the treatment of type 2 diabetes mellitus and obesity stand out (Kamarulzaman *et al.*, 2014; Muñoz-Labrador *et al.*, 2024), since the result that stevia produces on this condition, type 2 diabetes, is that it tends to reduce excess glucose in the blood and tends to enhance insulin secretion (Anton *et al.*, 2010; Zaidan *et al.*, 2019), so it is concluded that stevia consumption has a potential antidiabetic effect (Mishra, 2011; da Silva *et al.*, 2025).

Likewise, stevia consumption was highlighted not only because it does not have calories, but also because it reduces anxiety related to food consumption (Gupta *et al.*, 2013; Muñoz-Labrador *et al.*, 2024). Stevia is marketed in several ways: a) as a simple infusion; b) in liquid form; and c) in the form of soluble crystals, and each of them will have different properties and applications, being their choice dependent; the best way to use stevia will depend on the amount of sweetness required in the particular product or beverage to be sweetened (Marín, 2004; González-Moralejo, 2011; Mahajan *et al.*, 2024).

Projections of the global stevia market indicate substantial growth, with an estimated value of 1.3871 billion USD projected by 2032, at a compound annual growth rate of 8.7% (Patil, 2025). Currently, type 2 diabetes mellitus is the second leading cause of death in Mexico (INEGI, 2025). The state of Veracruz is among the states with the most cases of type 2 diabetes in the Mexican Republic (Federación Mexicana de Diabetes, 2021); Mexico ranks first in the world in terms of childhood obesity and second in adults with this condition (UNICEF, 2023). However, according to the Federación Mexicana de Diabetes (2021), the state of Veracruz ranks first nationally in terms of obesity in children and adults.

Therefore, given the high prevalence and incidence rates of type 2 diabetes mellitus and obesity in the state of Veracruz and knowing the benefits of stevia in both diseases, the objective of this research was to know the feasibility of marketing an infusion made with dried and ground stevia leaves among people with this condition, type 2 diabetes and people with obesity in the locality of Córdoba, Veracruz,

## Materials and methods

### Study area

The study was conducted in 2022 in the municipal seat of Córdoba, Veracruz, from where the target audience of this study was considered. The stevia (*Stevia rebaudiana* Bertoni 'Morita II') infusion was prepared in the Food Sciences Laboratory of the College of Postgraduates-Córdoba Campus in accordance with the patent: MX/a/2017/000229.

### Production process and stevia packaging formats

Stevia was offered to both target audiences (diabetics and people with obesity) in the following forms: whole dried leaves in a cellophane bag, liquid extraction, and a stevia infusion. The most accepted packaging form of stevia infusion in both target audiences was filter bags; for this reason,

a small batch of this format was produced. The raw material used to prepare the infusion was the product from the harvest of the demonstration plots located in the College of Postgraduates-Córdoba Campus.

To prepare the infusion, the production process was as follows: first, the raw material was selected and classified, then the washing, drying, and defoliation processes were carried out. A mortar and pestle were used to grind the dry leaves, then the powder obtained was sifted through a 300-400 µm mesh sieve. Finally, 0.25 and 0.5 g of stevia leaf powder were packaged and sealed in filter bags and stored for future commercialization (Baltazar-Bernal, 2022).

## Research design

The data collection technique employed was a survey conducted through the use of a questionnaire applied to a target audience consisting of adults over 18 years of age. This questionnaire consisted of four sections: a) person's profile; b) knowledge about the stevia plant; c) willingness to buy; and d) marketing. Both variables are also considered for both target audiences (Table 1).

**Table 1. Sections, indicators, variables, and units of measurement.**

Sections	Variables	Unit of measurement
Person's profile	Age, Sex, Schooling	Number, M/W, Number
Knowledge about stevia	You know stevia, You learned about it through, You have consumed stevia	Yes/no, "Doctors, people, media, others", Yes/no
Willingness to buy	You would consume a stevia infusion, You would buy a stevia infusion	Yes/no,, Yes/no
Marketing	Packaging format of the infusion you would like to buy, Place where you would buy it, Ideal advertising	"Filter bags, cellophane bags, other", "Drugstores, health food stores, supermarkets, grocery stores", "Radio, press, TV, other"

The method used to administer the questionnaire was through face-to-face interviews, and according to its periodicity, it was a one-off study. Its design consisted entirely of single, single dichotomous, and multiple questions, with closed answers. The sample size was calculated using the formula for the calculation of finite universes:

$$n = \frac{Za^2 N p q}{e^2 (N - 1) + Za^2 p q}$$

Where: n= sample size; N= size of the universe, made up of 28 179 diabetic people and 98 627 people with obesity in Córdoba, Veracruz; Za= confidence level (95%; corresponding z-value: 1.96), p= probability in favor (50%, corresponding p-value: 0.5); q= probability against (50%, corresponding q-value: 0.5); and e= sampling error (10%, corresponding q-value: 0.1). Thus, by substituting the values, the estimated sample size n was 96 diabetic people and 96 people with obesity.

The sample was selected through a non-probabilistic sampling by convenience. People over 18 years of age were interviewed in the hospitals of the health centers, ISSSTE and IMSS in Córdoba, Veracruz, a cross-tabulation was performed in order to understand the relationships between the they would buy a stevia infusion section and the variables of sex and age. The variables used for the cluster analysis were age, sex, level of education, you know stevia, means by which you learned about stevia, you have consumed stevia, you would consume a stevia infusion, you would buy a stevia infusion, place where you would buy it, and ideal advertising.

The cluster analysis employed the agglomerative hierarchical classification method using single linkage, and the measure of similarity employed was the squared Euclidean distance, utilizing the statistical program IBM SPSS Statistics 22.0.

## Results and discussion

The results of the interviews applied regarding the person's profile section indicated that 66% of diabetic people were between 51 and 65 years old, had an average schooling of 9.1 years; in contrast, 62% of people with obesity were between 26 and 50 years old, with an average schooling of 9.7 years; based on these results, we had a target audience with an adult population over 18 years old (people with obesity) and another target audience with an elderly population (people with diabetes). Regarding sex, a 1:1 ratio was interviewed in both target audiences.

Fourteen percent of both people with diabetes and people with obesity mentioned that they know stevia, with people mainly learning about the existence of stevia through word of mouth. This low level of knowledge aligns with the findings by Kamarulzaman *et al.* (2014), who identified that 'effective promotion is necessary to increase consumer awareness towards a healthier diet' based on alternatives such as stevia. In addition, 6% and 3% of both target audiences have only tried the plant, representing a significant market opportunity for stevia-derived products.

In the willingness to buy section, 92% of people with diabetes mellitus stated that they would like to acquire a stevia infusion and 87% commented that if they were offered a stevia infusion, they would buy it; in comparison, 100% of people interviewed with obesity mentioned that they would like to acquire a stevia infusion and 80% said that if they were offered a stevia infusion, they would buy it. These results are consistent with the findings of Kamarulzaman *et al.* (2014), who found that 'the majority of respondents were willing to use stevia-based products as a sugar substitute'.

Finally, both target audiences agreed that the place where they would like to buy a stevia infusion would be a supermarket and that the ideal advertising would be through television. This preference for conventional distribution channels differs partially from that reported by Lemus-Mondaca *et al.* (2012), who found a greater preference for channels specialized in healthy products in other geographical contexts.

In the contingency tables of the cross-tabulation, it is observed that the group of diabetic people, men aged between 51 and 65 years, are the population most willing to consume a stevia infusion (Table 2), while regarding people with obesity, men between 26 and 50 years of age are the ones who are willing to consume a stevia infusion (Table 3).

**Table 2. Contingency table of diabetic people who would consume stevia in Córdoba, Veracruz**

Age	Sex		Total	
			Man	Woman
26-50 years	They would consume a stevia infusion	Yes	9	7
		No	3	2
	Total		12	9
51-65 years	They would consume a stevia infusion	Yes	34	27
		No	0	2
	Total		34	29
Over 65 years	They would consume a stevia infusion	Yes	2	9
		No	0	1
	Total		2	10
Total	They would consume a stevia infusion	Yes	45	43
		No	3	5
	Total		48	48

**Table 3. Contingency table of people with obesity who would consume stevia, Córdoba, Ver.**

Age	Sex				Total
			Man	Woman	
18-25 years	They would consume a stevia infusion	Yes	13	11	24
	Total		13	11	24
26-50 years	They would consume a stevia infusion	Yes	32	28	60
	Total		32	28	60
51-65 years	They would consume a stevia infusion	Yes	3	9	12
	Total		3	9	12
Total	They would consume a stevia infusion	Yes	48	48	96
	Total		48	48	96

This association between age and willingness to buy a stevia infusion, particularly in the 51 to 65 age group for people with diabetes, is consistent with the higher prevalence of type 2 diabetes mellitus in older adults, as noted by Samuel *et al.* (2018).

Based on the cluster analysis, the proximity matrix is presented in Tables 4 and 5, where the distances between the different cases are expressed by combining the ten variables used. As can be seen, in both target audiences, the most similar variables are they would consume a stevia infusion and they would buy an infusion of stevia. For its part, the dendrogram shows the formation of two segments in individuals with diabetes (Figure 1) and in people with obesity, four segments are formed (Figure 2).

**Table 4. Proximity matrix of variables used in people with diabetes in Córdoba, Veracruz.**

Case	Age	Sex	Schooling	They know stevia	They have consumed stevia	They learn about it through	They would consume a stevia infusion	They would buy a stevia infusion	Place where they would buy it	Ideal advertising
Age	0	46.618	36.499	67.344	49.478	31.297	70.378	70.378	8.406	36.989
Sex	46.618	0	25.123	5.639	6.27	3.829	4.628	4.628	38.991	5.297
Schooling	36.5	25.123	0	28.338	20.215	13.473	31.372	31.372	18.522	17.879
They know stevia	67.3	5.639	28.338	0	3.718	7.445	1.011	1.011	50.755	5.976
They have consumed stevia	49.49	6.27	20.215	3.718	0	3.727	4.73	4.73	37.051	2.258
They learn about it through	31.3	3.829	13.473	7.445	3.727	0	8.456	8.56	21.648	1.469
They would consume a stevia infusion	70.378	4.628	31.372	1.011	4.73	8.456	0	0	55.811	6.988

Case	Age	Sex	Schooling	They know stevia	They have consumed stevia	They learn about it through	They would consume a stevia infusion	They would buy a stevia infusion	Place where they would buy it	Ideal advertising
They would buy a stevia infusion	70.378	4.628	31.372	1.011	4.37	8.456	0	0	55.811	6.988
Place where they would buy it	8.406	38.991	18.522	50.755	37.051	21.648	55.811	55.811	0	28.991
Ideal advertising	36.989	5.297	17.879	5.976	2.258	1.469	6.988	6.988	28.991	0

**Table 5. Proximity matrix of variables used in people with obesity in Córdoba, Ver.**

Case	Age	Sex	Schooling	They know stevia	They have consumed stevia	They learn about it through	They would consume a stevia infusion	They would buy a stevia infusion	Place where they would buy it	Ideal advertising
Age	0	30.32	22.17	59.15	22.619	20.608	59.147	59.147	8.13	13.513
Sex	30.32	0	10.494	13.61	12.344	13.548	13.61	13.61	33.2	14.783
Schooling	22.17	10.5	0	29.66	17.469	7.29	29.663	29.663	16.2	12.8
They know stevia	59.15	13.6	29.663	0	12.895	32.98	0	0	66.45	27.251
They have consumed stevia	22.62	12.34	17.469	12.89	0	13.657	12.895	12.895	27.76	10.298
They learn about it through	20.61	13.55	7.29	32.98	13.657	0	32.98	32.98	11.16	14.452
They would consume a stevia infusion	59.15	13.61	29.663	0	12.895	32.98	0	0	66.45	27.251
They would buy a stevia infusion	59.15	13.61	29.663	0	12.895	32.98	0	0	66.45	27.251
Place where they would buy it	8.13	33.12	16.196	66.45	27.764	11.156	66.448	66.448	0	21.286
Ideal advertising	13.51	14.78	12.8	27.25	10.298	14.452	27.251	27.251	21.29	0

Figure 1. Dendrogram using single linkage for diabetic people.

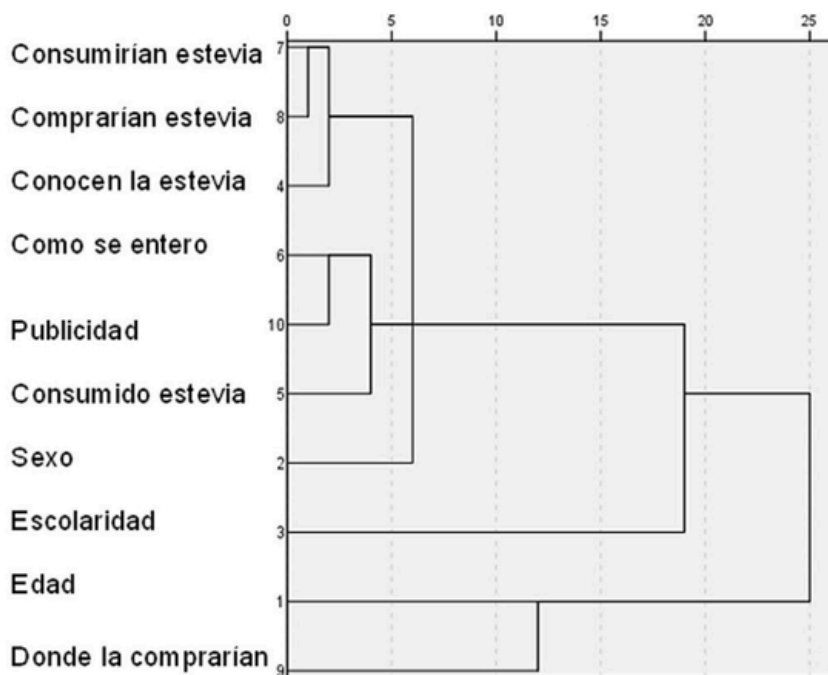
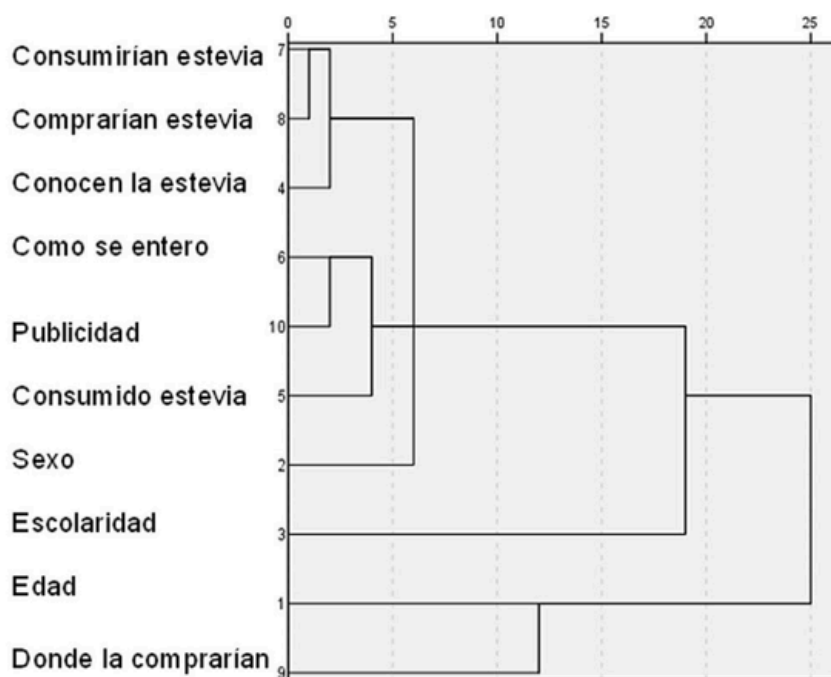


Figure 2. Dendrogram using single linkage for people with obesity.



This segmentation partially aligns with the typologies of consumers of healthy products, highlighting the importance of adapting communication strategies to the characteristics of each segment. Prior knowledge about stevia was found to be a significant predictor of purchase intention in both populations, which underscores the crucial importance of educational and informational strategies in product marketing.

## Stevia tea

The commercial brand or name with which the tea is intended to be marketed will be 'Steviacolpos'; based on the results of a study to know the ideal sweetener dose of an infusion prepared in 300 ml of water, which was accepted by the palate, it was concluded that the infusion will be available in two different doses (250 and 500 mg). The stevia infusion will be available in the form of infusion filter bags (7 × 5 cm) in doses of 250 and 500 mg, string-sealed provided with a handle (1.5 × 1.5 cm) to handle the infusion more easily when preparing; the central part of the handle will have the logo of the product; this infusion will come in paper envelopes (7 × 7 cm) where the logo will also be printed.

The boxes to store the tea packets will be made of paperboard, measuring 13.5 cm in length, 7.5 cm in width and 8 cm in height; they will have a rectangular shape, with four parallel sides and two diagonal sides; they will have impressions on three parallel sides and on the two diagonal sides, leaving a parallel side, where the base is located, completely plain. On the diagonal sides of the box, the following will be printed: the method of use, the legend imposed by Cofepris on food supplements, the batch number, the best before date, information on the healing properties of stevia in type 2 diabetes mellitus and in excess body mass and obesity, and the place of manufacture of the infusion; likewise, the logo of the product and the logo of the College of Postgraduates will also be printed on the five sides of the box.

## Conclusions

There is a low level of knowledge about stevia (14%) in both populations studied. In addition, a high initial willingness towards stevia infusion was identified (92% in people with diabetes and 100% in people with obesity), which translates into a declared purchase intention of 87% and 80%, respectively. The proposal of an innovative product, 'Steviacolpos', for the introduction in the market of Córdoba, Veracruz, determined that there is a potential demand for stevia leaf infusion in filter bag form, due to the health benefits generated by its consumption, which is the reason why the product could be accepted; therefore, it is feasible to market an infusion made from dried stevia leaves with a marketing strategy.

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Journal Information
Journal ID (publisher-id): remexca
Title: Revista mexicana de ciencias agrícolas
Abbreviated Title: Rev. Mex. Cienc. Agríc
ISSN (print): 2007-0934
Publisher: Instituto Nacional de Investigaciones Forestales, Agrícolas y Pecuarias

Article/Issue Information
Date received: 1 July 2025
Date accepted: 1 October 2025
Publication date: 8 December 2025
Publication date: Nov-Dec 2025
Volume: 16
Issue: 8
Electronic Location Identifier: e3924
DOI: 10.29312/remexca.v16i8.3924

### Categories

Subject: Articles

### Keywords:

#### Keywords:

non-nutritive to caloric supplement  
stevia consumption  
stevia dosage  
*Stevia rebaudiana* Bertoni

### Counts

Figures: 2

Tables: 5

Equations: 1

References: 24