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## Dulcamara a refreshing and medicinal drink

### Dulcamara una bebida refrescante y medicinal

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#### Abstract

The work proposed the production and sale of healthy beverages based on natural products, using dulcamara as raw material, a medicinal plant used in the pharmaceutical sector that helps prevent low defenses and weak immune system. The objective is to have a drink based on dulcamara combined with natural fruits such as strawberry, coconut, pineapple and aloe vera, which contribute to a better functioning of the organism. The preparation of the beverage started by obtaining the extract of dulcamara leaves and fruits, mixed in defined proportions and checking pH values and Brix degrees according to INEN standards for these products. To determine market acceptance, an 11-question survey was applied to the Rumiñahui sector, with a sample of 384. The beverage has pH 4.25 and 19.5°Bx within the parameters established in INEN 2337. The beverage was sensorially evaluated with an acceptance of 91.15%, at a value of US\$1 per 450 cm<sup>3</sup>. The preparation under standardized conditions and market study of the product design establishing the price, quantity, place, promotion, indicating that advertising campaigns should be carried out to promote the properties and consumption.

**Keywords:** Beverage, Dulcamara, Fruits, Medicine, Treatment.

## Resumen

El trabajo propuso la elaboración y venta de bebidas saludables partiendo de productos naturales, empleando como materia prima la dulcamara, planta medicinal empleada en el sector farmacéutico que ayuda a la prevención de bajas defensas y sistema inmunológico débil. El objetivo es disponer de una bebida a base de dulcamara combinada con frutas naturales de fresa, coco, piña y sábila, que contribuyan al mejor funcionamiento del organismo. La elaboración de la bebida partió de la obtención del extracto de las hojas de dulcamara y de las frutas, mezclado en proporciones definidas y comprobación de valores de pH y grados Brix según normas INEN para estos productos. Para determinar la aceptación del mercado se planteó una encuesta de 11 preguntas aplicado al sector de la Rumiñahui, con una muestra de 384. La bebida tiene pH 4.25 y 19.5°Bx dentro de parámetros según lo establecido en la norma INEN 2337. La bebida se valora sensorialmente teniéndose una aceptación de 91,15%, a un valor de \$1 dólar los 450 cm<sup>3</sup>. La elaboración bajo condiciones normalizadas y estudio de mercado del diseño del producto estableciendo el precio, cantidad, plaza, promoción, indicando que se debe realizar campañas publicitarias para promocionar las propiedades y el consumo.

**Palabras clave:** Bebida, Dulcamara, Frutas, Medicina, Tratamiento.

## Introduction

The eating habits of human beings present frequent changes according to trends, as the traditional diet has been replaced by products with low nutritional value or excess of chemicals. Fernández Díaz (2015) indicates that "80% of our immune system is in the intestine and this diet will make us keep it healthy and strong helping us to prevent diseases such as cancer and autoimmune diseases, allergies or arthritis." Poor nutrition leads to the fact that many current diseases are due to an unhealthy diet Borja (2009) This problem is accentuated by the involvement of large food producing industries, which promote the consumption of products with high amounts of sugar, salt, low levels of nutrients, vitamins and proteins that are necessary for a balanced diet; which is unfavorable for health, leading to present a population with a myriad of diseases. Given this situation, the initiative towards the consumption of natural products focused on care and health benefits is essential Lapoujade (2016), in Andrade-Yucailla et al. indicates that "Medicinal plants provide a wide variety of ecosystem services such as medicines, fodder, fuel, food and traditional ecological products, in addition to allowing the conservation of biodiversity" (2019, p. 34).

Until today, there is not a total idea of the characteristics and properties of the diversity of medicinal plants, so many natural products are used to improve physiological functions (Palumbo et al., 2019, p. 56). In this sense, it is proposed the use of Dulcamara (*Kalanchoe gastonis-bonnieri*), a plant whose leaves have been used in the traditional system of medicine for the treatment of ovarian cysts, urinary tract infections, uterine fibroids (Dasgupta et al., 2013, p. 12), also used as a natural remedy, because it strengthens the immune system and prevents the lowering of defenses, in order to avoid contracting diseases or viruses that affect the health of the human being.

Ecuador, a place with a variety of zones, climates and microclimates so it lends itself to the cultivation of a wide variety of plants, Pinela et al. fruits and spices characteristic of each region, beneficial elements for the production of the beverage from the use of dulcamara that is produced throughout the year, ensuring the supply of raw material (2017, p. 98).

The market in the course of time has become demanding in aspects related to health as a response to countless disorders that trigger a poor diet, in the constitution of the republic. Art. 32 of October 2008 (Ecuador), states that health is a right whose execution is linked to the attribution of water, food, education, physical culture, work, social security, healthy environments, among others that support good living.

The lack of knowledge of the essential nutrients in a basic diet by Ecuadorians and the benefits of certain plants and fruits grown in our country, facilitates the development of diseases that plague our population Pinela et al., (2017) knowing the negative effects that originates in humans the consumption of beverages made with excess chemicals or low nutritional value, it is possible to demonstrate the acceptance of dulcamara-based drinks with different flavors in the market. Ecuador has a variety of medicinal plants, but due to the lack of knowledge of their beneficial properties, they are not used as raw material in the production of beverages or other products that favor the health of the consumer.

Consequently, the idea of creating natural beverages based on dulcamara with different pleasant flavors arises, which in addition to helping to quench thirst provide health benefits. For this reason, this project is proposed as a venture at the Universidad Tecnológica Indoamérica Gros & Lara, (2009), Barros & Turpo, (2018) applying their model.

For Andrade-Yucailla et al. indicates that "The Ecuadorian Amazon Region (RAE) has a great biological and cultural wealth with 10 nationalities living in the area (2019, p.45) being those who possess great knowledge focused on natural remedies, whether plant and animal, this represents a great potential for the world, knowing that the greatest source of remedies for the health problems of the people possesses nature, approximately 71 % of new drugs have been obtained directly or indirectly from natural products.

Ancestral medicine is used especially in Latin America, Asia and Africa to treat ailments such as: injuries and diseases related to cell damage, particularly cancer, deep and gangrenous wounds, infections, burns, tumors and abscesses, rheumatism, inflammations, hypertension, renal colic, diarrhea, psychological illnesses: schizophrenia, panic attacks and fears, among others. A study by Josep Pámies recommends its leaves for the treatment of cancer (Ruiz & Maldonado, 2014, p. 98).

*Kalanchoe gastonis-bonnieri* is a medicinal plant, Palumbo et al., (2019) of rapid development that can reach up to 45 cm in height. Dulcamara acts globally within the body and in fact its action is great.

The drink for its content of vitamins and minerals strengthens the immune system contributing to a better quality of life, since in Ecuador there are some flavored waters, artificial juices for commercial sale, we can provide one with natural compounds. On the other hand, it is convenient to generate initiatives in the country in order to venture into business management, taking the organization to its maximum productive and competitive potential, giving priority to a proactive, innovative, entrepreneurial and customer-centered attitude (Sandoval et al., 2020, p. 45).

The study proposes to use the dulcamara in the elaboration of refreshing drinks combined with 100% natural fruits (strawberry, pineapple, coconut and aloe vera) with a high content of fiber, vitamins, minerals, antioxidant substances; and to carry out market research to establish the acceptance of the product. In this case to make known the benefits provided by the dulcamara, in the human organism, and also to introduce our product to the market. The proposed drink is elaborated under the specifications of the NTE INEN 2337 and the market acceptance is done through tasting and the application of a survey and then go to industrial production.

The document is organized as follows: the materials and methods section deals with the preparation of the beverage by establishing the raw material and process conditions in accordance with INEN standards for beverages, as well as packaging, labeling and storage conditions. The commercial feasibility is carried out with the market study that starts with the sample calculation, design, elaboration and application of the survey. The results section defines the characteristics of the approved product, acceptance and marketing conditions obtained in the surveys. Finally, the conclusions and future works are shown.

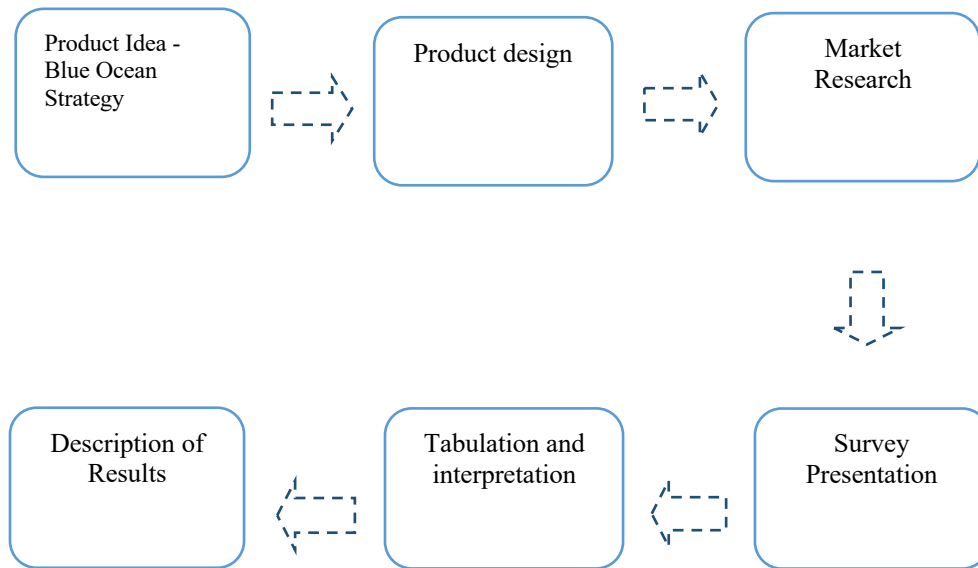
## **Materials and methods**

In this study, the leaves of the *Kalanchoe gastonis-bonnierei* plant cultivated in Ecuador were classified and washed, cut into small pieces and crushed to obtain the liquid by means of an extractor; the juice of each fruit was also extracted. Finally, the extracts are combined in the established proportions, distilled water and sodium benzoate are added as a preservative and mixed. To determine the quality of the product, we take as a reference the stipulated in the INEN 2337 standard, regarding pH less than 4.5 (Instituto Ecuatoriano de Normalización, 2017), as well as measuring the Brix degrees at 20°C with the refractometer in which drops of the solution are placed and we perform the reading. For packaging, we use resistant 450 cm<sup>3</sup> plastic bottles, certified for food and that meet the specified requirements established in INEN standards, leaving the calculated space to withstand changes in temperature and pressure. For labeling, INEN standard 1334-3:2011 is used, corresponding to the Declaration of properties related to nutrient content.

Finally, plastic bottles should be properly stored in a place where direct exposure to light, dust, humidity and heat is avoided, the containers should not come into contact with the walls, nor

should they be overloaded, the assigned spaces should be respected and the expiration dates of the products should be controlled.

The methodology, Berselli, (2018) carried out in this proposal is summarized in Figure 1.



*Figure 1* Project Methodology

On the other hand, we consider the Blue Oceans strategy, which is identified by the construction of markets in places that are not currently exploited, and which provide opportunities for sustained and profitable growth in the long term.

Next, we move on to the product design phase, Table 1 shows the established phases and activities.

Table 1 *Product Design Phases*

Phase	Activity
<b>Evaluation of the problem</b>	Determine the people who wish to consume a beverage with medicinal properties.
<b>Design Specifications</b>	Determine the type of beverage packaging, selling price, product volume, ingredients.

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<b>Idea Generation</b>	Strategy development and acceptance.
<b>Conceptual Design</b>	Characteristics of the dulcamara to prevent diseases.
<b>Detailed Design</b>	Nutritional composition of the beverage.
<b>Testing and Manufacturing</b>	Presentation of the product prototype.

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The Market Study, which is a full-fledged research, begins with the determination of the Demographic Dimension corresponding to the statistical study of the human collectivity in which the population or universe is considered; that is, the set of elements that establish the characteristics of the object of study. In this case of Ecuador with 17,267,986 inhabitants according to the 2019 census, the Sierra region with 7,733,725 inhabitants, the province of Pichincha with 3,172,200 inhabitants, the canton of Quito with 2,735,987 and the parish of La Concepción with 32,269 inhabitants, values that correspond according to the National Institute of Statistics and Census.

Since we know the size of the population and it is less than 500,000 elements, the finite sample formula was used to calculate the sample used to apply the surveys, according to what was established by (Benavides et al., 2016, p.65), which is set out below:

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

Where:

n = sample size

Z = confidence level, for 95% certainty Z = 1.96

p = probability of occurrence, 50%.

q = probability of non-occurrence, 50% q = probability of non-occurrence, 50% q = probability of non-occurrence, 50%

N = population or universe

e = sampling error, 5%.

$$n = \frac{(1,96)^2 * (0,50) * (0,50) * (26.107)}{(1,96)^2 * (0,50) * (0,50) + (0,05)^2 * (26.107 - 1)} = 384$$

The calculated sample value determines that the number of surveys to be conducted is 384.

The survey is a technique used to obtain information systematically about a defined population, from the answers given by a small part of the people in that population González & Suris, (2011). The survey procedure was applied, which consists of gathering data through interviews. Eleven questions were used as a study tool applied to the inhabitants of the La Rumiñahui sector, for the execution and measurement of the level of acceptance of the product.

## Result

The first approach is the preparation of a beverage using dulcamara with different flavors thanks to the benefits that the dulcamara medicinal plant provides in people who consume it, such as preventing diseases by powerfully balancing the body's defenses, preventing it from being depressed or over-stimulated, creating autoimmune and degenerative diseases. The preparation of the beverage with dulcamara extract was elaborated considering the Ecuadorian Institute of Normalization for this type of products, having an average pH of 4.25 and an average Brix of 19.5. As for the design of the product in the specification phase of the beverage, it can be specified that the presentation will be in a 450 cm<sup>3</sup> plastic bottle. The value of the beverage was established by making a comparison between the prices that customers are willing to pay and what is offered in the market for similar products. The packaging has the logo of the company called "Dulcalife", with the nutritional table of the drink such as the ingredients, semaphores, date of preparation and expiration of the product.

In order to establish in the target market the knowledge of the properties of dulcamara and the acceptance of the product, a questionnaire was elaborated as an instrument that was applied to 384 people that were obtained in the sample. From the surveys conducted, it was determined that 53.65% do know about the benefits provided by the dulcamara medicinal plant and 46.35% have no knowledge. The responses can be seen in Table 2.

*Table 2 Knowledge of the benefits of dulcamara*

Options	Frequency	%
a.- Yes		53,65
b.- No		46,35
Total	384	

This question asks if people are aware of the health benefits of the dulcamara plant. According to the results, it is established that the dulcamara-based beverage will be favorably received.

Regarding the frequency of purchase in units of dulcamara drinks of different flavors that they would be willing to buy weekly, 38.80% of the population would buy from 3 to 5 units of dulcamara drinks with different flavors per week and 27.09% would buy 5 units or more. It is observed that the expected consumption is between 1 to 5 units per week. In terms of where they prefer to buy, 48.44% of the people surveyed tend to buy in stores near their homes, 26.30% in supermarkets and 25.26% in micro markets. The respondents are detailed in Table 3.

Table 3 *Place of Purchase Preference*

<b>Options</b>	<b>Frequency</b>	<b>%</b>
a.-Nearest store	186	48,44
b.- Micro markets	101	26,30
c.- Supermarkets		25,26
<b>TOTAL</b>	<b>384</b>	

The majority prefer to buy their beverages in stores near their homes, either because of distance or convenience, followed by supermarkets and finally micro markets; therefore, the product will be marketed in the sector's stores. With respect to the question regarding price, 56.51% of the respondents chose to pay from 1 to 2 dollars per unit, 36.46% would be willing to pay from 2 to 3 dollars and 7.03% would pay from 3 to 4 dollars per unit of dulcamara beverage of different flavors.

The price established for the study will be US\$1 per unit for sale to the public. On the other hand, regarding the question of the size of the bottle, 38.54% of the people surveyed consider that the size of the dulcamara-based drink should be 450 cm<sup>3</sup> and the minority being 28.91% think that it should be one liter. This is shown in Table No. 4.

Table 4 *Presentation of the dulcamara beverage*

<b>Options</b>	<b>Frequency</b>	<b>%</b>
a.-375 cm <sup>3</sup>		32,55
b.- 450 cm <sup>3</sup>	148	38,54
c.- 1 liter		28,91
<b>Total</b>	<b>384</b>	

Due to consumer preferences for the dulcamara-based beverage with different flavors, the size of the bottle will be 450 cm<sup>3</sup>, considering that it corresponds to an adequate size for transportation. As for the aspects or factors considered when making a purchase, it is shown that 31.77% of the people choose a product for its price, 25.26% for its quality, 20.31% for the brand and 7.82% are the minority who make purchases simply on impulse. Table 5 shows the above.

Table 5 *Purchase Decision Factors*

<b>Options</b>	<b>Frequency</b>	<b>%</b>
a.- Price		31,77
b.- Brand		20,31
c.- Quality		25,26
d.- Custom		14,84
e.- Impulse		7,82
<b>Total</b>	<b>384</b>	

Most of the people surveyed when purchasing a product do so based on price, quality and brand recognition.

Finally, the question that shows the acceptance of the product corresponds to whether the respondent would be willing to buy dulcamara-based beverages with different flavors, which shows that 91.15% are willing to consume dulcamara-based beverages with different flavors and 8.85% would not. Figure 4 shows the above.

A large part of the population is willing to consume dulcamara-based beverages with different flavors, thanks to the benefits it has on the body of the people who ingest it. There are publications on the properties and benefits of plants with medicinal characteristics existing in Ecuador, among these is the dulcamara and that in general there is a marked lack of knowledge about them the population, which has slowed technological development in both the food industry and in the industry of phytopharmaceuticals in the country. The beverage made from dulcamara as a final product meets the specifications established in Ecuadorian standards for this type of product.

## **Conclusions**

The production and sale of beverages is planned, using dulcamara combined with different fruit flavors as an option to strengthen the immune system with the objective of powerfully balancing the defenses, since there are currently no beverages with this component in the market, since dulcamara is used in the pharmaceutical sector. Dulcamara leaf and fruits are used in the production process under controlled manufacturing and quality conditions established by INEN standards. For the market analysis, we worked with the Rumiñahui sector in the north of Quito with a population of 32,269 people, where we applied the formula for the finite sample, obtaining 384 people to

whom we then applied the surveys of an 11-question questionnaire. It is established that 53.65% do not know the properties of the dulcamara plant. The sensory evaluation of the beverage qualifies it as a product with an acceptance of 91.5% for its different flavors, which offers possibilities for industrial-scale production and market introduction.

Regarding the question about the places of preference for the purchase of any type of beverage, it is established that there would be greater acceptance if the products are sold in the stores of the Rumiñahui sector, either by distance or convenience of consumers at the time of purchasing the product. Due to the lack of knowledge of the benefits of dulcamara on the part of those surveyed, it is necessary to carry out a thorough publicity campaign in this aspect. It is proposed to complement the market study with the business plan, for the achievement of the financial analysis through indicators that establish the economic viability of the project, such as the internal rate of return (IRR), net present value (NPV), cost benefit and the investment recovery period (IRP). In the future, it is recommended that the study be conducted in other geographic sectors in order to ratify the acceptance and sustainability of this venture.

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