



APPLIED BIOTECHNOLOGY IN COCOA PASTE PRODUCTION

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696

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Abstract

Currently, the international market population distinguishes regular cocoa from Premium cocoa, the latter is produced in Ecuador and demanded worldwide thanks to its organoleptic properties recognized by the different consumers of Premium products. The world cocoa market is developing and there is a demand from chocolate manufacturers in Europe and the United States who are looking for cocoas that are exclusive in origin and quality. At the close of 2015 exports of cocoa beans and semi-processed cocoa increased by 10% compared to 2014, reaching a total volume of 260 thousand tons, it should be noted that since 2008 exports of soft cocoa in aroma from other producing countries are of the country 0.1% higher. This business plan evaluates the volume potential to export fine aromatic Cocoa to Continental Europe, which presents an opportunity to establish and grow in the international market since fine aroma Cocoa is now recognized for its quality and organoleptic properties. The competitive advantage lies in the supply of premium cocoa paste in selected flavors to small farmers in the value chain.

Keywords: Cocoa paste - Business plans - production plants - fine aroma cocoa - organoleptic characteristics

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Resumen

En la actualidad la población del mercado internacional distingue el cacao regular del cacao Premium, este último es producido en Ecuador y demandado en todo el mundo gracias a sus propiedades organolépticas reconocidas por los distintos consumidores de productos Premium.

El mercado mundial del cacao se está desarrollando y existe una demanda por parte de los fabricantes de chocolate de Europa y Estados Unidos que buscan capullos que sean exclusivos en origen y calidad. Al cierre del 2015 las exportaciones de cacao en grano y cacao semielaborado aumentaron un 10% con respecto al 2014, alcanzando un volumen total de 260 mil



toneladas, cabe señalar que desde el 2008 las exportaciones de cacao suave en aroma de otros países productores son del país. 0,1% superior. Este plan de negocios evalúa el potencial de volumen a la exportación de Cacao aromático fino a Europa Continental, lo que presenta una oportunidad para establecerse y crecer en el mercado internacional ya que el Cacao fino de aroma ahora es reconocido por su calidad y propiedades organolépticas. La ventaja competitiva radica en el suministro de cacao en pasta de primera calidad en sabores seleccionados a los pequeños agricultores de la cadena de valor.

Palabras clave: Pasta de cacao – Planes de negocios – plantas de producción – cacao fino de aroma – organolépticas

1. Introduction

For many years, small cocoa producers have sought to provide added value to their product, going from simple producers and sellers of cocoa to exporters in companies that are responsible for sending it to other countries, as well as going from cocoa sellers to small producers of artisan chocolate, (MORENO, 2018)

The cultivation of cocoa in Ecuador for many years represents one of the main agricultural activities in the country, for its peculiar aroma and flavor, occupy among the best in the world, due to its importance in the region, over time has led to new ways in both its extraction and processing in compliance with the trends and demands required for the consumption of the organic product, the study aims to capture relevant information on the processing based on biotechnology concerning the production of one of the products obtained based on cocoa, which is called cocoa paste (GONZALES, 2018)

The process of fermentation of cocoa contributes greatly to the concentration of aroma and flavor level of cocoa, thanks to the biochemical analysis carried out. Many human manipulations work for the benefit of continuous improvement in the product, also supported by sensors that determine the organoleptic characteristics of the product, however, such tests are lowered in the color and aroma of the bean for rest to ensure the quality of the paste to develop and the benefits obtained by giving use, with the advent of modernity consumers have developed their taste

for chocolate as a status of life in a sophisticated way.

Food science and technology have been developing for a few decades and the influence it has had on the preservation and processing of food is a breakthrough in the food industry. The research and the progress made by the union of chemical and biological sciences were definitive for the food production sector to develop rapidly on a large scale (GARCIA, 2017)

Biotechnology in chocolate production

The Trinidad Cocoa Research Center, along with the International Cocoa Bank, houses 2,400 varieties of cocoa. It has the collective potential to produce any number of creative hybrids, but the conventional breeding process, given cocoa's turtle-like growth rate, will not be easy (AGRO BIO, 2018).

The CCN-51 variety, developed by agronomist Homero Castro, a chocolate enthusiast from Ecuador, is now recognized as the best in the world for avoiding chocolate disasters. Considered by some as a "miracle tree", the CNN-51 cocoa variety is a short, stunted plant that produces bright red buds, and is robust and prolific. It is also disease resistant and yields four to ten times more than conventional cocoa (RODRIGUEZ, Maria, 2017).

The bad news is that its seeds taste bad. The kindest description of the taste of CNN-51 chocolate is that it is "flat". Less discreet critics compare it to rusty fingernails, vinegar, sour taste or wood shavings.

However, despite the drawbacks, some major chocolate manufacturers have resorted to variety. About 95 percent of chocolate is made of inferior quality, which is over-processed, sugar-enhanced and flavors, such as vanilla, are added. For such purposes, CNN-51 would be fine, since, if processed in this way, consumers will not know the difference.

However, for artisan chocolate makers who rely on rigorously good bean flavor for their high-end products, it's a different story. For example, Seattle's Chocopolis describes its chocolate as a fine bottle of wine, carefully blended by master chocolatiers to contain the right aroma of flavor notes: cashew, raisin, cherry, and even a hint of herb or earthy (IRANZO, 2020).



2. Objective

Conduct a literature review through secondary documents for biotechnology applied in the production of cocoa paste.

3. Problem Statement

Cocoa production begins with the harvesting of cocoa beans. Inside are cocoa nibs, nuts or almonds wrapped in the pulp, which is slightly white in color. These seeds must be extracted and fermented.

In Ecuador, there are two kinds of cocoa, clonal and national cocoa, the latter which is distinguished by its exceptional organoleptic characteristics so it is called fine aroma, until 2013, twenty-five percent of clonal cocoa and seventy-five percent of national cocoa, of all Ecuadorian exports were registered. There is a small part of the industry that is dedicated to the transformation of cocoa, where processed products such as cocoa liquor, cocoa powder and cocoa paste are obtained (EGAS CHAVEZ, 2017)

Materials and Methods

Among the materials for the elaboration of the cocoa paste we have the physicochemical analysis, which influences the determination of weight, moisture and impurity percentages, as well as in the sensory analysis the roasting temperature of the beans greatly influences the benefits it brings to activate the aroma and flavor, as well as the separate ownership of its shell, so it is vital to determine the correct temperature for this to contribute beneficially other factors (VASQUEZ, 2019)

In the development of the drying curve, it is possible to establish cocoa roasting times, this action is also influenced by the humidity with which the bean is found, the analysis of the cocoa yield in the shelling process allows to avoid waste when separating the natural shell from the pure bean, trying to reduce waste and obtain the appropriate weights (MORA ENCALADA, 2019)

The temperature and the degrees of fineness in the milling that occur due to friction for such action it is necessary to measure the temperature with a mercury thermometer to obtain the required parameters biotechnology contributes

with temperature analysis in the processing of grains and their milling, preserving the largest amount of product and generating a plus to its nutrients, as shown in Table 2.

(ENCALADA, 2017)

698

Method

Component	Method/norm	Result
Proteína	AOAC/Volumétrico	7.33
Grasa	AOAC/gravimétrico	47.89
Humedad	AOAC/gravimetric	0.86
Cenizas	AOAC/gravimetric	1.69
Carbohydrates		43.09
pH		4.7

Table 1: Cacao CNN-51

Source: (ANDRADE, Johana, 2018).

Identify the steps selected to carry out the methods used in the production of cocoa paste as is the drying method, once the fermentation of soft cocoa beans that contain a high percentage of moisture is finished it is necessary to dry it, for this procedure can be used two methods, artificial or traditional, the first is drying with the help of instruments that accelerate the process, traditional method as is known is to lay the cocoa beans on a surface under the sun for natural drying (ANDRADE, 2018)

The cleaning is very important since many cocoa beans usually arrive at the process with foreign matter such as mud, fluids, wood, sand, glass, stones, other grains, etc., using a type of sieve and sieves, the aim is to eliminate all types of material foreign to the cocoa bean, thereby seeking to present a high-quality product and appreciable to get the most benefit in each process, roasting is the next step and one of the most important since it facilitates the removal of the husk, obtaining a pure product free of impurities and shell ready to start grinding.



The shelling process is immersed in essential methods since the wrong handling could cause burns and waste of the raw material, one of the most used methods for the complete liberation of the shell is through sieves which with the help of vibration facilitate almost complete separation of the residue from the pure cocoa kernel (C., 2017)

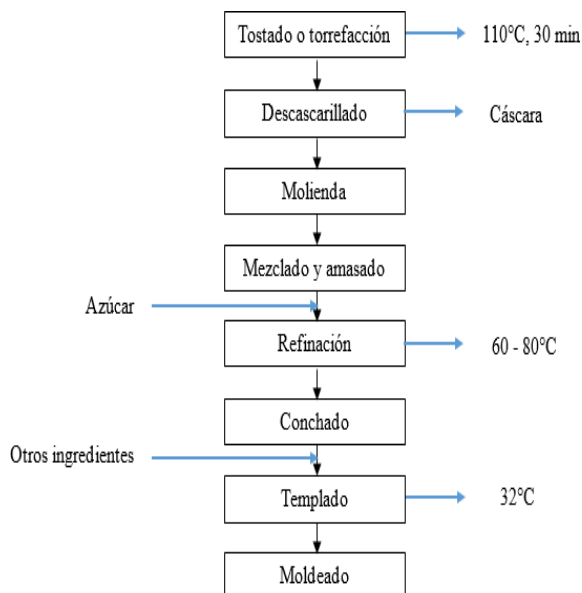


Figure 1: Flowchart for the Chocolate Production Process.

Source: (Juan Carlos Púas, 2017).

Next process to use is called first grinding, this method is very repetitive, this series of steps consists of the preparation of a mill for the crushing of cocoa beans which must be ground several times to obtain the consistency of mass required, due to new technologies this process can be done manually or automatically, for the second grinding its function is to increase the fineness of the paste to reach the exact point helped by a special milling machine (LEYVA FLORES, 2020).

The cooling is done once obtained the necessary fineness, such a method is used to ensure the hardness of the product, because the paste is kept at a high temperature, it is necessary to let it rest in the molds purchased and then send it to cool by the cold to gain adequate strength.

then the packaging is the hallmark of the place where it is produced all in handling equipment capabilities. (CHANG, 2019)

	Val.	Life	Cos t	Cos t	
Description	Unit	Use f	yea r	day	Tota l
Toaster	1500	10	150	1.2	0.12
Grinder	635	10	64	0.5	0.05
Blender	100	5	20	0.2	0.15
Thermomet er	22	5	4	0	0.01
Digital scale	45	5	9	0.1	0.01
Various utensils	20	5	4	0	0.01
SUMA					0.41

Table 2: Materials required
 Source: (Bisang, 2018)

4. Results and discussion

In the production of cocoa paste, the process begins as it is usually known, begins with the harvest of cocoa which is removed from the plant, the cocoa is initially inside the cob, are removed from the cob and the beans are detached from the central membrane, for that moment the fruit is wet.

A drying process begins, which through methods is achieved to obtain a product ready to enter the next process, it should be noted that all traditional drying is to place the beans under the sun, which by the temperature it emits manages to dry the grain in days, also used sieves that help in the same way a faster and more uniform drying.

After the previous steps, the grains must be subjected to a cleaning process, which is designed to extract foreign elements such as stones, weeds, and other compounds that could have come with the grains from the harvesting process or any of the previous ones.

After cleaning each cocoa bean, it is roasted under strict control of temperature and time, being one of the highest priority processes because in this process it is possible to measure the aroma and taste so that the cocoa paste highlights its aroma and flavor.

After the cocoa beans are roasted, they are shelled and the shell of the cocoa bean is removed, because this is an element not necessary or desired in the industries that produce chocolate,

however, it is used in an artisanal way in the preparation of concoctions, as a result, we obtain a clean bean that when split in half is obtained cocoa nib name given by the industry before sending them to the next process, it should be emphasized that being a nut can be ingested in diets.

The grinding process is done to the cocoa nib, it is taken to the mill where its temperature helps to detach from the nib a high content of fats present in it, making the solid cocoa becomes a paste, which is known as mass, paste or cocoa liquor.

The cocoa paste, is the main ingredient if you want to make a bar of chocolate, you can also obtain two sub-products which are cocoa fat obtained by maintaining a low pressure to the paste, also known as cocoa butter and others do the same way by maintaining pressure to the mass is obtained cocoa cake, which contains a small percentage of cocoa butter between 10% and 12% inside, the latter is subjected to grinding to obtain a cocoa powder.

5. Justification

Ecuador is one of the megadiverse countries in the world, enjoying a wide variety of species in both flora and fauna, thanks to them can afford to export a diverse amount of raw materials and among the most exported star products of the country is cocoa, fine and aromatic cocoa is a flagship product of the country presenting as main feature the aroma and flavor, coveted by manufacturers of chocolate and cocoa paste (MIRANDA, 2018).

Thanks to Ecuador's geographical location and the biological resources available, it is the country par excellence producer of fine aroma cocoa, with 63% of the world's production (VASQUEZ, 2018).

The flavor of Ecuador's national cocoa has been recognized worldwide for centuries, as it is a type of bean used in all types of fine and refined chocolates, many do not notice that the unique valuation of fine chocolate is characterized by its purity, especially its fragrance and flavor.

The process to the elaboration through biotechnology is to try to present a purer product, the intervention of the technology in the food products already comes giving in the industries from already many years ago, this mainly for a faster conversion of matter, and to be able to

cover the demand of the foreign and national market. (BISANG, 2018).

The intervention of biotechnology in the fermentation of the product allows it to concentrate even more flavor and preservatives, as well as shortening the waiting time from one production process to another.

700

6. Conclusions

In conclusion, it can be added that the use of biotechnology has been present in products for human consumption for many years now, especially used for:

- To provide food with extra nutrients.
- Reduce their maturation time to preserve them.
- Massify the aroma of the cocoa paste.
- Prevail more intensely the flavor of the first paste.
- Generate a much faster and more abundant production.

Biotechnology in the elaboration of cocoa paste represents in itself a benefit for consumption or use since it can be used to obtain cocoa butter and cocoa cake, resulting in a product that is not only limited to one use or preparation, the chocolate paste obtained in an artisanal way generates a lot of loss of raw material which results in the small amount of production, in addition, that the times determined for its preparation become extensive, with the development of biotechnology it is possible to produce cocoa paste without generating a loss of material and to increase considerably its production maximizing its aroma and flavor.

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