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Research and analysis of functional foods in the food industry

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A B S T R A C T

Functional foods have a positive potential for health since they go beyond basic nutrition and promote optimal health that help reduce the risk of disease, which is why they are defined as products of physiologically active components, generally the industry food has developed impressive products which are scientifically beneficial or harmful to health, which is why the have developed a great researcho on components such as: fats,sugars and tests of acceptability in consumers to develop nutritional and safe products for the society for which there was a progress of nutritional labeling for products, in which the products " light'', "low in calories'', "low in fat'' and "low in sugar'' arose, and in parallel those products are highlighted'' rich in fiber.

Introduction

In Ecuador, people between 20 and 60 years of age have greater overweight problems and the highest rate of fast food consumption occurs in young people between 15 and 19 years of age, in the last national health and nutrition survey it is determined that 3 out of 10 school-age children have problems with being overweight, this is added to the lack of macrominerals and anemia that affects approximately 50% of children between 6 months and 2 years of age and pregnant women (Sambrano, 2014).

Functional foods have strategically evolved with a potential to prevent chronic diseases in which they have beneficial physiological effects since these foods have added bioactives for health benefits, therefore they contain a greater amount of nutrients for the convenience of consumers (Berrio, 2015).

The healthy effects of the regular consumption of fruit and vegetables have been confirmed by a large

number of epidemiological studies, which is why a daily consumption of fresh fruit and vegetables is recommended in an adequate quantity of 400 to 500 grams/day with the aim of prevent diseases (Gomez, 2013).

Growth

Origin of functional foods

In 1924, for the first time, functional foods were mentioned with the application of a preventive measure against goiter, consisting of the enrichment of salt with iodine in the State of Michigan. In the 1930s, Dr. Minoru Shirota began research and development of fermented milk in Japan for the prevention of gastrointestinal diseases. In the 1950s, the World Health Organization (WHO) established food fortification programs to combat malnutrition in disadvantaged areas (Flowers, 2018).

Nutrition acquires a new therapeutic and preventive approach; participates in health promotion and is already considered a protective factor against a long series of pathological circumstances (Manuela Belén Silveira Rodríguez, 2003).

Current status of functional foods

Functional foods not only for the field of nutrition and consumption, but also for what is so important for health, economy, scientific research, legislation, trade and market development since many studies have carried out the effects on health of functional foods, and their regular consumption has been proven or closely related to disease prevention (Runian, 2006).

In our country there is a regulation that prohibits, among others, the use of any mention attributed to certain forms, presentations or brands of food products for ordinary consumption (Abadía, 2003).
There are wide expectations on functional foods worldwide, not only because of the impact it has on nutrition and consumption habits, but also because it involves other important aspects such as health. Functional foods are a way of giving added value to food products, a value that is acquired by generating an attractive market for the food industry.

Design of a functional food

A food can be designed in the elimination of components known to cause harmful effects to consumers, elimination of allergens, the increase in the concentration of a component present in the food, it is also necessary to integrate disciplines such as engineering, food science, chemistry, nutrition, pharmacy and statistics (González, 2018). Functional foods can be described as food products that provide specific healthy effects, in addition to the basic nutritional components (G, 2006).

A functional food can be designed by identifying the factors that influence nutrition, we can also calculate or establish dietary guidelines that are healthy for individuals and communities, and design production processes and food modifications.

Habits and times

It state that eating habits are the expression of their beliefs and traditions and are linked to the geographical environment and, as has been said, to food availability in which these factors evolve over the years and constitute the response to new styles. of life, the new products to consume, the type of meals (fast food), etc. (Garca, 2018).

It is important to consider that eating habits are the only ones that provide energy and various nutrients necessary to grow healthy, strong and be able to carry out daily activities. No person can survive without food and the lack of any of the nutrients causes serious health problems.

Benefits of functional foods

Functional foods are beneficial for health, so it is important that the foods are safe and have nutritional value for the person, while medicines are not safe, but are approved based on judgments about their

benefits and risks (Meneses, 2011).

A functional food can be a natural food or one that has been modified to have a functional influence on the health and well-being of the consumer through the addition, elimination or modification of specific components (Román Jiménez).

There is a growing awareness among consumers of the importance of diet in health status, which is accentuated by the aging of the population and the increase in life expectancy, a phenomenon that is not the heritage of developed countries and that It is also clearly observed in the countries of our Latin America (Illanes, 2015).

In the food industry, a more nutritious, hedonic or prestigious type of food has begun to be produced, adding the nutrients that biomedical fashion entails, with which 70 are vitamins, 80 are proteins, 90 are fibers, at the beginning of the third millennium acids fats and in the last decade prebiotics (Aguirre, 2019).

Consuming functional foods helps us since they have beneficial properties for health because they contain flavonoids, which is why it is important to include foods rich in these compounds in our diet and combine them with foods of animal origin or their derivatives to obtain the necessary amount of nutrients.

The food industry and the development of functional foods

Functional foods in the food industry have been incessant for some years, especially since the concept of health promotion was developed in 1984 in Ottawa, Braverman shows how the food industry has undergone an impressive development in the creation of this type of food for the last thirty years (Cristina Gonzalez Diaz, 2012).

Consumer behavior around food selection, and how the industry has responded to these market demands, which is consistent with findings on the effects of diet on human health. (José, 2014) The provision of this type of products in supermarket windows and the advertising that develops around them, greatly affects consumer behavior and, therefore, poses new challenges for nutritional food education (Masis, 2002).

The integral use of fruits is a requirement and at the same time a demand that must be fulfilled by countries that wish to implement the so-called "clean technologies" or "technologies without residues" in agribusiness. (Magaly Iuit-González, 2019). Regarding the characterization of phenolic compounds in processed fibers from the juice industry, particularly fruits such as: apple, pear, peach, orange, tangerine, lemon and carrot as a vegetable, identified the concentration of around forty phenolic compounds, both those linked to the epicarp (peel) and to the mesocarp (pulp) (Lamos, 2017).

Functional foods in the food industry have been incessant for some years, especially since the concept of health promotion was developed. Therefore, the industry must identify potential foods and enrich them. It can even be added to certain foods that are considered fast, and transform them, for example, juices that are kept cold, some fruit-based fried foods.

Healthy foods with low nutritional value

The high content of inulin in onions is also interesting, because this compound is not digested or absorbed in the small intestine, it ferments in the colon and selectively stimulates the development of lactic acid bacilli that are called probiotics and are beneficial for intestinal ecology, however, its nutritional contribution is scarce (Santiago, 2016).

Eating a healthy and balanced diet can be difficult, especially when we have a wide variety of cravings for junk food, those foods with high caloric content, but with low nutritional value and that do not provide us with anything beneficial for our health, that is, empty calories.

Post-hoc dietary patterns

This approach tries to detect, through statistical methods such as factor analysis or principal component analysis, underlying dietary patterns in the population under study. Through factor analysis, a so-called prudent dietary pattern has been identified in the American population, characterized by a greater consumption of fruits, vegetables, whole grains and fish, and another called Western, characterized by a high intake of processed meat, French fries, dairy products and refined cereals (Barbonade, 2019).

We put this paragraph because it is very important to be able to improve the health of human beings and to be able to know what causes the excess consumption of food plus junk food since it talks about subsequent dietary patterns and is important for functional foods.

Healthy and functional foods with good nutritional value

Natural or processed foods that contain known or unknown biologically active compounds that, in defined, effective and non-toxic amounts, provide a clinically proven and documented health benefit for the prevention of chronic diseases are considered functional (Galarza, 2019).

This paragraph is very important since it speaks of making natural foods that are not harmful to people and provide a health benefit and prevent serious diseases that can cause death.

A clear example of this group of foods is the common bean or kidney bean, which has a high protein content, starches with an intermediate digestion speed, a high content of dietary fiber, phytates, tannins and non-digestible oligosaccharides (Masis, 2014).

Beans are said to be good for health since they have a high content of non-digestible proteins, fiber, tannins and oligosaccharides, therefore they have little fat and it can also be said that legumes are similar to meat in terms of nutrients, but with lower levels of iron and animal fats.

Any food that comes close to the nutritional recommendations is usually recognized as "healthy", and if it also contains some component that provides additional benefits, it can become functional as long as it is scientifically confirmed (Jáuregui-Lobera, 2018).

How to determine the difference between a functional food and a conventional one

To determine the difference between a functional food and a conventional one, science plays a determining role in this conclusion, to give it this functional food label, an exhaustive review by experts in the field must be carried out, where studies of the organic functions of the food to be processed for this purpose, considering as a first measure its benefit to health and its nutritional properties, in addition to considering that access to ingredients and this guarantees an offer that supplies the demand for food, which In turn, it opens a wide field of research for specialists in nutrition and health (Lope, 2015).

In this part it is said that functional foods play a very important role since it is a food of ordinary consumption in the current diet, while conventional food is those that are produced under an artificial production system.

Food market and consumer orientation

One possibility to take advantage of the nutritional qualities of pejibaye is the preparation of tortilla-chip type sandwiches, currently in high demand in the international market, this product can be produced with an advantage over those marketed, since it can be manufactured without added fat, salt nor artificial additives that characterize them (Rebeca López-Calvo, 2015). To be able to consume pejibaye, sandwiches and chips are made, since it can be made without added fat or

condiments, since it is an important source of vitamin A, β-carotene, potassium and carbohydrates, although they contain low levels of protein and other minerals. This type of food product is favored by multiple factors, among which stand out: greater social recognition of the role that diet plays in the prevention and cure of diseases, greater access to information by the consumer, the need to have of processed foods that lighten the workload in the face of the pressures that modern life demands, the possibility of "substituting" natural foods for "supplements" (Masis, 2002).

Prebiotics, probiotics and synbiotics and antioxidants

Probiotics are named after a broad group of non-pathogenic bacteria, which have various potential health benefits, and have been used for centuries in the form of fermented milk-based products such as yogurt (Marbe Alexandra Cardona-Arengas, 2019).
In recent years, the demand of the national and international market has promoted a new line of probiotic functional foods, food products, in addition to their intrinsic nutritional value, help maintain the general state of health of the organism and at the same time can have an additional beneficial effect, therapeutic or preventive in the host (Taranto, Medici, & Font, 2005).

It is important to include foods rich in prebiotics and probiotics in the daily diet thanks to their usefulness in reducing the risk and treatment of various gastrointestinal diseases, since the combination of probiotics and prebiotics in food products as functional ingredients is becoming increasingly interesting for the food industry (Loin, 2018). These compounds are associated with the prevention of chronic degenerative diseases that in recent times are increasing among the population (Star Lara-Cortez, 2014).

Prebiotics, probiotics and synbiotics and antioxidants are very important in functional foods since they have various health benefits and yogurt, etc., are made from these products. For this reason, the consumption of these foods is recommended because On the other hand, they reduce the risk and treatment of various gastrointestinal diseases.

Glucosinolates and health benefits

Vegetables include broccoli, from the cruciferous family, of limited consumption in Spain, but an excellent source of phytochemical compounds, including: glucosinolates, vitamins C, E and K, folate and phenolic compounds, in addition to essential minerals for consumer health (DA Moreno, 2008).

Isothiocyanates are potent inducers of cytoprotective enzymes in man and mammals, they are metabolized through the mercapturic acid pathway, they are initially conjugated with glutathione, catalyzed by glutathione transferase (GST), the conjugate undergoes a series of reactions catalyzed by glutamyltranspeptidase (γ-GT), cysteinylglycinase (CGase) and N-acetyltransferase (AT), forming conjugates of N-acetylcysteine or mercapturic acids (Villanova, 2019). In this part talk about vegetables since they are very important for what they provide many benefits for nutrition and disease prevention and above all they regulate intestinal transit so they provide vitamins that modulate metabolic processes.

Accessible food for society

It is made up of men and women consumers, who make their purchases at the Fairs, thus called the shopping centers that bring together wholesalers, retailers and local producers of the most varied items, within the same place, allowing direct access to the public and with prices accessible (Provens, 2013).

This has multiple conditions, such as poverty, one of the main modifiable health risk factors. Thus, it provoke to say that do not need new healthy foods, but rather improve access to existing ones, that is, those that meet the requirements to integrate a balanced diet: fruits, vegetables, legumes and water (Intrigue, 2019).

Table.1 Functions and sources of minerals

Minerals	Functions	Fuente
Hierro	It is part of the hemoglobin in the blood whose function is to transport oxygen to all tissues. Its deficiency produces anemia, mainly in women of reproductive age and young children.	- Red meat, liver and other viscera. Morcilla (Moronga) - Intense green herbs. - Leguminosas - Foods fortified with iron.
Soccer	Indispensable in the formation and maintenance of bone and teeth. Participates in the regulation of body fluids, in blood coagulation.	Milk and cheese - Meat and sardines Egg yolk - Grain legumes
Iodine	Necessary for the proper functioning of the thyroid. Its deficiency produces goiter (the thyroid enlarges its size) and produces cretinism in children (physical and mental retardation).	- Iodized salt Fish and shellfish
Five	Important in the body's defense against infections and in the growth and development of children.	- Meat, liver, eggs and shellfish. - Foods fortified with zinc.

Source: Guatemala, Pan American Health Organization (2012)

Table.2 Contents of natural foods for the benefit of human health

Class/component	Origin	Potential benefit
carotenoids		
beta carotene	Carrot	Neutralizes free radicals that could damage cells
lutein	Green vegetables	Contributes to healthy vision
lycopene	Tomato	Reduce the risk of prostate cancer
dietary fiber		
Fibra insoluble	wheat husk	Reduce the risk of colon cancer
Beta glucano	Avena	Reduce the risk of cardiovascular disease
Fatty acids		
Omega 3, fatty acid DHA	fish oils	Reduce the risk of cardiovascular diseases and improve mental and visual functions
Linoleic acid	Cheese, meat products	Improving body composition could reduce the risk of certain types of cancer
Flavonoids		
catechins	Te	Neutralizing free radicals could reduce cancer risk
Flavonas	citrus	Neutralizing free radicals could reduce cancer risk
plant sterols		
stanol ester	corn, soybeans, wheat	Reduce blood cholesterol levels
Prebiotics / Probiotics		
Fructooligosaccharides	Chicory, onion	Improve gastrointestinal health
lactobacilli	Yogurt	Improve gastrointestinal health
Phytoestrogens		
isoflavones	soy foods	Reduce symptoms of menopause

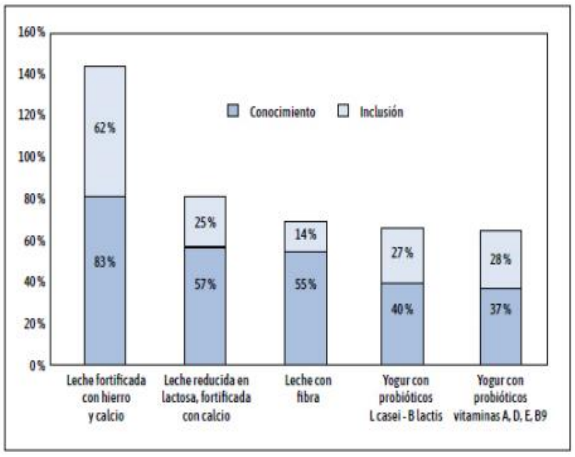
Source: : Villanueva, Emilio Yabar (2019)

Table3 Functional foods.

Natural	Processed
Contain beneficial substances naturally	They eliminate, add or increase a component (lactose-free milk).
Example: Fish or chia for its high content of omega 3.	They replace one component with another (they replace sucrose with non-caloric sweeteners).
	They alter the metabolic availability (egg with greater availability of fatty acids).

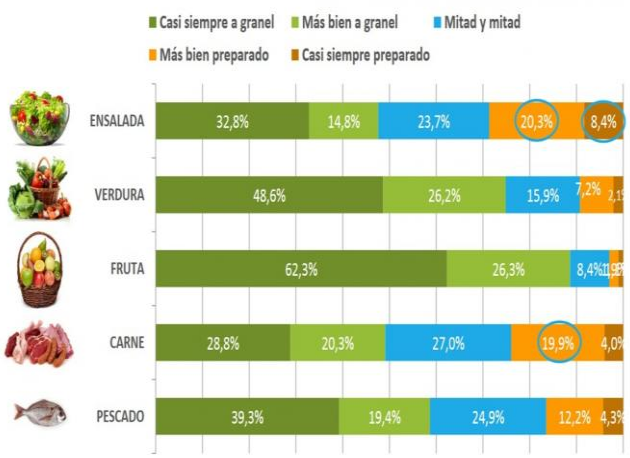
Source: Méndez, Castillo M. (2020)

Figure.1 Knowledge and inclusion in the diet of milk and dairy products added with functional ingredients.



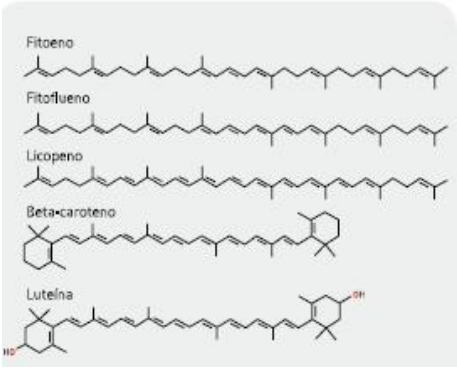
Source: Mara, Melisa Gladys Brítez. (2019)

Figure.2 Fresh food trend



Source: Jareño, Nina (2017)

Figure3. Chemical structure of the main tomato carotenoids



Source: González, María Navarro (2016)

Functional Dairy Foods

People frequently consume fortified milk, especially at breakfast, and recognize yogurts as functional foods, however, they do not consume them or consume them occasionally. (Maria, 2019)
Consumers often search the market for products that contribute to their health and well-being without knowing that these are called functional foods (Gomez Zavaglia, 2012).

Meat derivatives as functional foods

Nutrition science has traditionally studied the relationship between health and nutrition. Diets have been based on food combinations, designed to provide the human body with the nutrients required in different physiological situations.

Diets have been based on food combinations, designed to provide the human body with the nutrients required in different physiological situations (Lopez, 2011).

Food consumption trend

In this study experiencing that currently called an "epidemiological transition", since our causes of illness and mortality are beginning to be different from those that afflicted us thirty or fifty years ago (Morales, 2014).

They are constantly dynamic, and can be reflected as a temporary preference or become a permanent force in the market as they are conditioned by various factors, such as income level, environmental changes, altered diets, population growth and demographic variations (Whitewashed, 2021).

Competitiveness in the functional food industry

The ability to innovate to access a local market that is structured in niches and is in training, for the generation of knowledge and access to technology is fundamental, therefore, public institutions of science and technology, such as INTA and Universities , are important to accompany this type of process, particularly for SMEs, which add value to primary productions (Campora, 2016).

The development of functional foods with antioxidant activity based on the diversification of their commercialization, not only as dry calyxes but also as a common ingredient or excipient of high value for the food industry (Sumaya Martínez, *et al.*, 2014).

Food classification

Due to the multiple studies that demonstrate the relationship between diet and health, the production and market of functional foods has grown widely, being driven mainly by new consumption trends where consumers choose their foods according to their properties and benefits. conferred on them, in an effort to maintain good health. (Motino, 2018)

A functional food can be classified into two large groups: natural and processed.

On the other hand, some commercialized or processed functional foods are:

- Probiotics
- Prebiotics
- Modified dairy products
- Products enriched in phytosterols
- Products enriched in Omega-3
- Products enriched with antioxidants (Castle, 2020).

Tomato as functional food

The deep red color of tomatoes is provided by a chemical molecule called lycopene, which constitutes approximately 80-90% of the total content of carotenoids present in the tomato. Lycopene content in tomato is influenced by several factors such as plant nutrition, environment and genotype, which together can significantly affect carotenoid bio-synthesis (Gonzalez, 2016).

In conclusión, Functional foods are very important since they are those foods that are made not only for their nutritional characteristics but also to fulfill a specific function such as improving health and reducing the risk of contracting diseases.

These foods are very important for health and there is a very wide possibility of food research due to the achievements made in food products and improve gastrointestinal functions.

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