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Attestation de collaboration

Nous, soussignés, attestons par la présente la collaboration entre les étudiants des deux masters suivants pour le projet d'étude intitulé : **"Studies on Some Functional Dairy Products"**, encadré par Professeur TABAK Souhila.

Objet de la collaboration

Cette collaboration vise à combiner les compétences et les connaissances des étudiants des deux masters pour mener à bien une recherche approfondie sur les produits laitiers fonctionnels. Les étudiants travailleront ensemble pour explorer les aspects microbiologiques, toxicologiques et de sécurité alimentaire de ces produits, afin d'améliorer la qualité des produits laitiers disponibles sur le marché.

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Fait le : .

Dedication

To our parents and families; our success is undoubtedly the fruit of their years of labor and sacrifice

To all my family members

To all my friends, particularly:

Ahmed, Wail, Habib and Hamid

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List of abbreviations

Subsp: subspecies

LAB: Lactic acid bacteria

pH: Hydrogen potential

°D: Dornic Degree

MRS: De Man, Rogossa and Sharpe

AOAC: Association of Official Analytic Chemists

E. coli: Escherichia coli

NIST: National Institute of Standards and Technology

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ملخص

Résumé

Abstract

Abstract:

This study investigates the public's knowledge of probiotic foods, specifically dairy products, as well as the physicochemical and microbiological characteristics of yogurts from two brands: Summam and Danone. To go through the experiment, samples of eight distinct varieties of yogurt from these brands were gathered from various points of sale. These samples were placed in a cooler to preserve their integrity throughout transportation. Later, they underwent thorough physicochemical and microbiological examinations in a laboratory. The findings showed that the pH, lipid content, and protein levels of the yogurts from Summam and Danone both satisfied basic physicochemical requirements. Microbiological examination, however, showed different concentrations of good bacteria, with Danone samples often exhibiting greater probiotic counts than Summam. In parallel, a survey with eight questions was administered in person or via Google Forms to people of various ages and genders to gauge participants' knowledge and awareness of the health advantages of probiotic foods. The results indicate that there is a moderate level of public awareness regarding the health benefits of probiotic dairy products. A thorough grasp of the probiotic knowledge of consumers as well as the quality of yogurt products is possible through the combination of public surveys and laboratory investigations.

Keywords: microbiological traits, physicochemical qualities, yogurt, functional food, customer preferences, dietary advice

GENERAL INTRODUCTION

GENERAL INTRODUCTION

Introduction:

Yogurt is one of the most notable examples of functional food, and it is gaining popularity because of its possible health advantages beyond simple nutrition. The present study explores the various aspects of yogurt's role in enhancing health and wellness. It is named "Studies on Certain Functional Foods: A Case Study of Yogurt as a Functional Food." Known for its rich nutritional profile, which includes vital minerals like calcium, protein, vitamins, and probiotics, yogurt is a dairy product fermented by particular bacterial cultures. When ingested in sufficient quantities, these probiotics—live microorganisms—offer various health advantages, including better immune system performance, better digestion, and maybe lowered illness risks. The biochemical and physiological effects of yogurt consumption are investigated in my work, with a focus on how regular consumption may affect metabolic processes, gut flora, and general health consequences. To demonstrate the functional qualities that contribute to yogurt's value as a part of a well-balanced diet, this study will evaluate three different types of yogurt: Greek, classic, and fortified. Moreover, taken into account in the research are consumer attitudes and the function of functional foods in contemporary eating patterns. This research emphasizes how crucial it is to include functional foods like yogurt in daily nutrition to support optimal health and prevent chronic diseases through a thorough analysis of scientific literature and empirical evidence.

This study is significant in a number of ways that is indicative of its influence on society and science. Secondly, it discusses the rising demand for functional meals, which are distinguished by their capacity to offer health advantages above and beyond those of simple sustenance. By concentrating on yogurt, a dairy product that is commonly consumed, the study advances our knowledge of how common foods can be extremely important in maintaining and preventing disease.

From a scientific standpoint, it offers insightful information on the physiological and biochemical processes by which yogurt achieves its health advantages. This covers the effect of probiotics in preserving gut health, boosting immunity, and possibly alleviating ailments like inflammatory bowel disease, lactose intolerance, and gastrointestinal infections. The study contributes to the body of knowledge in nutrition science and microbiology by clarifying these pathways and providing evidence-based suggestions for dietary guidelines and public health policy.

The obtained results will have the potential to impact dietary guidelines and population health initiatives from the standpoint of public health. Promoting yogurt consumption might be a useful tactic to address nutritional deficiencies and enhance overall health outcomes because it is both accessible and reasonably priced, especially for groups with limited access to a variety of dietary options. Furthermore, by incorporating functional items into daily diets, yogurt may help promote sustainable dietary practices, according to the research.

From an economic standpoint, the study can help the dairy industry since it offers scientific evidence to support the health claims made for yogurt, which will boost customer confidence and possibly drive up demand. Hence, this can stimulate innovation in the dairy product industry and help the functional food industry expand. The study's overall significance stems from its ability to inform and impact consumer behavior, industrial practices, public health policies, and nutritional science—all of which could lead to a healthier society.

Rich in nutrients, milk is employed widely in the production of dairy products through technical procedures such as lactic fermentation. This procedure includes producing bacteriocins to suppress dangerous microorganisms and acidifying food to ensure food safety (Hadjimbei et al., 2022). To improve the organoleptic quality of dairy products, it also entails producing aromatic molecules. Because of the probiotic and nutritional qualities that lactic acid bacteria give, yogurt in particular is regarded as a functional food (Gómez-Gallego et al., 2018). So it's crucial to figure out exactly what constitutes a functional food and to contrast minimally processed homemade yogurt with commercial ones that go through a lot of processing and include additives.

The incentive behind this study is to perform a thorough examination of the microbiological and physicochemical properties of yogurts that are often consumed. It will assess the probiotic content, pH ranges, texture, and nutritional makeup of Greek, traditional, and fortified yogurts. The study will also look into the items' shelf life and safety, as well as consumer preferences and potential health advantages. The study compares several yogurt varieties and analyzes their effects on gut health to offer useful information to consumers, medical professionals, and the dairy sector.

To delve into the subject and determine the nature of Yogurt as a functional food, the following questions are asked:

1) What makes Yogurt a functional food?
2) What differences may there be between homemade Yogurt and industrial yogurt.

These questions are asked in order to identify the specific properties and components that classify yogurt as a functional food, and to explore the variations in quality, composition, and health benefits between homemade and commercially produced yogurts, considering the impact of processing methods and additives.

The following hypotheses are tentative answers to the research questions:

1) Yogurt is a functional food because its probiotics improve gut health and immune function, and its rich nutrients, like calcium and protein, support bone health and overall wellness.
2) Homemade yogurt has higher probiotic content and fewer additives, while industrial yogurt often includes stabilizers, and sweeteners, and has more controlled production processes.

Method of Investigation:

To confirm the stated hypotheses, a method of investigation is set: it includes:

An **experimental protocol** consisting of a sample of 8 types of yogurt from the ‘Summam’ and ‘Danone’ brands collected from different points of sales. These

samples which were placed in a cooler were taken directly to the laboratory for physicochemical and microbiological analysis.

A **survey** containing 8 questions directed to people of different genders and ages. This survey which is conducted via Google forms and in-person is to check the public's awareness of probiotic foods mainly dairy products.

Research Plan:

This dissertation consists of three sections and a general conclusion:

Section one: is a review of the literature that discusses the foundations and broad ideas of yogurt is presented. This is followed by an analysis of our yogurt survey.

Section two: includes a survey discussion

Section three: is an experimental section that focuses on yogurt's physicochemical and microbiological properties.

General conclusion: summarizes research on the functional characteristics of yogurt and the distinctions between commercial and homemade varieties, emphasizing the implications for consumer choices and health. It highlights the significance of this knowledge for well-informed dietary advice and business procedures.

FIRST PART

LITERATURE STUDY

I-1-Definition of a functional food

Functional foods belong to a category of food products designed to provide health benefits that extend beyond their basic nutritional value. They are formulated to contain substances or live microorganisms at safe and effective concentrations, aiming to achieve specific health-enhancing effects (**Temple, 2022**).

I-2-Definition of Yogurt

A fermented milk product is produced through the bacterial fermentation of heat-treated milk, facilitated by the symbiotic interaction of Streptococcus thermophilus and *Lactobacillus delbrueckii* subsp. *bulgaricus* (**CXS 243-2003**).

I-3- Key attributes of yogurt's lactic ferments

I-3-1- *Streptococcus salivarius subsp. thermophilus*

This microorganism is exclusively isolated from milk and milk products. It is characterized as a gram-positive coccus, non-mobile, thermoresistant, sensitive to methylene blue and antibiotics. It is homofermentative, anaerobic, and may occur in the form of chains of variable length or in pairs. The optimal temperature for its growth typically ranges between 40 and 50 °C. Its primary function lies in the fermentation of lactose into lactic acid (**Lagunas *et al.*, 2022**).

Moreover, it plays a crucial role in determining the texture of fermented milks by increasing milk viscosity through the production of polysaccharides. These compounds consist of galactose and glucose, with minor amounts of rhamnose, arabinose, and mannose. In addition to its acidifying properties, these polysaccharides contribute significantly to the texture enhancement of fermented milk products (**Hoxha Ramize *et al.*, 2023**).

I-3-2-*Lactobacillus delbrueckii* subsp *bulgaricus*

This bacterium is a gram-positive bacillus, non-motile, and asporogenic, typically isolated in the form of thermophilic chain rods. It exhibits microaerophilic characteristics and is highly dependent on calcium and magnesium for its growth. The optimal temperature for its growth is approximately 44°C, and it possesses a homofermentative metabolism.

Significantly, this bacterium plays a crucial role in shaping the organoleptic and hygienic qualities of yogurt, underscoring the importance of understanding its functions in yogurt production (**Hoxha Ramize *et al.*, 2023**).

I-4-Importance and functions of yogurt bacteria

I-4-1-Lactic acid production

Lactic acid bacteria (LAB) play a pivotal role in yogurt production by facilitating the generation of acidity, a fundamental aspect for yogurt formation. As LAB ferments the lactose present in milk, it produces lactic acid, leading to a gradual accumulation of acidity and subsequent reduction in pH. This increase in acidity triggers the destabilization and coagulation of milk proteins, ultimately culminating in the development of a dense, gel-like texture characteristic of yogurt (**Hoxha Ramize *et al.*, 2018**).

I-4-2- Texturing activities

The textural characteristics of yogurt are influenced by several factors, one of which is the utilization of exopolysaccharides produced by starter cultures during fermentation. These exopolysaccharides play a crucial role in enhancing the texture of yogurt by influencing parameters such as firmness, cohesiveness, and viscosity.

The presence of these compounds significantly contributes to the overall sensory experience and mouthfeel of yogurt, thereby elevating its quality and enhancing its appeal to consumers (**Han Xue *et al.*, 2016**).

I-4-3- Proteolytic activity

Yogurt's proteolytic activity stems from the proteolytic systems of lactic acid bacteria (LAB) that remain active during fermentation. These LABs produce enzymes responsible for breaking down proteins, including casein and whey proteins, into smaller peptides and amino acids. This proteolysis process significantly influences the texture, flavor, and nutritional quality of yogurt **(Amani *et al.*, 2016).**

Moreover, LABs play a vital role in hydrolyzing major dairy proteins, thereby affecting the digestibility and bioavailability of proteins in yogurt. These enzymatic

activities contribute to the overall sensory experience and nutritional profile of the yogurt product (**Sumi Koichiro *et al.*, 2023**).

I-4-4- Aromatic activity

The aromatic activity observed in yogurt is closely linked to the presence of volatile aromatic flavor compounds, which play a pivotal role in shaping its distinctive aroma and taste profile. These compounds are essential for enhancing the organoleptic qualities of yogurt, significantly influencing its overall sensory experience (**Ayivi *et al.*, 2023**)

The volatile aromatic compounds present in yogurt are paramount for its flavor, contributing to a pleasant and appealing aroma that enhances consumer enjoyment. However, it's worth noting that the presence of these compounds can be influenced or altered by the addition of aromatics, potentially modifying the overall flavor profile of the yogurt product (**Krastanov Albert *et al.*, 2023**).

SECOND PART

EXPERIMENTAL STUDY

MATERIALS AND METHODS

II-1- Objectives

To assess the safety of the yogurt brands included in our survey and to ascertain their compliance with microbiological and physicochemical standards as outlined in Annex II of the interministerial decree of June 25, 2020, we undertook the following actions:

1. Physicochemical Parameter Control:

- Conducted a comprehensive analysis of physicochemical parameters, focusing on pH and acidity levels, to ensure adherence to regulatory requirements.

2. Yogurt Production:

- Produced our own yogurt samples to serve as benchmarks for comparison against commercial brands, allowing for a more thorough evaluation of quality and safety.

3. Microbiological Quality Control:

- Implemented rigorous microbiological quality control measures, including the assessment of key microbial indicators such as Lactobacillus and Streptococcus thermophilus.

- Employed GRAM staining techniques for bacterial identification and conducted an antibiogram comparison to assess antibiotic susceptibility patterns.

II-2- Location and duration of study

The experimental work was conducted at both the Microbiology Laboratory 2 and the Laboratory of Ecology and Soil Studies within the Faculty of Natural and Life Sciences at the University of Tiaret. The study took place over a period extending from February 18th to March 3rd, 2024.

II-3- Instruments used

The materials used for the study are listed in the tables below (1 and 2)

Table 01: Equipment used

Biological materials	**Devices**	**Glassware**	**Culture mediums**
-Yogurt 8 samples of yoghurt from the two brands (Soummam; Danone) -Lactic ferments (BENEFLORE)	- Optical microscope (OPTIKA) - Micropipette - Autoclave - Icebox - Sterilizer - Analytical balance (SARTORIUS) - Incubator: **37**°C; 43°C (BINDER) - Water bath (MEMMERT) -PH meter (HANNA)	- Erlenmeyer flasks - Beakers - Graduated cylinders - Petri dishes - Desiccator - Graduated burette - Glass spreader	- MRS - M17

Table 02: Material used

Thinners	Other appliances and utensils	Chemicals
-Physiological water	-Whisker -Funnel - Sterile cotton swab - Culture swab - Bunsen burner - Rack -Timer	-Distilled water -NaOH -Phenolphthalein -Disinfectant

II-4- Sampling

Eight (8) samples of yogurt from the two brands (Soummam; Danone) of the same lot, the most consumed by the population, according to traders, were taken from points of sale of different shops. These samples were placed in a cooler and transported directly to the laboratory for physicochemical and microbiological analysis.

II-5- Experimental protocol

The following figure outlines the experimental procedures used in this study. These procedures detail the steps followed in this study.

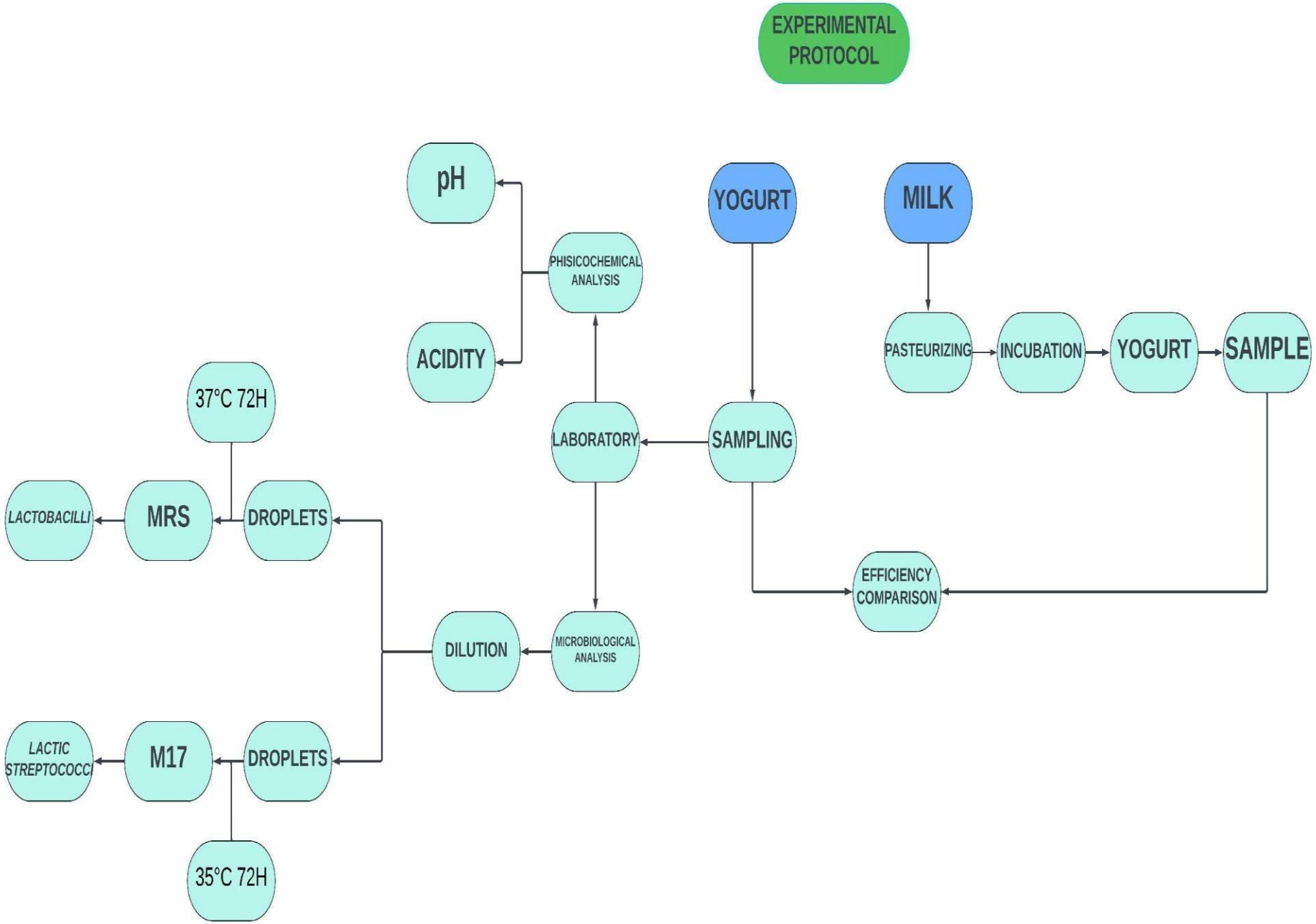


Figure 01 : Scheme of the experimental protocol

II-5-1 Survey

1) The survey is administered to the public in order to gauge their awareness about probiotic foods especially dairy products

2) The questions included the age and gender of the survey takers, their educational level and their occupation. They were to check whether and how often they consume famous brands of dairy products.

3) Instead of asking about probiotics the questions were about the ‘’bifidus’’ term as it is more known especially in the dairy products advertisements

4) The survey was conducted via ‘’google forms’’ and in person. While the online survey targeted tech-savvy people; the physical survey targeted the older population

See the copy of the survey in appendices 01.

II-5-2- Technical Analyses

II-5-2-1- Physicochemical analyses

II-5-2-1-1- pH measurement

A-Definition

The relative concentration of hydrogen ions (H^+) and hydroxide ions (OH^-) in a solution (**NIST , 2020**).

B-Principle

The principle is to measure the difference in potential between a measuring electrode and a reference electrode combined in a combination electrode system (**Lakhdar N *et al.*, 2014**)

C- modus operandi

- Calibrate the pH meter with distilled water
- Thoroughly mix the contents of the yogurt container with a spatula
- Immerse the pH meter probe into the yogurt container

- Read the result displayed on the screen

II-5-2-1-2- Determination of the titratable acidity

A-Definition

Titratable acidity in yogurt refers to the quantity of lactic acid that is produced when lactose is converted into lactic acid by lactic acid bacteria. **(Tamime and Robinson, 2015)**

B- Principle

The measurement of titratable acidity is carried out by neutralizing a sample of the culture to be analyzed using sodium hydroxide (NaOH); the titration is done in the presence of phenolphthalein, a colored indicator whose endpoint is a pink coloration.

The result can be expressed according to the difference in units which are a function of the molarity of the sodium hydroxide solution used as the neutralizing alkaline agent.

The Dornic degree (°D) is the most widely used unit, one Dornic degree corresponds to 0.01% (or 0.1 g/L) of lactic acid present in the culture medium. This titration method is still widely used in the dairy industry. Yogurt acidity values are around 100°D. **(Tamime and Robinson, 2015)**

C-Modus operandi

- Take a 10 ml volume from the yogurt container using a graduated pipette

- Pour this volume into a beaker and add 2 to 3 drops of phenolphthalein

- Add the sodium hydroxide solution from the burette drop by drop until the color changes to pink

- Read the volume of sodium hydroxide solution used from the burette

D- Measurement and monitoring of acidity

- **Calculation (AOAC International, 2019)**

Acidity is given by the following expression:

$$A = V_1 .10$$

A: Titratable acidity expressed by °D
V_1: The volume of the NaOH base (N/9) poured in ml.

II-5-2-2-Microbiological analysis

II-5-2-2-1- Objective of microbiological control

To guarantee that the yogurt is made with the best possible microbiological quality, measures must be put in place. These controls have several uses, one of which is to verify if the product is promoting the presence of good bacteria. The safety and quality of the yogurt can be protected by upholding microbiological standards through the implementation of stringent microbiological examinations, such as microbial enumeration and identification. The viability and abundance of probiotics, or good bacteria, are also revealed by these controls, supporting the product's health-promoting qualities. All things considered, careful observation and management practices are essential to preserving the microbiological purity and effectiveness of yogurt manufacturing procedures.

II-5-2-2-2- Preparation of sample and test sample

It's imperative to completely clean the yogurt container's outside surrounding the region where the sample will be obtained to remove any possible sources of contamination before opening it. Ethanol is a useful tool for this cleaning procedure because it reduces the possibility of further contamination. To preserve the integrity and quality of the yogurt sample, the container must be opened aseptically after cleaning is finished.

II-5-2-2-3- Preparation of the 10^{-1} and 10^{-3} dilutions

To conduct the microbiological analysis of the yogurt, follow these steps:

1. Shake the contents of the yogurt jar thoroughly;

2. using a sterile spatula take 10 grams of yogurt and introduce it into 90 ml of saline solution to achieve a 10^{-1} dilution;

3. From the 10^{-1} dilution, take a volume of 1 ml and transfer it into a test tube containing 9 ml of saline solution to create a 10^{-2} dilution;

4. Similarly, from the 10^{-2} dilution, take 1 ml and add it to another test tube containing 9 ml of saline solution to obtain a 10^{-3} dilution. (**JoVE Science Education Database, Microbiology, Serial Dilutions and Plating: Microbial Enumeration, 2024**).

II-5-2-2-4- Microbiology Research

II-5-2-2-4-A-Detection of *lactobacilli*

The family Lactobacillaceae contains a varied range of rod-shaped, facultatively anaerobic, Gram-positive bacteria known as lactobacilli. They are known for having a fermentative metabolism, which mostly produces lactic acid from carbs like glucose (LeBlanc et al., 2017). Using a bent pipette, equally, distribute 100µl of the material onto MRS agar petri dishes to look for Lactobacilli. After that, these plates are kept in a desiccator for 72 hours at 37°C. Colonies are examined and found to be tiny, opaque, elevated, and white.

II-5-2-2-4-B-Detection of *lactic streptococci*

Lactic streptococci are a varied collection of cocci-shaped (spherical), Gram-positive bacteria that belong to the Streptococcaceae family. They are well-known for their fermentative metabolism, which largely converts sugars and carbohydrates into lactic acid (Leroy and Chopin, 2016). Using a bent pipette to ensure even distribution, 100µl of each sample is pipetted onto three M17 agar Petri dishes in order to detect lactic streptococci. Following inoculation, the plates are incubated for 72 hours at 43°C in a desiccator. Colonies are small, smooth, complete, and translucent when inspected.

II-5-2-2-5-Gramm test

*** Definition**

Based on the composition of their cell walls, bacteria are divided into Gram-positive and Gram-negative groups using the Gram stain method. Under a microscope, gram-positive bacteria look purple due to a thick layer of peptidoglycan that holds onto the crystal violet stain. On the other hand, the peptidoglycan layer of Gram-negative bacteria is thinner, and their outer membrane does not hold the crystal violet stain. However, when these bacteria are counterstained with a dye like safranin, they lose their purple hue and turn pink or red (Baron et al., 2019).

*** Analytical technique**

1- Prepare bacterial smears on a glass slide using isolated colonies from the agar plate and allow to air dry.
2- Flood the slide with crystal violet stain for 1 minute.
3- Rinse gently with distilled water.
4- Flood the slide with iodine solution for 1 minute.
5- Rinse the slide gently with distilled water.
6- Decolorize by exposing the slide to 95% ethanol for 10-20 seconds.
7- Rinse gently with distilled water.
8- Counterstain by flooding the slide with safranin for 45 seconds.
9- Rinse gently with distilled water.
10- Gently blot dry with bibulous paper or paper towel.
11- Examine the slide under a bright field microscope under oil immersion.

*** Reading**

- Purple/blue color:
  - Indicates the cells are Gram-positive bacteria.
  - The thick peptidoglycan layer in their cell walls retained the crystal violet dye during the decolorization step.
- Pink/red color:
  - Indicates the cells are Gram-negative bacteria.
  - The thin peptidoglycan layer and outer membrane allowed the crystal violet to be washed out during decolorization.

II-5-3- Yogurt making

To prepare yogurt, first, pasteurize two liters of milk in a two-liter Erlenmeyer flask by heating it to 82°C for ten minutes. Then, place 60 mL of the milk in a 43°C water bath and let it cool to 46°C. Then, in a graduated cylinder with 60 mL of milk, add 4 grams of yogurt starter and whisk until completely dissolved. One milliliter of the starter mixture at a time, slowly spinning the flask after each addition, is how you inoculate the two liters of milk. Loosely place a lid on each of the two sterile 1-liter Erlenmeyer flasks after dividing the infected milk equally between them. During twelve hours, place the flasks in an incubator set to 43°C. Lastly, place the flasks in the refrigerator to store them. for six hours at 4°C (Agustinah et al., 2019).

Figure 02: Picture of yogurt preparation

II-5-4-Efficacy comparison

The antibacterial qualities will be assessed and contrasted using our homemade yogurt, which contains known ferments as a control group and no additions or preservatives.

*** Analytical technique**

- immerse 2 disks into Activia yogurt serum, and 2 disks into Activia yogurt supernatant.

- immerse 2 disks into Acti+ yogurt serum and 2 disks into Acti+ yogurt supernatant.

- immerse 2 disks into homemade yogurt serum, and 2 disks into homemade yogurt supernatant.

- inoculate each Petri dish with E. coli and Salmonella cultures using sterile techniques to obtain well-isolated colonies.

- use sterile spreaders to evenly distribute the cultures on the agar surface.

- deposit the following disks onto each inoculated Petri dish:

1 Activia serum disk

1 Activia supernatant disk

1 Acti+ serum disk

1 Acti+ supernatant disk

1 homemade yogurt serum disk

1 homemade yogurt supernatant disk

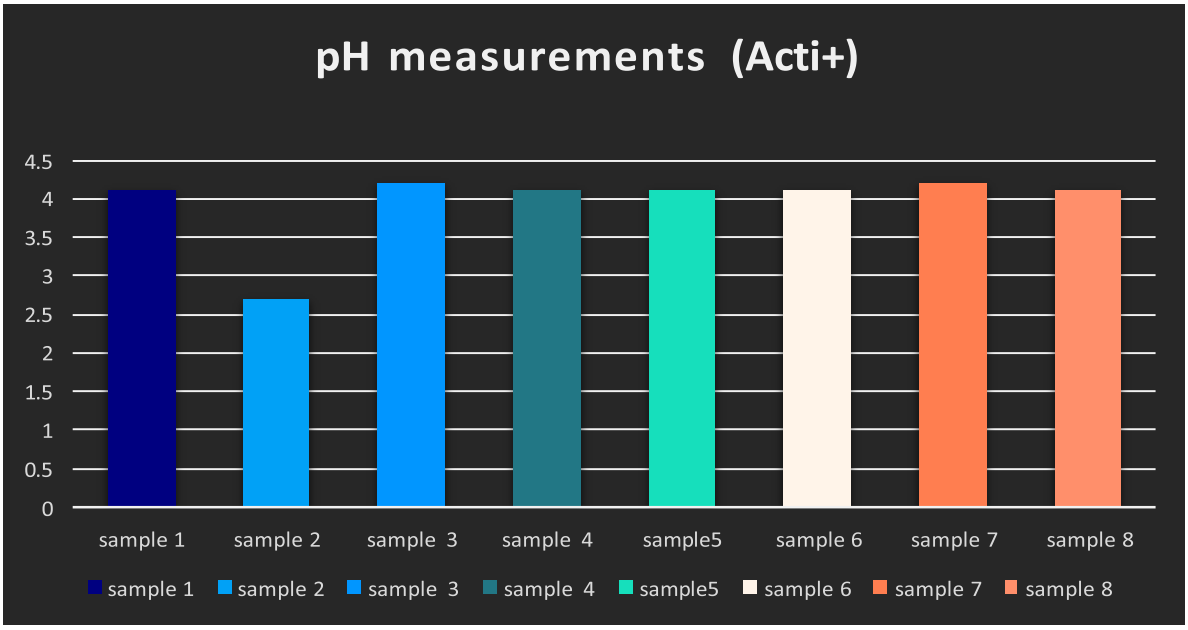
- incubate at 37°C for 48 hours

*** Reading**

· Determine the diameter of the inhibition halos surrounding each disk

· Compare inhibitory effects of different yogurt samples on the 2 bacteria

RESULTS AND DISCUSSION



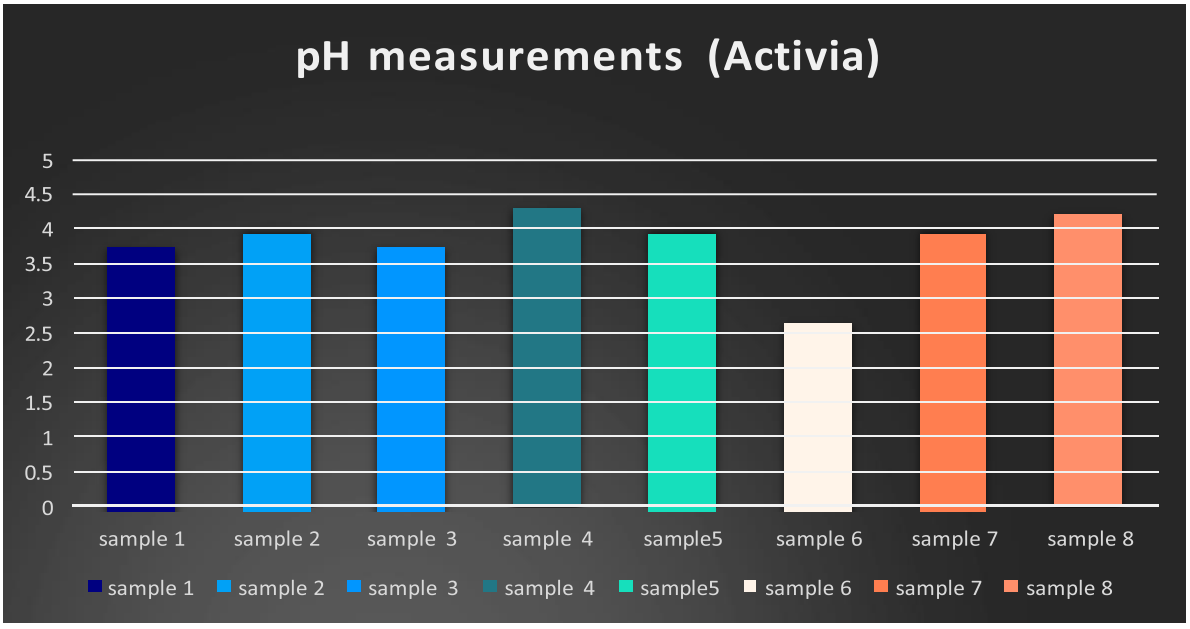
III-1-Results and discussion

III-1-1- Physicochemical analyses results

For physicochemical analyses, we took 8 units for each sample in order to get more accurate results

III-1-1-1- pH

The results obtained from our work are represented by the following figure 3 (A and B). (Refer to the corresponding tables in Annex 3)



A: Histogram of the pH analysis results from (Activia)
B: Histogram of the pH analysis results of (Acti+)

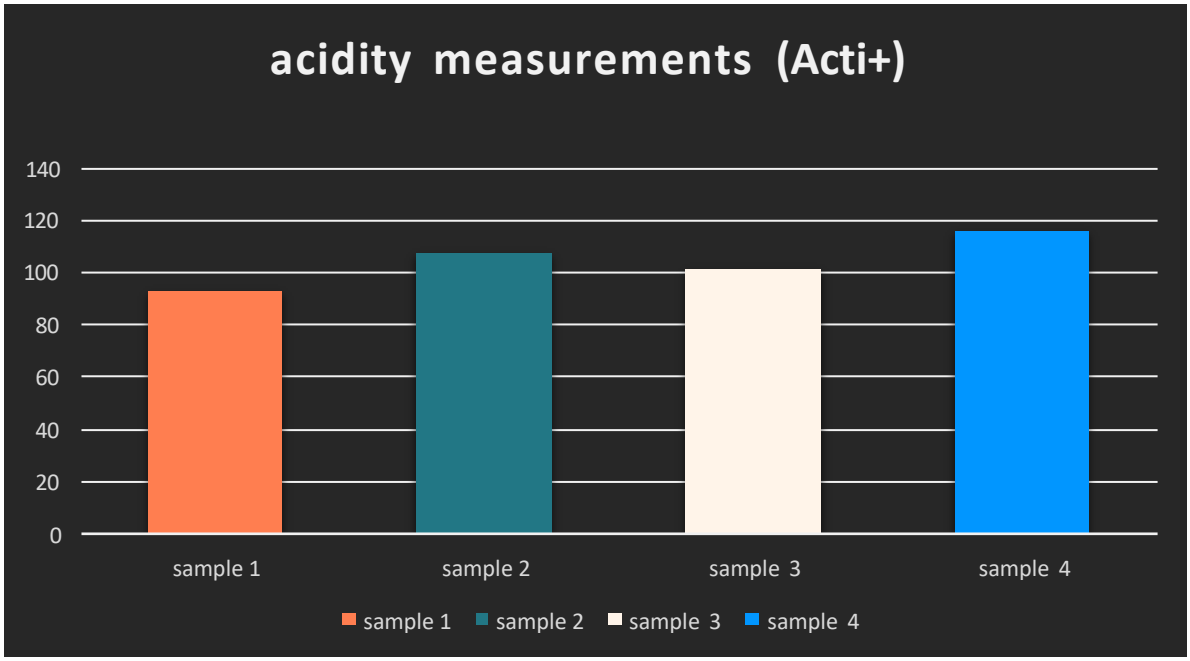
Figure 03 :(A, B) Histograms provide a visual representation of the results obtained from pH analysis.

The pH value serves as a reliable indicator of yogurt freshness, primarily due to the activity of lactic acid bacteria, which leads to a decrease in pH over time. Initially, yogurt typically exhibits a pH ranging from 4.25 to 4.50. However, as the shelf life progresses, the pH of yogurt samples gradually declines due to increased activity of lactic acid bacteria (LAB) (**JGS Ranasinghe *et al.*, 2016**).
Our analysis of collected yogurt samples confirms this trend, with pH values falling within the range of 3.6 to 4.5. This adherence to the standard pH range signifies the quality and compliance of the yogurt products.

This correlation between pH and yogurt freshness underscores the importance of monitoring pH levels as part of quality assurance measures in the dairy industry.
The result underscores the pivotal role of pH as an indicator of yogurt freshness and quality. The gradual decrease in pH over time is directly linked to the activity of lactic acid bacteria (LAB), responsible for lactose fermentation and lactic acid production. This progressive acidification is a natural process contributing to the characteristic taste of yogurt and its preservation (**Burke *et al.*, 2018**)

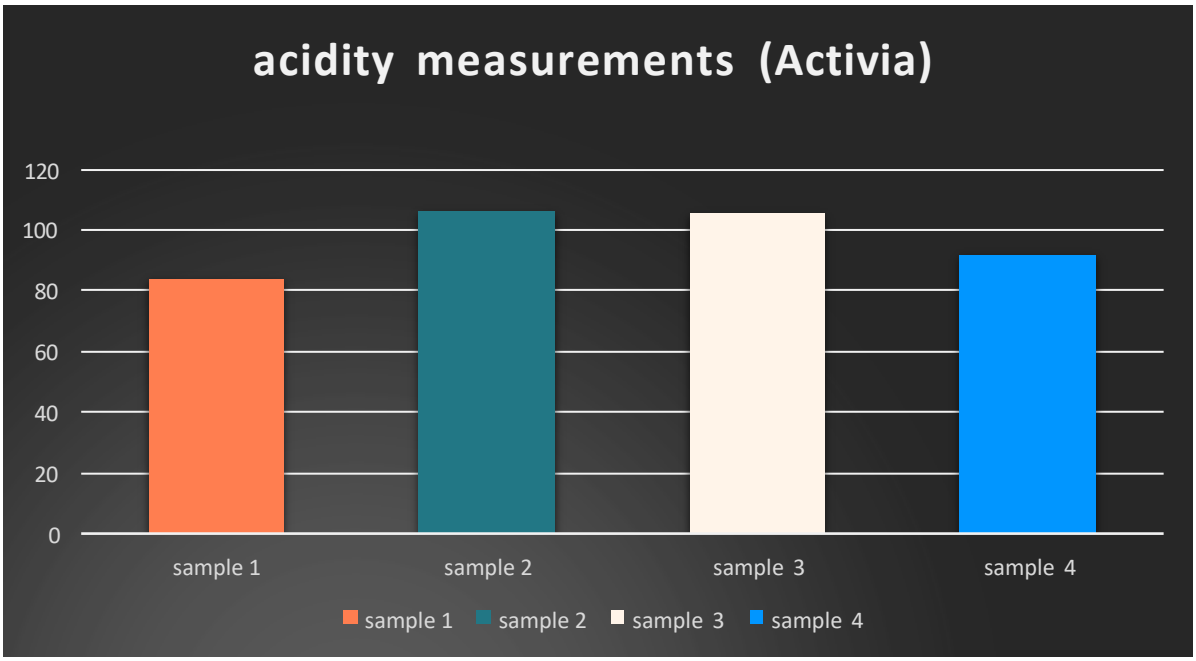
The fact that pH values of all collected yogurt samples fall within the normal range of 3.6 to 4.5 is encouraging, indicating compliance with established quality standards. It suggests that manufacturing and storage processes have been controlled, thus maintaining product quality throughout its shelf life.

These findings highlight the importance of regularly monitoring yogurt pH throughout its lifespan to ensure quality and safety for consumers. Moreover, they reinforce the notion that pH control should be integrated into quality control protocols in the dairy industry to ensure product consistency and compliance. Finally, these conclusions can serve as a basis for further research aimed at optimizing manufacturing processes and extending the shelf life of dairy products.



III-1-1-2-Acidity

The results of the acidity measurements for both brands are demonstrated in the histograms below



A: Histogram of the acidity analysis results of (Activia)

B: Histogram of the acidity analysis results of (Acti+)

Figure 04 (A, B) Histograms provide a visual representation of the results obtained from acidity analysis.

yogurts typically exhibit a titratable acidity falling within the range of 80°D to 120°D (**Tamime *et al.*, 2015**). The acidity values of all collected yogurt samples in our study fall within this range, indicating conformity to established standards.

The acidity of yogurt can be influenced by various factors, including the type of milk used, fermentation time, and the specific strains of lactic acid bacteria present in the starter culture. Whole milk yogurt typically demonstrates slightly lower acidity compared to yogurt made with skim milk due to the partial conversion of lactose to galactose during fermentation (**Tamime *et al.*, 2015**). This reduction in available lactose substrate limits lactic acid production, resulting in a milder acidity profile.

Additionally, fermentation time plays a significant role in determining yogurt acidity. Extended fermentation periods lead to increased acidity as lactic acid bacteria continue to convert lactose into lactic acid (**Tamime *et al.*, 2015**).

Furthermore, the choice of starter culture can impact the rate and extent of acidification. Different strains of lactic acid bacteria may exhibit varying efficiencies in lactose conversion, affecting the final acidity of the yogurt product (**Tamime *et al.*, 2015**).

By understanding these factors, yogurt manufacturers can adjust production parameters to achieve desired acidity levels and meet quality standards consistently.

III-1-2-Microbiological analyses results

III-1-2-1-*Lactobacillli* isolation

The colony morphology of the bacteria typically observed in yogurt exhibits various characteristics. These colonies often display a fusiform or elongated shape, although round or irregular forms are also possible. Their size ranges from small to medium, with diameters typically falling within the range of 1-3 mm. Colonies generally have a flat or slightly raised elevation, with edges that appear either entire or slightly lobate. Surface texture may vary, ranging from smooth to slightly rough, while the predominant color observed is usually white or cream-colored (**Vos *et al.*, 2016**).

Regarding the analysis of the two yogurt samples, notable differences were observed. The sample obtained from Danone Activia showed the presence of lactobacilli, indicating the presence of this specific bacterial strain. Conversely, the sample from Sommame Acti+ did not exhibit detectable levels of lactobacilli, suggesting the absence of this strain in the product.

These findings underscore the importance of microbial analysis in yogurt quality control and highlight the variability that can exist between different yogurt products.

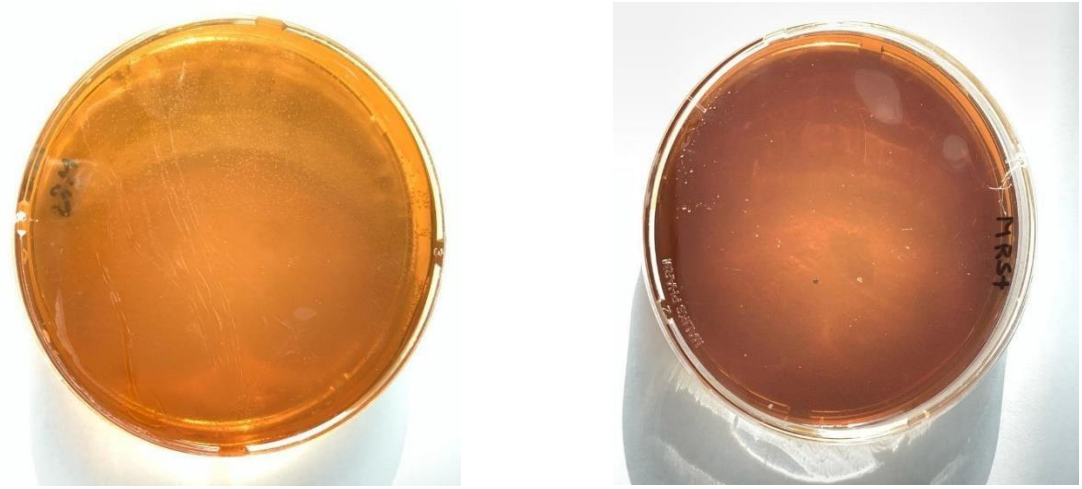


Figure 05: Results of *Lactobacilli* incubation on MRS culture medium from (Activia and Acti+) (left,right)

III-1-2-2-*Lactic streptococci* isolation

The colony morphology of the bacteria typically observed in yogurt exhibits various characteristics while circular colonies are possible, these bacteria frequently adopt elongated or even spindle-shaped forms. In some instances, irregular colonies may also be observed. The size of these colonies varies, typically ranging from small to medium, with diameters falling between 1 and 3 millimeters. Generally, lactic streptococci colonies have a flat or slightly raised profile, and their edges may appear smooth or with slight lobations. The surface texture can vary from smooth to slightly rough, while the predominant color is typically white or cream-colored. (**Vos *et al.*, 2016**).

Regarding the analysis of the two yogurt samples, no differences were observed. Both samples showed the presence of *Lactic streptococci*, indicating the presence of this specific bacterial strain.

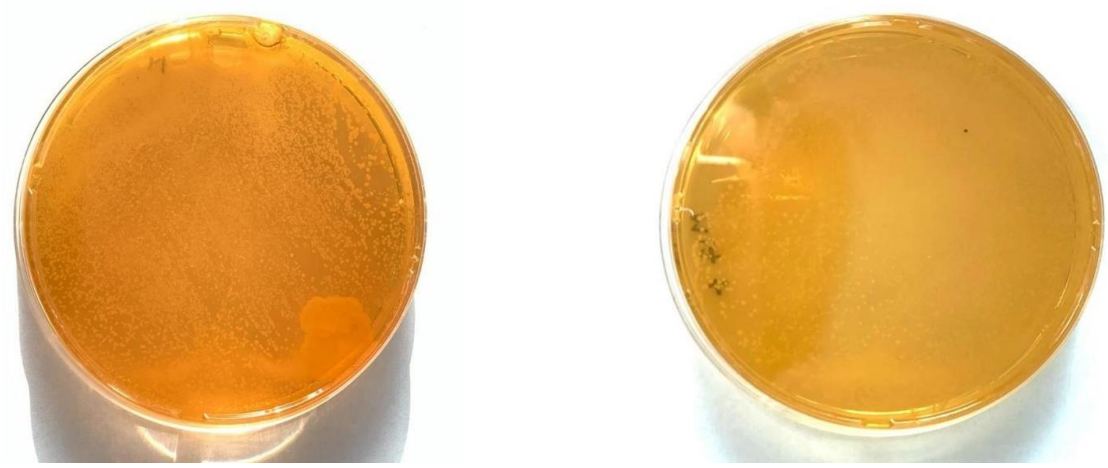


Figure 06 : Results of *Lactic streptococci* incubation on M17 culture medium from (Activia and Acti+) (left,right)

III-1-2-3-Gram stain test

Interpreting the results of a Gram stain involves observing the color of the bacterial cells under the microscope after staining. Cells that appear purple or blue are classified as Gram-positive bacteria due to their thick peptidoglycan layer retaining the crystal violet dye. In contrast, cells that appear pink or red are Gram-negative bacteria, as their thinner peptidoglycan layer and outer membrane allow the crystal violet to be washed out, taking up only the counterstain. **(Baron *et al.*, 2019)**

The Gram staining revealed the following results:

The interpretation of Gram staining results provides valuable insights into the microbial composition of samples. In Gram staining, the color of bacterial cells observed under the microscope after staining indicates their Gram classification.

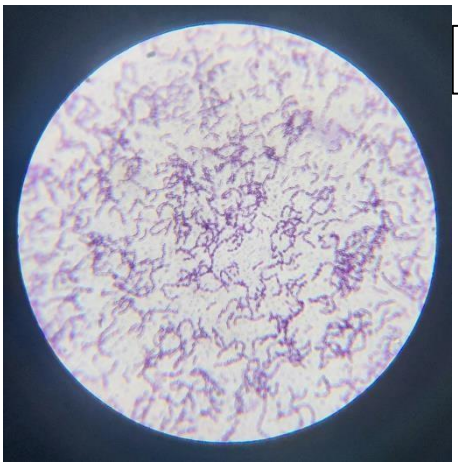
In this context, purple or blue-colored cells indicate Gram-positive bacteria, characterized by a thick peptidoglycan layer that retains the crystal violet dye. On the other hand, pink or red-colored cells are indicative of Gram-negative bacteria, possessing a thinner peptidoglycan layer and an outer membrane that allows the crystal violet dye to be washed out, with the cells taking up only the counterstain.

Based on the Gram staining results provided:

- The MRS agar sample from Danone displays chains of purple thin rods or bacilli. This observation confirms the presence of lactobacilli, which are Gram-positive bacteria.

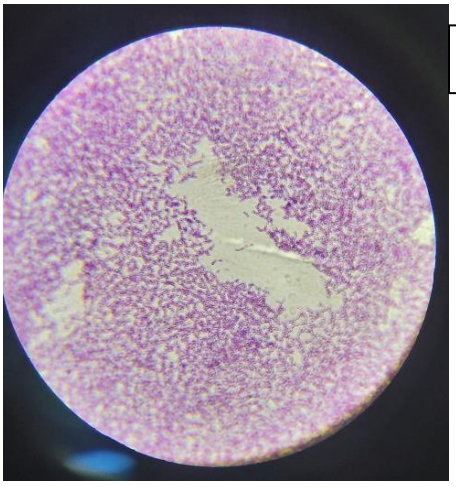
- The M17 agar samples from both Danone and Soummam exhibit pairs or small chains of purple oval-shaped cells, indicating the presence of streptococci, which are also Gram-positive bacteria.

These results align with the typical Gram staining characteristics of lactobacilli and streptococci, providing valuable information about the microbial composition of the samples from both Danone and Soummam.



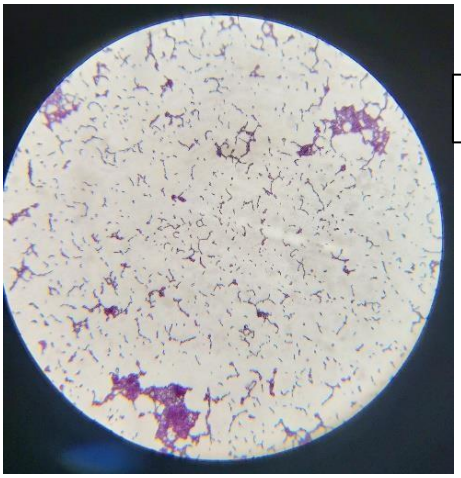
Lactobacil

This Gram stain obtained from (40X) magnification reveals rod-shaped bacteria stained purple, indicating they are Gram-positive. The rod-shape, a defining characteristic of Lactobacillus.



Streptococci

This Gram stain obtained from (40X) magnification reveals purple cocci (spherical bacteria) arranged in chains. This chain-like morphology is a hallmark of Streptococci.



Streptococc

This Gram stain obtained from (100X) oil immersion magnification further showcases the purple Streptococci cocci arranged in chains.

Figure 07 : Results of Gram staining

III-1-3-Yogurt efficacy comparison

III-1-3-1-Yogurt making

Obtaining yogurt fermented solely with *Lactobacillus acidophilus*, *Lactobacillus bulgaricus*, *Lactobacillus casei*, *Bifidobacterium lactis*, *Bifidobacterium longum* and *Streptococcus thermophilus*, without any added flavors or additives, offers a pure and traditional yogurt experience.

Lactobacillus acidophilus contributes to the characteristic tangy flavor and provides potential health benefits, such as aiding digestion and promoting gut health. Lactobacillus bulgaricus works synergistically with Streptococcus thermophilus to ferment lactose into lactic acid, resulting in the acidic taste and creamy texture typical of yogurt.

This simple formulation aligns with the traditional method of yogurt production, allowing consumers to enjoy the natural flavors and probiotic benefits of these bacterial strains without any additional ingredients. Additionally, it provides an ideal base for individuals seeking a clean, unadulterated yogurt option.

This type of yogurt may appeal to purists who appreciate the simplicity and authenticity of traditional yogurt-making techniques, as well as those who prefer to avoid added sugars or artificial flavors.

Figure 08 : Homemade Yogurt Culture

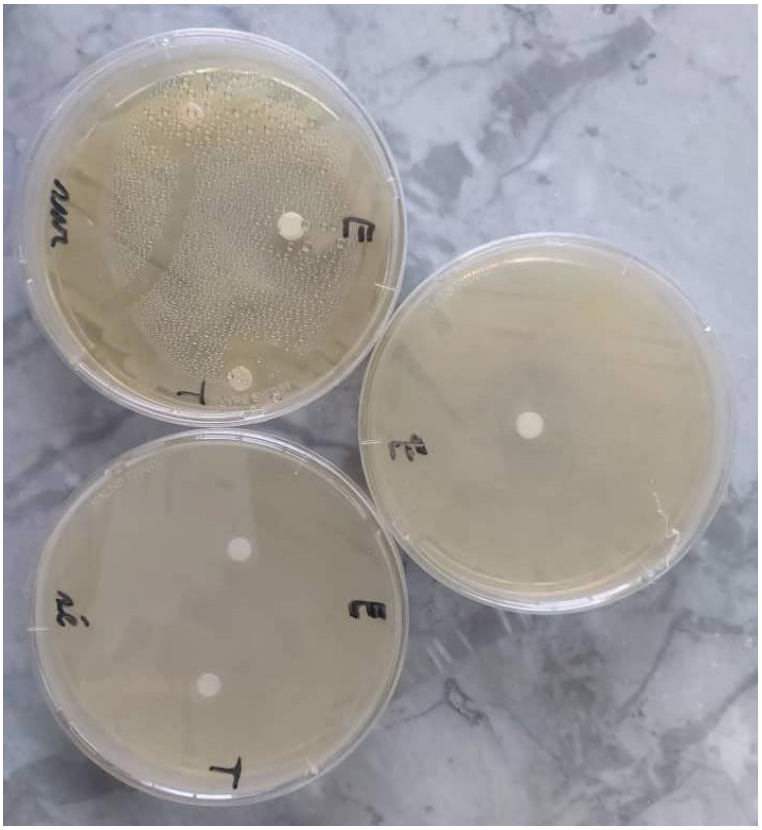
III-1-3-2-Amtibacterial test

A procedure used to determine the effectiveness of different antibiotics against a specific bacterial isolate based inhibition zone

This method revealed the following results:

Table 03: Yogurt samples and their inhibition zones (mm)

	Escherichia coli	**Staphylococcus aureus**
Danone supernatant	10	14
Danone serum	7	11
Soummam supernatant	13	14
Soummam serum	9	12
Homemade supernatant	35	31
Danone supernatant	10	14



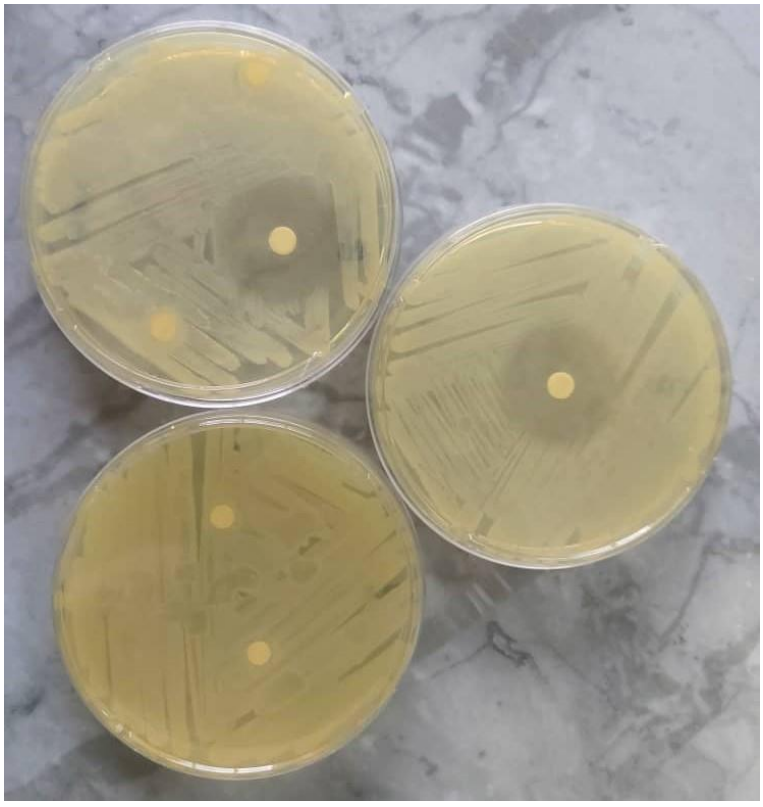


Figure 09 : Antibiogram test of (Activia, Acti+ and homemade) samples in *E.coli* culture

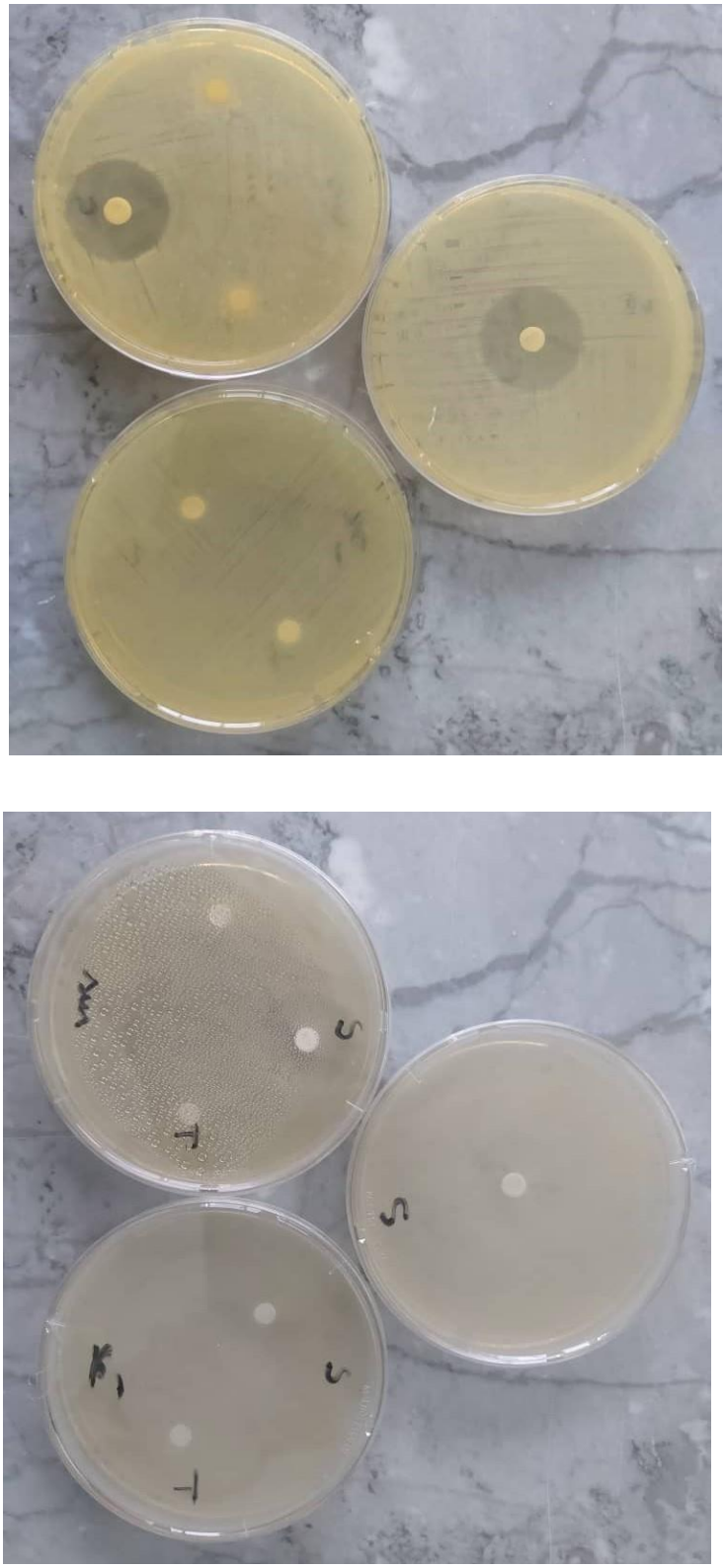


Figure 10 : Antibiogram test of (Activia, Acti+ and homemade yogurt) samples in *Staphylococcus aureus* culture

III-1-4-Survey results

This survey aims to assess the familiarity and knowledge about probiotics in dairy products among consumers.

The survey sample comprised of [172] respondents, [70.93%] of whom are women and [29.07] are men, their ages ranging from [18-45<]

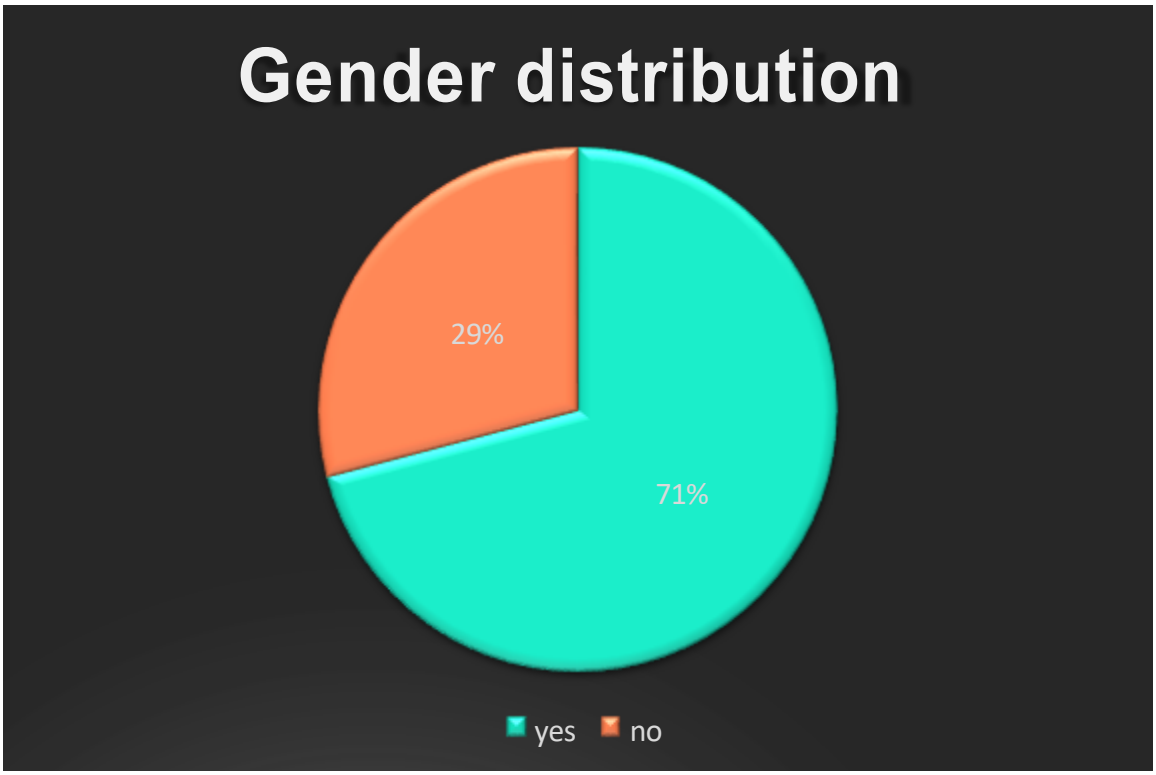


Figure 11: Gender distribution pie chart

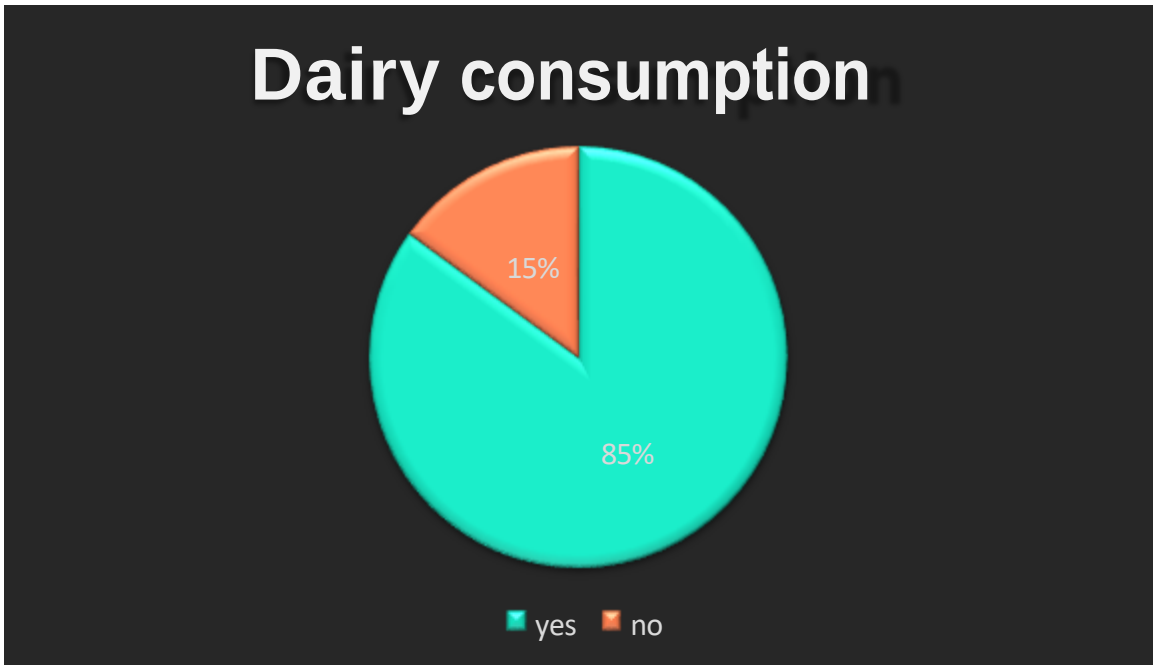


Figure 12: Dairy consumption

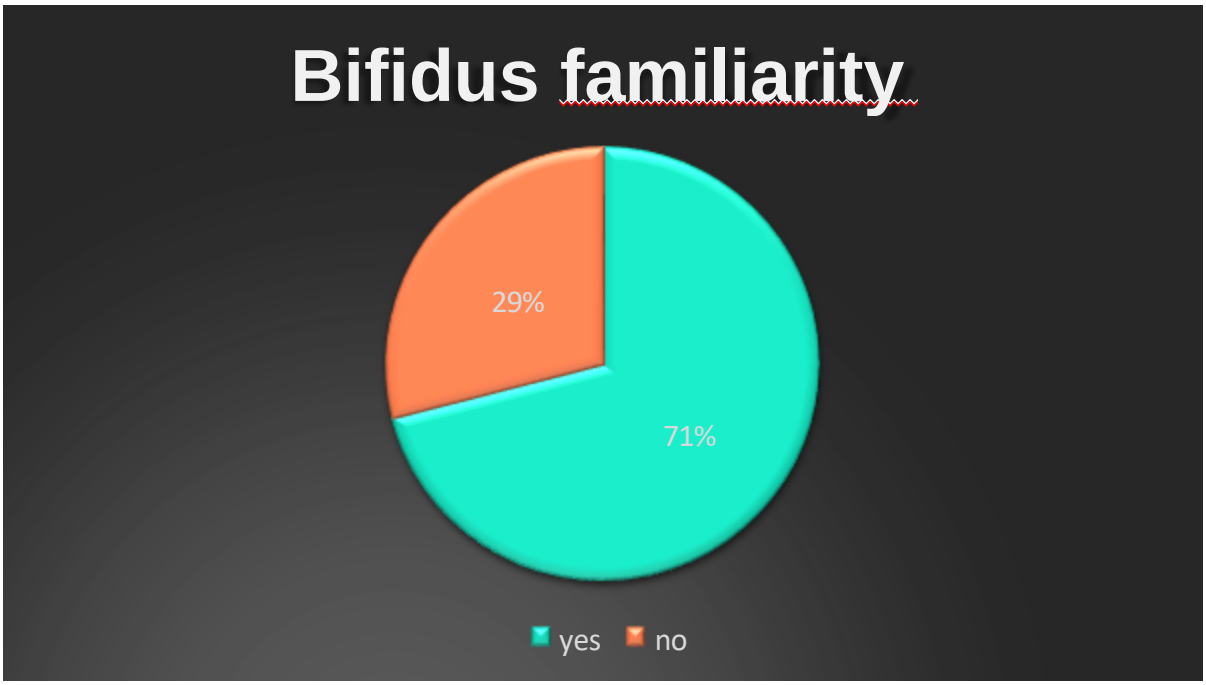


Figure 13: Bifidus familiarity

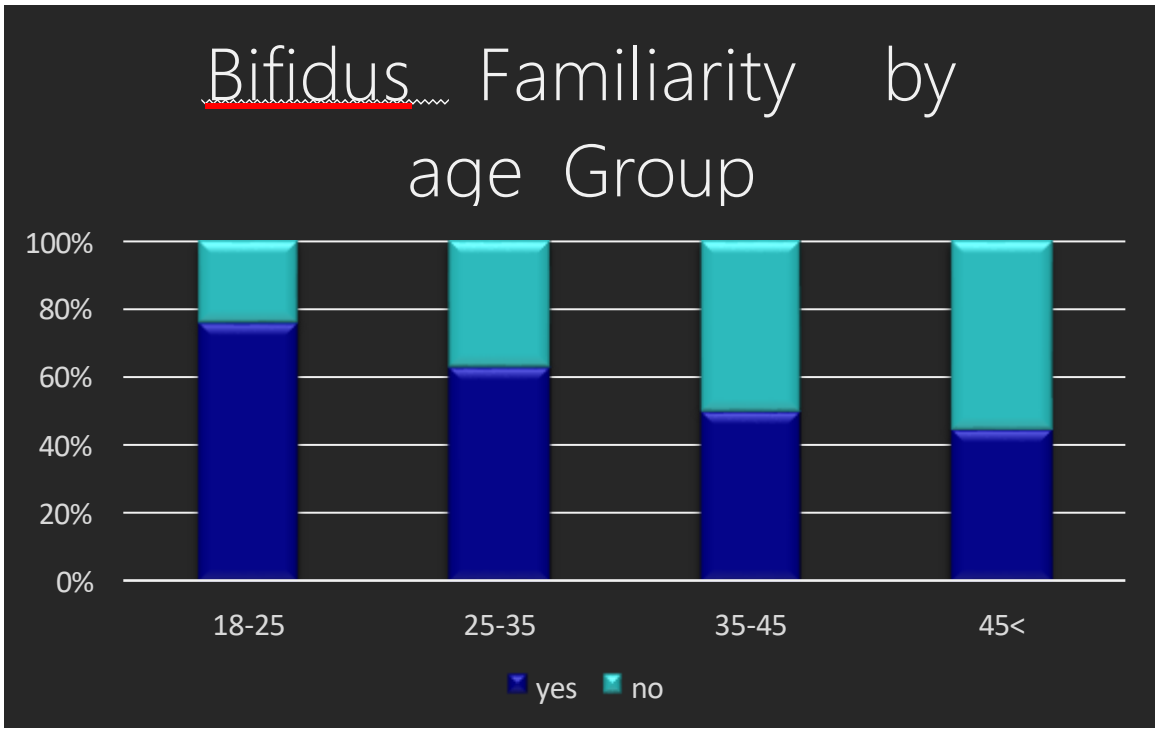


Figure 14: Bifidus familiarity by age group

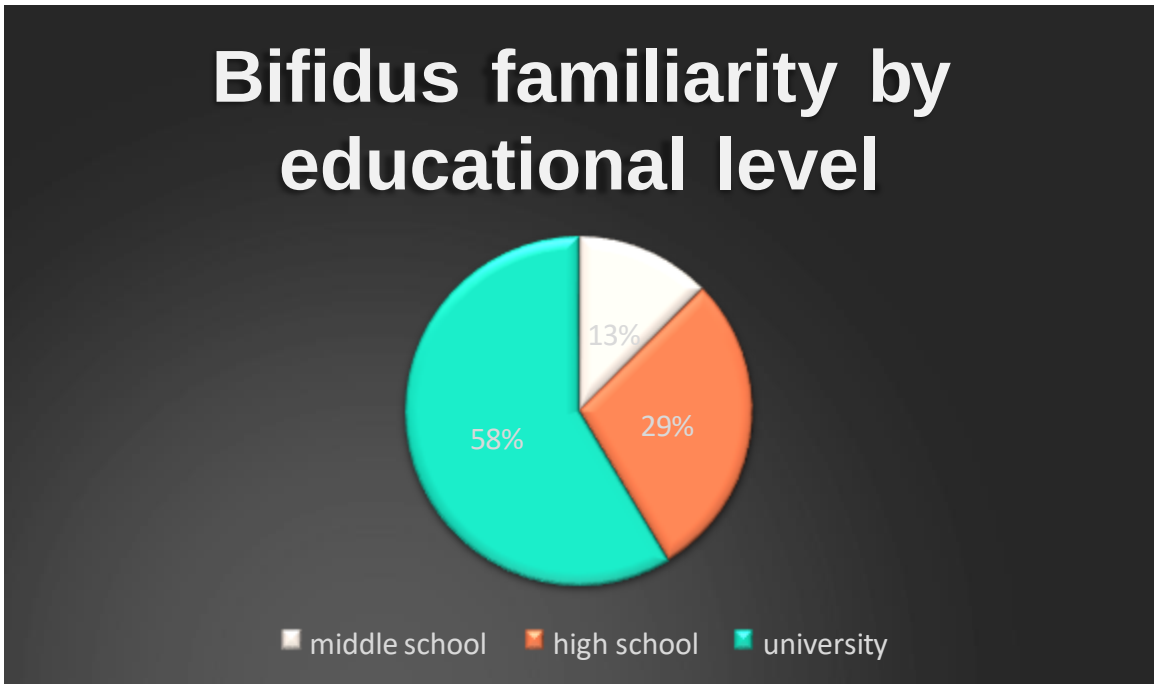


Figure 15 : Bifidus familiarity by educational level

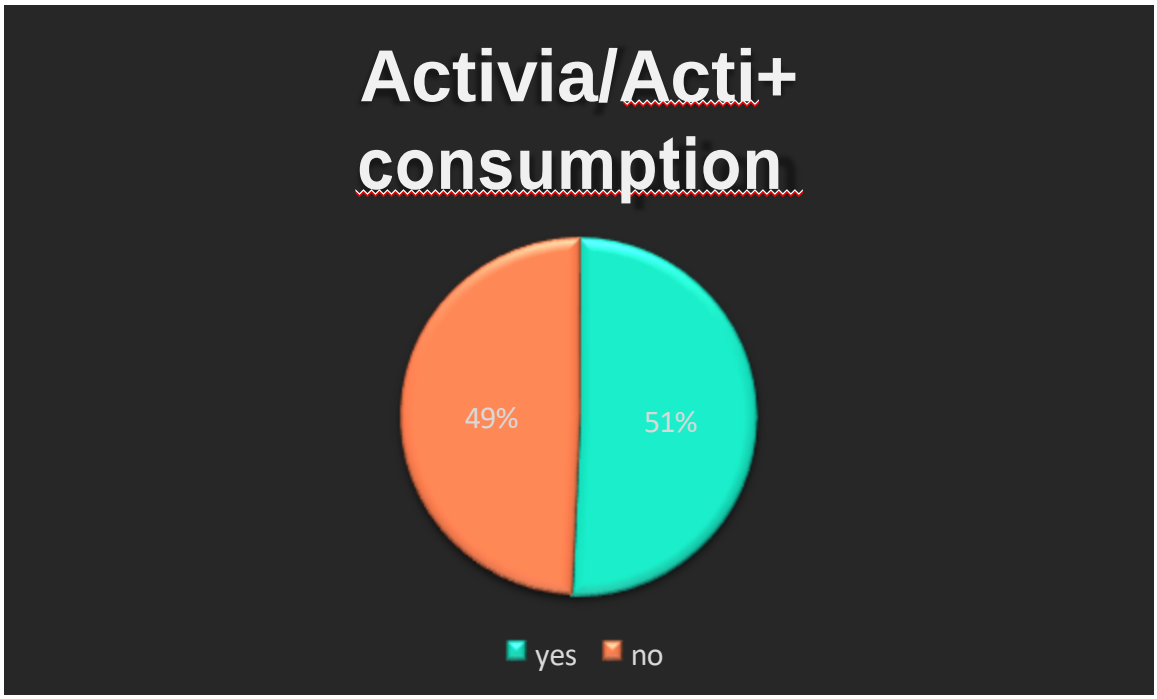


Figure 16: Activia/Acti+ consumption

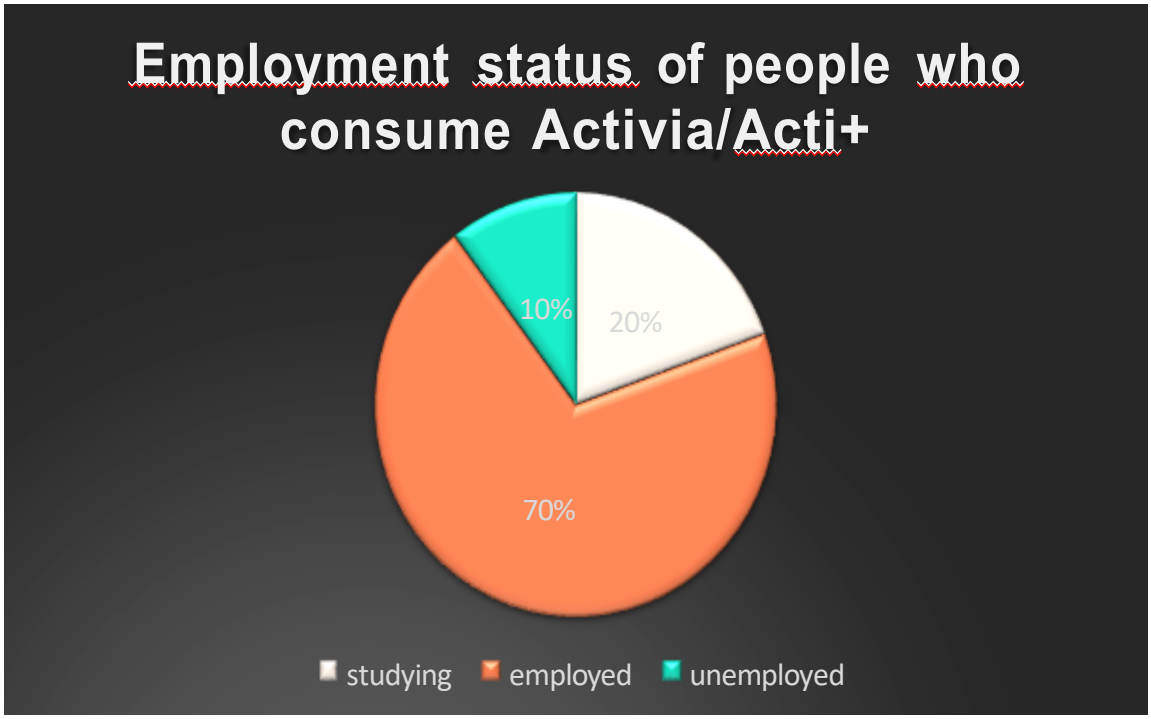


Figure 17: Employement status of people who consume Activia/Acti+

Table 04: Desired health effect by age group

	Better digestion	Lowering blood sugar levels	Lowering blood pressure	Lowering weight
18-25	15.12%	2.33%	1.74%	7.56%
25-35	13.95%	3.49%	2.91%	4.07
35-45	9.88%	5.23%	4.65%	1.16%
45<	8.72%	6.98%	6.40%	0.58%

Figure 18: Willingness to pay extra by employement status

IV- Survey discussion

Some noticeable findings are

-Out of the 172 who answered the survey the majority of the survey takers were female representing [70.93%] and males representing [29.07%]

-The majority of the survey takers consume dairy products representing [85%]

-The majority of the survey takers are familiar with the term ‘’Bifidus’’ representing [71%]

And the majority of the first age group representing ages [18-25] are familiar with the term, the same is for the second age group representing ages [25-35]. However less than half of the third age group representing ages [35-45] are familiar with the term, while very few of the fourth age group representing ages [45<] are familiar with the term

-The familiarity based on educational level was as expected with the maojority of university studentsrepresenting approximately [60%] were familiar with the term, while highschool graduates represented [30%] of all the people who were familiar with the term and middle school graduates being the minority with[10%]

-Slightly more than half of the survey takers consume probiotic products and of that half [70%] are employed and [20%] are students while [10%] are unemployed

-When asked what health benefits they want from their food, we noticed varying responses based on age group:

Most of G1 opted for better digestion followed by weight loss, G2 was the same, most of G3 opted for better digestion followed by lowering blood sugar level and blood pressure; and G4 was the same

-when asked about how much more were willing to pay for said health effects, the responses didn't differ much from expectations:

Most of the survey respondents who picked the first option of a [10–20%] increase were students, as were most of the unemployed and a small portion of the employed.

The vast majority of the survey respondents who picked the second option of a [20–40%] increase were employed, followed by a small portion of students, and a smaller portion of unemployed

Almost all of the survey respondents who picked the third option of a [40–60%] increase were employed, with the exception of a very few who were unemployed.

All of the survey takers that picked the fourth and fifth options of a [60–80%] and [80–100%] increase, respectively, were all employed

CONCLUSION

The objective of this study was to obtain pertinent information on a few yogurt brands widely consumed among the local population and also analyze the physicochemical and microbiological properties of these brands. Thus, based on the detailed analyses conducted, we can confidently conclude that all yogurt samples have passed the measured range of pH and titratable acidity in the Algerian official journal. Therefore, manufacturers maintain the necessary quality control

Finally, the microbiological investigations, which comprised the isolation and identification of the lactic acid bacteria, have led to interesting results. Although in both samples, Danone Activia and Soummam Acti+ lactic streptococci were found, the latter lacked detectable levels of lactobacilli. These findings indicate possible differences in the microbial composition of the products that may influence their organoleptic properties as well as their nutritional value.

Thus, the comparison of the efficacy of commercially produced and homemade yogurts has demonstrated the potential advantages of minimal processing and the absence of additives in the manufacturing of dairy products. The homemade product demonstrated excellent antimicrobial activity against the pathogenic bacteria E. coli and Staphylococcus aureus compared to the commercial samples. This proves the possible advantage of simplicity in both ingredients and the production process to produce better bioactive foods.

In conclusion, the consumer survey showed a good awareness of probiotics and functional dairy products in the population. Nevertheless, this information suggests that even more education and popularization must be conducted to inform the elderly and those with a low level of education. This survey has served the purpose of gaining valuable knowledge on the yogurt market and consumption in the Wilaya of Tiaret.

Future research could explore the potential health effects of probiotic strains found in other fermented dairy products.

Furthermore, research into what determines consumer choices and purchases could help create suitable marketing strategies to help more individuals benefit from functional dairy products.

General Conclusion

This study examined popular yogurt brands in the area in-depth, paying particular attention to their microbiological and physicochemical characteristics. The results showed that all yogurt samples satisfied the titratable acidity and pH requirements set by the Algerian official journal, demonstrating strict quality control by the producers. The microbial composition of Danone Activia and Soummam Acti+ varied, according to microbiological analysis, with lactic streptococci being present in both but lactobacilli being absent in the latter. The organoleptic qualities and nutritional value of the items may be impacted by these variations.

The benefits of minimum processing and the absence of additives were underlined by a comparison of handmade and professionally produced yogurts. Better antimicrobial activity was shown by the handmade yogurt against harmful bacteria including E. Coli and Staphylococcus aureus, indicating that more bioactive foods can be produced with less complicated production methods.

A consumer survey revealed that while probiotics and functional dairy products are generally well-known, older and less educated groups may benefit from additional education. Important information about yogurt consumption trends and market trends in the Tiaret Wilaya was obtained from this survey.

Future studies should examine the potential health benefits of probiotic strains found in various fermented dairy products as well as the variables influencing customer preferences to create efficient marketing plans that will increase the use of functional dairy products.

Implication of the research findings in teaching

The results of this investigation have numerous ramifications for instruction in a range of educational settings, encompassing microbiology, nutrition, food science, and consumer health education:

Curriculum Creation: Food Science and Technology: Provide in-depth case studies about dairy product microbiological and physicochemical analyses. Draw attention to the variations in microbial makeup and how they affect the nutritional value and quality of food.

Nutrition and dietetics: Make use of the study's findings to educate students about the value of yogurt as a functional food and the nutritional advantages of probiotics. Talk about how little processing and the lack of additives can improve the quality of food.

Work in a Practical Laboratory: Microbiology: Provide lab exercises that allow students to isolate and identify beneficial bacteria in yogurt and duplicate the microbiological analyses used in the study. Students will get an understanding of the practical aspects of food microbiology through this hands-on approach.

Chemistry: Provide hands-on instruction in evaluating titratable acidity, pH, and other dairy product physicochemical characteristics.

Customer Instruction: Public health: Provide instructional materials that discuss the value of probiotics in a diet and are aimed at a range of demographics. Use survey data to illustrate the current state of awareness and emphasize the importance of continued education, particularly for the undereducated and elderly populations.

In home economics class, demonstrate how to make yogurt at home and highlight the advantages of little processing and no preservatives. This can enable people to generate nutritious, high-quality meals on their own.

Research Proficiency:

1) Data Analysis: Teach students about data collecting, statistical analysis, and interpretation by using the study's survey and experimental data. This might be very helpful for research methodology courses in the food and health sciences.

2) Critical Thinking: To develop abilities in scientific thinking and evidence-based conclusions, encourage students to critically assess the study's procedures and findings.

Multidisciplinary Education:

1) Integration of Disciplines: Describe how ideas from nutrition, food science, microbiology, and public health are combined in this work. Promote multidisciplinary initiatives that tackle practical issues, advancing a comprehensive comprehension of food quality and the well-being of consumers.

2) Programs for Community Outreach:

Workshops for Education: Create community outreach initiatives based on the study's conclusions to inform people about the advantages of eating foods high in probiotics. Engage students in these initiatives to improve their education and foster community engagement.

Collaboration Projects: To give students opportunities for experiential learning, and collaborate with nearby food producers and health organizations to apply study findings in real-world contexts.

Teachers can improve their students' comprehension of key ideas in food science, nutrition, and public health by incorporating the findings of this study into their lesson plans. This will also help students develop their research, critical thinking, and community participation skills.

Study Recommendations

The study's conclusions lead to the following recommendations being put forth:

Improve Quality Control: To guarantee that yogurt products consistently meet or surpass national criteria for physicochemical and microbiological quality, manufacturers should keep up and even improve their quality control procedures.

Enhance Microbial Composition: In order to guarantee the presence of advantageous lactobacilli, which might improve the nutritional and organoleptic qualities of the yogurt, yogurt producers—especially those of Soummam Acti+ should think about optimizing their fermentation procedures.

Encourage Minimum Processing: The greater antibacterial activity of handmade yogurt serves as evidence that minimal processing and the absence of additives in yogurt production are beneficial, and this should be emphasized to both consumers and commercial manufacturers.

Consumer Education: Constant efforts should be made to inform people about the advantages of functional dairy products and probiotics. Reaching the elderly and those with lower levels of education is especially important, as they might not be as aware of these advantages.

Market research and strategy development: To better understand the variables impacting consumers' decisions and purchases of dairy products, more research should be done. With this data, personalized marketing campaigns highlighting the health advantages of functional dairy products can be created.

Further Research on Probiotics: Research on the health benefits of probiotic strains present in different fermented dairy products should be conducted in the future, going beyond yogurt to encompass a larger variety of functional foods.

Promote Yogurt Production at Home: As a way to get high-quality, bioactive dairy products with improved antimicrobial qualities, consumers should be encouraged to create yogurt at home.

Support for Policies and Regulations: Lawmakers ought to back programs and rules that promote the manufacturing and consumption of premium, minimally processed functional dairy products.

By putting these suggestions into practice, yogurt and other probiotic dairy products can be better on the market in terms of quality, health benefits, and customer awareness.

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Appendices 01
Copy of the survey

استبيان حول الاغذية الوظيفية

الجنس ☐ ذكر ☐ انثى

العمر ☐ >45 ☐ 35-45 ☐ 25-35 ☐ 18-25

المستوى الدراسي ☐ المتوسط ☐ الثانوي ☐ الجامعي

المهنة ☐ طالب ☐ بطال ☐ عامل

هل تستهلك الحليب و مشتقاته ☐ نعم ☐ لا

هل تتناول الياغورت ☐ نعم ☐ لا

كم تستهلك ☐ يوميا ☐ اسبوعيا ☐ شهريا

هل تستهلك علامة (اكتيفيا) او (اكتي+) ☐ نعم ☐ لا

هل تعرف ما هو البيفيدوس ☐ نعم ☐ لا

ما هو الفرق الذي لاحظته ☐ سهولة الهضم ☐ تحسن المناعة ☐ انخفاظ الكولسترول

كم أنت مستعد للدفع مقابل هذه الفرق؟ ☐ 20%-10% ☐ 40%-20% ☐ 60%- 40%
☐ 80%-60% ☐ 100%-80%

ما هي الفوائد الاضافية الذي تريدها في غذائك ☐ تخفيض ضغط الدم ☐ تخفيظ السكري
☐ تخفيظ الوزن ☐ تسهيل الهضم

Appendices 02
Culture media and reagents used
According to (Lewis, 2012)

❖ MRS (De Man, Rogosa, Sharpe) Medium Composition

- Component..... Amount
- Proteose Peptone..... 10.0 g/L
- Beef Extract .....10.0 g/L
- Yeast Extract..... 5.0 g/L
- Dextrose.....20.0 g/L
- Polysorbate 80 ..... 1.0 g/L
- Ammonium Citrate .....2.0 g/L
- Sodium Acetate..... 5.0 g/L
- Magnesium Sulfate .....0.1 g/L
- Manganese Sulfate .....0.05 g/L
- Dipotassium Phosphate ..... 2.0 g/L
- Agar.....12.0 g/L
- pH.....6.5

❖ M17 medium composition

- Pancreatic digest of casein..... 5.0 g/L
- Soy Peptone. .....5.0 g/L
- Beef extract.....5.0 g/L
- Yeast extract. .....2.5 g/L

- Ascorbic acid. .....0.5 g/L
- Magnesium sulfate. ..... 0.25 g/L
- Disodium-β-glycerophosphate. ..... 19.0 g/L
- Agar.....11.0 g/L
- pH.....6.5

Dilutants

- **physiological serum and distilled water**
- physiological serum 500ml
- distilled water 1000ml

Appendices 03
Summary table of physicochemical test results

Table 1: pH measurements (Activia)

Samples	pH	Samples	pH
1A	3.8	3A	3.9
1B	3.9	3B	3.9
1C	3.7	3C	3.8
2A	4	4A	4.2
2B	3.9	4B	4.5
2C	4.3	4C	4.2

Table 2: pH measurements (Activia)

Samples	pH	Samples	pH
5A	4.2	7A	4.1
5B	3.9	7B	4.3
5C	4	7C	3.7
6A	0	8A	4.5
6B	4.4	8B	4
6C	3.7	8C	4.2

Table 3: pH measurements (Acti+)

Samples	pH	Samples	pH
1A	4.2	3A	4.4
1B	4	3B	4
1C	4.3	3C	3.8
2A	4.1	4A	4.1
2B	0	4B	4.2
2C	4.2	4C	4.2

Table 4: pH measurements (Acti+)

Samples	pH	Samples	pH
5A	4.2	7A	4.2
5B	4.5	7B	4.1
5C	4	7C	4.3
6A	4.1	8A	4
6B	4.4	8B	4.2
6C	3.9	8C	4.1

Table 5: Acidity measurements (Activia)

Samples	Acidity	Samples	Acidity
1A	82	3A	87
1B	87	3B	115
1C	82	3C	114
2A	120	4A	69
2B	100	4B	99
2C	99	4C	108

Table 6: Acidity measurements (Acti+)

Samples	Acidity	Samples	Acidity
1A	84	3A	115
1B	85	3B	85
1C	110	3C	103
2A	108	4A	120
2B	94	4B	119
2C	119	4C	108

Appendices 04
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ANNEXE II

SPECIFICATIONS TECHNIQUES DES TYPES DE LAIT FERMENTE

Spécifications techniques	Produits	
	Lait fermenté	Yaourt
Protéine du lait [a] (% masse/masse)	Minimum 2,7 %	Minimum 2,7 %
Matière grasse laitière (% masse/masse)	Inférieure à 10 %	Inférieure à 15 %
Acidité titrable, exprimée en pourcentage d'acide lactique (% masse/masse)	Minimum 0,3 %	Minimum 0,7 %
Somme des micro-organismes spécifiques cités à l'article 3 ci-dessus (ufc/g, au total)	Minimum 10^7	Minimum 10^7
Micro-organismes étiquetés[b] (ufc/g, au total)	Minimum 10^6	Minimum 10^6
La teneur en matière sèche laitière non grasse (% masse/masse)	Minimum 8,2 %	Minimum 8,2 %

Appendices **05**

Summary table of survey results

Gender distribution of survey takers

SURVEY TAKERS		
MALE	FEMALE	
50	122	TOTAL=172

Dairy consumption habits of survey takers

DAIRY CONSUMPTION		
YES	NO	
146	26	TOTAL=172

Bifidus familiarity among survey takers

BIFIDUS FAMILIARITY		
YES	NO	
122	50	TOTAL= 172

Bifidus familiarity by age group

Age group **familiarity**	**18-25**	**25-35**	**35-45**	**45<**
YES	60	25	16	10
NO	18	14	16	13
TOTAL	78	39	32	23

Bifidus familiarity by educational level

MIDDLE SCHOOL	16
HIGH SCHOOL	35
UNIVERSITY	71
TOTAL	**122**

Activia/Acti+ consumption

ACTIVIA/ACTI+ CONSUMPTION+	
ACTIVIA	62
ACTI+	61
TOTAL	**123**

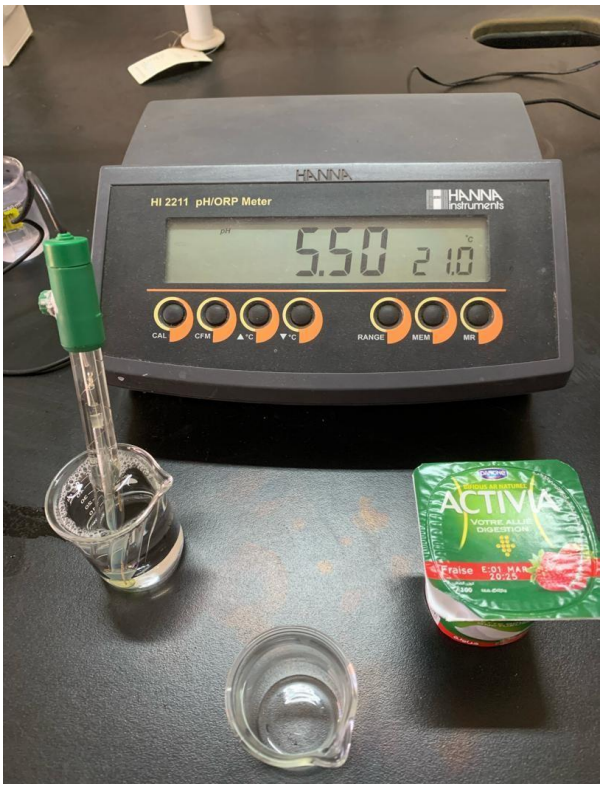
Employment status of people who consume (Activia/Acti+)

EMPLOYEMENT STATUS	
STUDYING	24
EMPLOYED	86
UNEMPLOYED	13
TOTAL	**123**

Willingness to pay extra by employment status

Extra pay **Employment**	**10%-20%**	**20%-40%**	**40%-60%**	**60%-80%**	**80%-100%**
STUDYING	15	7	0	0	0
EMPLOYED	8	105	17	1	1
UNEMPLOYED	11	6	1	0	0

Appendices 06
Equipment utilized for the study



pH meter

Titratable acidity apparatus

Microscope

Dessiccator

Appendices 07

Some yogurt samples

Summary:

This study assessed the physicochemical and microbiological properties of yogurts from Danone and Summam, as well as the general public's knowledge of probiotic foods, particularly dairy products. The bacterial content, pH, and titratable acidity of eight yogurt samples were examined. The pH and acidity of all samples were within Algerian guidelines, demonstrating effective quality control. Microbiological examination showed that while both brands contained lactic streptococci, Danone had greater probiotic levels while Summam had no discernible lactobacilli. Just 40% of consumers routinely ingested probiotics, even though 65% of them acknowledged their health benefits. Superior antibacterial activity against Staphylococcus aureus and E. coli was demonstrated by homemade yogurt, which served as a control and demonstrated the advantages of little processing and no additives. These results highlight the importance of continuing consumer education, particularly for the elderly and less educated populations. They also point to the need for more studies on the health benefits of probiotics and consumer behavior. Better manufacturing techniques, marketing plans, and educational campaigns to support functional dairy products can all benefit from the study's findings.

Keywords: microbiological traits, physicochemical qualities, yogurt, functional food, dietary advice.

الملخص:

قامت هذه الدراسة بتقييم الخصائص الفيزيائية والكيميائية والميكروبيولوجية للزبادي من دانون وسمام، بالإضافة إلى معرفة عامة الناس بالأطعمة التي تحتوي على البروبيوتيك، وخاصة منتجات الألبان. تم فحص المحتوى البكتيري، ودرجة الحموضة، والحموضة المعايرة لثمانية عينات من الزبادي. وكان الرقم الهيدروجيني والحموضة لجميع العينات ضمن المبادئ التوجيهية الجزائرية، مما يدل على مراقبة الجودة الفعالة. أظهر الفحص الميكروبيولوجي أنه على الرغم من احتواء كال العالمتين التجاريتين على المكورات العقدية اللبنية، إال أن دانون يحتوي على مستويات بروبيوتيك أعلى بينما ال يحتوي سمام على عصيات الكتوبية ملحوظة. فقط 04% من المستهلكين يتناولون البروبيوتيك بشكل روتيني، على الرغم من أن 55% منهم أقروا بفوائدها الصحية. تم إثبات النشاط المضاد للبكتيريا الفائق ضد المكورات العنقودية الذهبية والإشريكية القولونية من خالل الزبادي محلي الصنع، والذي كان بمثابة عنصر تحكم وأظهر مزايا المعالجة القليلة وعدم وجود إضافات. وتسلط هذه النتائج الضوء على أهمية استمرار تثقيف المستهلك، وخاصة بالنسبة لكبار السن والسكان الأقل تعليما. ويشيرون أي ضًا إلى الحاجة إلى مزيد من الدراسات حول الفوائد الصحية للبروبيوتيك وسلوك المستهلك. يمكن أن تستفيد تقنيات التصنيع الأفضل وخطط التسويق والحمالت التعليمية لدعم منتجات الألبان الوظيفية من نتائج الدراسة.

الكلمات المفتاحية : الياغورت، الخصائص الفيزيوكيميائية، الخصائص الميكروبيولوجية، الزبادي ، الغذاء الوظيفي ، المشورة الغذائية .

Résumé :

Cette étude a évalué les propriétés physiques, chimiques et microbiologiques des yaourts de Danone et Soumam, ainsi que la connaissance du grand public sur les aliments contenant des probiotiques, notamment les produits laitiers. La teneur en bactéries, le pH et l'acidité titrable de huit échantillons de yaourt ont été examinés. Le pH et l'acidité de tous les échantillons étaient conformes aux directives algériennes, ce qui indique un contrôle de qualité efficace. L'examen microbiologique a montré que même si les deux marques contenaient du Streptococcus lactis, Danone avait des taux de probiotiques plus élevés tandis que Samam ne contenait aucun lactobacille significatif. Seuls 40 % des consommateurs prennent régulièrement des probiotiques, même si 65 % d'entre eux reconnaissent leurs bienfaits pour la santé. Une activité antibactérienne supérieure contre Staphylococcus aureus et E. coli a été démontrée par le yaourt fait maison, qui a servi de témoin et a montré les avantages d'un traitement minimal et de l'absence d'additifs. Ces résultats soulignent l'importance d'une éducation continue des consommateurs, en particulier pour les populations plus âgées et moins instruites. Ils soulignent également la nécessité de mener davantage d'études

sur les bienfaits des probiotiques pour la santé et sur le comportement des consommateurs. De meilleures techniques de fabrication, des plans de marketing et des campagnes éducatives visant à soutenir les produits laitiers fonctionnels pourraient bénéficier des résultats de l'étude.
Mots clés : Yaourt - Caractéristiques physico-chimiques - Caractéristiques microbiologiques – Aliment fonctionnel – Conseils diététiques.