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The Probiotic Market In Turkey

*Arzan Dilek**

*Aşkım Nurdan Tümbek Tekeoğlu***

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Abstract

Many of today's health-focused initiatives are centred around the gut microbiome. A healthy gut microbiome has been proven to aid in the healthy functioning of the digestive system, strengthen the immune system, and maintain overall body health. Therefore, the development and use of microbiotic products are increasing rapidly, and Turkey has become an important market in this area. In order to define the dynamics of this market, determine its growth potential, and make predictions about the future of the sector, an in-depth case study was conducted based on an interview with industry cognoscenti Haydar Yılmaz.

During the interview, topics such as the history and current state of the industry, growth potential, market trends, consumer behaviour, regulations, and competition were discussed. In addition, detailed information was gathered on the product ranges, production processes, and R&D activities of companies operating in the sector. This information provided an important resource for understanding the industry's current state and identifying future growth opportunities. In the study, the data obtained were analyzed using the narrative analysis method. As the importance of healthy ageing and gut health continues to grow, microbiome and probiotic products are expected to be used more in marketing strategies. The microbiota strategy can help companies prepare for the effects of the microbiome in both the short and long term.

Keywords: Microbiome, Microbiota, Functional Food, Probiotic Market in Turkey

JEL classification: L11, L15

1. Introduction

The microbiome health trend is causing a significant shift in the business world due to increased consumer awareness of health and nutrition. As this trend continues, significant changes are expected in the food and pharmaceutical industries. Companies that focus on microbiome health in their products will be better equipped to meet consumers' needs accurately and effectively.

* *Istanbul Ticaret University, Turkey, 0000-0002-7295-5733, arzan.dilek@istanbulticaret.edu.tr*
** *Istanbul Ticaret University, Turkey, 0000-0002-6837-9649, anttekeoglu@ticaret.edu.tr*

Furthermore, the continued emphasis on microbiome research in medical studies and disease diagnosis will highlight the importance of collaboration between the business and health sectors.

The effects of the microbiome are becoming increasingly understood and causing significant changes in the business world. The gut-brain axis interaction, known as the microbiome, is believed to affect mental health. It has been shown that a healthy microbiome can slow aging and reduce the risk of dementia.

In Turkey, the emerging microbiome and probiotics sector, along with increasing entrepreneurial companies, could lead the way in producing healthier and antibiotic-free products in the European and Middle Eastern markets. This sector offers significant opportunities for both the health and business sectors. The purpose of this study is to examine the effects of the microbiome health trend on the business and health sectors.

2. Literature Review

According to world-renowned futurists Faith Popcorn and Adam Hanft, companies are trapped in this paradox because they focus on short-term goals. Many sectors, such as CPG companies, fitness brands, and travel companies, are facing the effects of the microbiome. Therefore, companies need to break free from this paradox and prepare for where the world is heading (Popcorn and Hanft, 2023).

An article in The New York Times in 2021 reported that a study published in the journal Nature Metabolism showed that as people age, the types of microbes in their gut tend to change, and this change is important for the potential for healthy aging. People with a unique profile of shifting gut microbiome have been found to have higher levels of health-promoting compounds produced by gut microbes fighting chronic diseases. (O'Connor, 2021) Research on modulating the bacterial community in the human body and the microbiome continues to grow rapidly. There are numerous scientific issues that need to be addressed when evaluating prebiotics and fibers, live bacteria, or postbiotics (thermally killed microbes or components that provide health benefits). At the same time, product development opportunities arise in this complex and challenging market (Montemarano, 2022).

At the Future of the Microbiome Summit organized by the Trust Transparency Center in December 2021, scientists discussed the latest developments in proving the benefits of "biotic"

supplements. At the same time, market experts have started to develop successful commercialization strategies based on the digestive, immune, mood, sleep, and inflammation benefits of these supplements (Montemarano, 2022). In this context, companies need to include the microbiome in their strategies while focusing on their short-term goals. A microbiome strategy can help companies prepare for where the world is heading and consider the effects of the microbiome in the short and long term.

A personalized approach to the microbiome is expected to usher in a new era and help with more accurate diagnosis and treatment of diseases. Products containing components that are beneficial to microbiome health, such as functional foods and probiotics, are being developed and launched by the food and pharmaceutical industries. This trend will have a significant impact on the healthcare sector and many other industries (Matusheski et al., 2021).

Two significant events occur during childbirth. The first is the birth of a new human being, and the second is the seeding of the baby's microbiome, an invisible event that affects the baby's lifelong health. The seeding of the microbiome helps the baby acquire a healthy bacterial community and activate the immune system, thus making the baby more resilient to diseases throughout their life. However, interventions such as the use of synthetic oxytocin, antibiotics, cesarean section, and formula feeding can prevent or completely obstruct the transfer of microbes from the mother to the baby (Harman and Wakeford, 2017).

The interaction between the human microbiome and the immune system affects many metabolic functions and influences our well-being. Additionally, the interaction between humans and microbes can play a significant role in determining the state of human health or disease. Dysbiosis is associated with many diseases, including skin, inflammatory, metabolic, and neurological disorders (Malla, Dubey, Kumar, Yadav, Hashem, & Abd_Allah, 2019).

The microbiome is a collection of genomes of not only bacteria but also fungi, viruses, and other microorganisms that can impact human health.

2.1. Human Microbiota and Gut Health

According to Montemarano (2022), "Remembering where we came from is important. The microbiome is a collection of the genomes of all microorganisms, not just bacteria but also fungi, viruses, and their DNA, RNA, and proteins, that can all impact human health." The microbiota is a complex community of microorganisms that live in the human body, including

bacteria, viruses, fungi, and other microscopic organisms found in 18 different locations, including the skin, mouth, lungs, and genital area. The most diverse microbiota is found in the intestines. Intestinal microbiota begins to develop during pregnancy and newborns born normally and breastfed receive more bacteria from their mothers. This early bacterial exposure is important for the development of healthy microbiota and is important for our overall health and well-being (Dash, Clarke, Berk, & Jacka, 2015).

Research on the human microbiota and gut health has gained momentum in recent years. However, initial studies on this topic began many years ago. For example, in 1907, Élie Metchnikoff conducted studies on the effects of probiotic bacteria found in the intestines on health (Metchnikoff, 1907). In later years, in the 1970s, research began on the effects of gut microbiota on human health. In these studies, it was discovered that gut microbiota has more significant effects on the immune system, metabolism, and nervous system than on gut health. In particular, it was found to have an impact on many systems, such as the immune system, metabolism, and nervous system (Turnbaugh et al., 2006).

In the 2000s, many studies were conducted on the importance of human microbiota and gut health. In 2007, the National Institutes of Health launched the "Human Microbiome Project". This project aims to contribute to the understanding of human health and diseases by determining the number, types, and genomic structures of microorganisms in the human body (The Human Microbiome Project Consortium, 2012).

The effect of Western-style nutrition on microbiota has been researched. African vegetarian children's microbiota was compared with Italian children's microbiota. Bacteroidetes species such as Prevotella and Xylanibacter were higher in African children's microbiota. These bacteria produce energy from plant polysaccharides. Medications and dietary interventions can alter the composition of the human microbiota, which can have broad effects on individual microbes. Everyone's microbiome is different, so they can respond to treatments in different ways (Büyüktuncer Demirel, 2017; Altındiş, 2023).

As we grow up, we continue to acquire and harbor different types of microorganisms. We get them from the foods we eat, the water and air we drink, and the people and animals we come into contact with. These microorganisms can be friends or foes and can affect our health in different ways. In a healthy human body, the number of friendly bacteria is primarily dominant.

These friendly microorganisms provide many benefits, including aiding digestion, producing vitamins and other nutrients, and supporting our immune system. The ratio of friendly/enemy microorganisms is estimated to be about 80/20. However, microbiota imbalances such as the excessive growth of harmful bacteria can lead to various health problems (Dash, Clarke, Berk, & Jacka, 2015). Microorganisms have a significant impact on human health. In a healthy human body, friendly bacteria dominate and provide benefits such as digestion, vitamin production, and immune system support. Probiotics are live microorganisms that colonize the intestinal system and improve microbial balance. Fermented dairy products, malt, and grain extracts are the best sources of probiotics. Prebiotics are indigestible substances that selectively support the growth of probiotics. Nutrition plays a critical role in regulating gut microbiota, and the effects of different dietary patterns, components, and nutrients on microbiota are being studied. Nutrition recommendations can be personalized, but a balanced intake of carbohydrates, fats, and proteins from the four basic food groups is essential. Increased intake of prebiotics and fermented foods is also recommended (Çakmak, 2018; Erbaş, 2016; Büyüktuncer Demirel, 2017).

Research on human microbiota and gut health has been ongoing throughout history. Today, research in this field is helping to better understand the effects of gut microbiota on health. The gut is a complex ecosystem containing different bacteria, fungi, and other microorganisms that are vital for healthy gut function. Imbalances in human microbiota can lead to gastrointestinal disorders as well as many chronic diseases, such as obesity, diabetes, allergies, asthma, and even autism (Marchesi and Ravel, 2015). Microbiota tests are technologies used to determine the diversity, density, and types of microbiotas in the gut. These tests can help healthcare professionals understand patients' microbiota profiles and create treatment plans accordingly. They can also be used to track personal health and well-being (David et al., 2014).

The use of microbiota tests is beneficial in many areas, including determining health status, diagnosing diseases, determining drug therapy, preparing nutrition programs, and preventing diseases (O'Hara and Shanahan, 2006). However, it is important to have sufficient knowledge about the limitations and correct interpretation of these tests.

The microbiome is a collection of microorganisms in the human body, and early bacterial exposure is important for the development of healthy microbiota. Western-style diets can have

negative effects on the microbiota. The human body interacts with microorganisms through contact, and in a healthy body, friendly bacteria are dominant. Microbiota imbalances can cause health problems, and probiotics, prebiotics, and balanced nutrition are important for gut health.

2.2. Functional Foods and Dietary Supplements

Functional foods are a marketing term used to describe foods enriched with ingredients that provide health benefits. The popularity of such products has increased with the growing connection between health, nutrition, and diet. Manufacturers develop added ingredients that provide value to the food. For example, probiotic products can improve gut health thanks to the Lactobacillus and Bifidobacterium organisms included in dairy products. Functional foods can be consumed in a normal food form and should not be in the form of a pill, capsule, or other dietary supplement. These types of products continue to grow rapidly in the global market (Tastan, n.d.; Çakmak, 2018). Thanks to the beneficial components they contain, they protect and improve the body and reduce the risk of developing diseases. Special functional foods such as probiotics and prebiotics have significant benefits for human health. Consumption of these foods can encourage healthy eating within society and reduce healthcare expenses and workforce losses. The promotion and preference for functional foods can help people lead healthier and longer lives (Erbaş, 2016).

The effects of functional foods on human physiology are quite diverse. These include positive effects on early development and growth, regulation of metabolic processes, aiding in blood sugar control, and antioxidant effects. In addition, other health benefits of functional foods include strengthening the immune system, reducing the risk of cardiovascular disease, improving digestive health, and enhancing brain function (Çakmak, 2018). People prefer to take preventive measures for a healthy and quality life, and dietary choices are among the most important measures. Functional foods are among the foods consumed for this purpose and their trade volume is increasing. In Turkey, there has been an increase in the quantity and variety of functional foods since 2005 (Erbaş, 2016).

Functional foods are foods that contain components with proven health benefits that positively affect human health. These foods may have short-term effects or the potential to reduce the risk of long-term diseases. The science of functional foods aims to create conditions to maintain or improve current health status and reduce disease risk. The benefits of functional foods are seen

in several important health areas such as cardiovascular physiology, gastrointestinal health, cognitive and mental health, physical performance, and fitness. These potential health benefits, combined with an increasing health consciousness in modern societies, make functional foods an effective marketing tool. Furthermore, deriving these products from natural sources and reducing the use of chemical additives may also align with consumers' tendencies to follow a healthier and more natural diet.

2.3. Microbiome and Probiotics

Probiotics can be associated with fermented foods that have been consumed by humans for thousands of years. For example, about 2,000 years ago, fermented rice water called "kombucha" started to be consumed in China (Jayabalan et al., 2014). Also, fermented dairy products such as kefir and yogurt have historically been considered probiotics in the Middle East (Hutkins, 2018).

However, the term probiotic was defined in the early 20th century. It was first used in 1907 by Elie Metchnikoff, a Nobel Prize-winning scientist. Metchnikoff suggested that yogurt consumption could protect health and called it "a yogurt-based therapy" (Metchnikoff, 1907).

But the modern meaning of probiotics was introduced in the 1960s with the Lactobacillus casei Shirota (LcS) probiotic developed by a Japanese researcher named Minoru Shirota. LcS is found in "Yakult," a fermented dairy product introduced in Japan in 1935 and still sold today (Lee and Salminen, 1995).

Today, probiotics are considered beneficial live microorganisms for the body, and potential benefits in areas such as gut health, immune system function, inflammation, allergies, and even mental health have been investigated in many studies (Hill et al., 2014).

Although probiotics are traditionally associated with fermented foods, their modern meaning and usage have developed through research on their potential benefits for human health. As research in this field continues, more information will be gained about the effects of probiotics on health, and new products and treatments will be developed to help people achieve a better quality of life.

2.3.1. Probiotic Market

The popularity of functional foods is based on a variety of factors, but health claims or implications do not guarantee success. Factors such as consumers' ability to measure product benefits and changing demands that affect purchasing behaviors are important. Processors must take these changes into account in their marketing strategies, target the appropriate market segment, and ensure that new products are suitable for consumers' future health goals (Sloan, 1998; Childs, 1997).

According to the GWR (2020) report, Japan is the leader with over 80 recognized functional foods and legal status for functional foods. Europe has seen increased interest, particularly in probiotic foods, but the United States views probiotic foods as niche products. The functional food market is expected to continue to grow. The global probiotics market was worth $58.17 billion in 2021 and is expected to grow at a CAGR of 7.5% from 2021 to 2030. Probiotics play a significant role in preventive healthcare due to their positive effects on gut health. Therefore, increasing awareness of preventive healthcare could increase market growth.

In Europe, probiotic dairy products, especially probiotic yogurts, and milks, have been the most active area in the functional food market. In 1997, these products accounted for 65% of the functional food market in Europe and were valued at $889 million. Probiotics, prebiotics, vitamins, and minerals are among the most important components of functional foods. Japan is a leader in the functional food market with over 80 recognized functional foods and legal status for functional foods. Europe has shown particular interest in probiotic foods. The functional food market will continue to grow.

The functional food market in Europe has focused on probiotic and prebiotic dairy products, while the United States has focused on food fortification with vitamins and minerals. Probiotic cultures have been added to yogurts and fermented dairy products in Europe, with brands such as LC1, Vifit, Actimel, and Yakult leading the market. Germany saw significant growth in the yogurt market due to the launch of probiotic products such as Nestlé's LC1. Misleading claims and existing laws on food safety are applied to functional foods in the absence of special legislation. Nestlé's LC1, containing the L. Tacidophilus La1 strain, has been extensively researched and claimed to stimulate the immune system. The different approaches to functional foods in various countries have resulted in related but distinct developments. (Young, 1996; Hilliam, 1998).

Consumer research has identified that those who purchase functional foods are typically women, well-educated, high-income, between the ages of 35-55, and actively interested in health. Women and high-income individuals have been found to have higher beliefs in the health benefits of food compared to men (Childs, 1997). Additionally, there is a positive relationship between belief in the health benefits of nutraceuticals and education level, which can be associated with higher income. Functional food consumers are generally slightly older and better educated than the general population (Gilbert, 1994). This trend is partly due to an aging population, increasing health concerns, and rising healthcare costs. Therefore, functional foods that have effects on aging, energy levels, immunity, and certain measures of disease treatment will become more important (Childs, 1997). Additionally, the proportion of women over 40, who are the population segment most concerned about nutrition, will continue to increase. In 29 years, marketing food products for disease prevention and treatment will be widespread, and marketers will target the new generation of young adults who are more aware of existing health issues and risk factors such as coronary artery disease and cancer (Sloan, 1998).

2.3.2. The Probiotics Market in Turkey

In recent years, with the increase of the healthy lifestyle trend in Turkey, there has been a significant growth potential in the probiotics market. According to data from the Turkish Statistical Institute, healthcare spending in Turkey reached 207.6 billion Turkish Liras in 2021 (Turkish Statistical Institute, 2021). This increase reflects the growing interest of consumers in healthy living and preventive healthcare services. Demand for probiotic products is also increasing with this trend.

There is no clear data on the size of the probiotics market in Turkey, but according to a survey conducted by the Turkish Food and Beverage Industry Associations Federation (TGDF), the market size of probiotic products in Turkey exceeded $200 million in 2019 (Turkish Food and Beverage Industry Associations Federation, 2020). Factors behind this growth include increased consumer health consciousness, the sensitivity of the aging population to health problems, and scientific evidence of the benefits of probiotics for gut health.

According to a study conducted by Kağan, Tuğçe, and Yurttaş (2019) on Turkish consumers, the majority of participants had heard of probiotics and were consuming foods that contained them. Those who did not consume probiotics either did not know the term or did not prefer them due to their high prices. Advertising and the media were believed to influence probiotic consumption, which is generally consumed with meals.

Probiotics are defined as microorganisms or microbes that, when consumed, positively affect consumer health. The global probiotics market is valued at 50 billion euros and is expected to reach 55 billion USD by 2024 in yogurts, beverages, ice creams, and other food products. The probiotics market in Turkey will double within 5 years. Kefir is a popular probiotic product in Turkey. Market data on the medical use of probiotics for human health is inadequate (Fortune Turkey, 2020).

The probiotics market is rapidly growing, especially in Europe, with yogurt and fermented dairy products leading the way. Long-term usage depends on clinical evidence supporting health benefits, accurate consumer knowledge, effective marketing strategies, and high-quality products.

The majority of companies operating in the sector in Turkey are less than 5 years old, with some having developed their first probiotic products with TUBITAK entrepreneurship support. Although companies that sell human probiotic drinks or drug additives generally import them through distributors from abroad, there are also companies in Turkey that produce them (Tastan, n.d.).

The growth potential of the probiotics market in Turkey is associated with the production and consumption of processed foods, dairy products, yogurt, and kefir that contain probiotics. However, it is important to pay attention to issues such as determining product quality, providing accurate and sufficient information on product labels, and controlling and regulating production processes in the production and marketing of probiotic products.

3. Research Methodology

3.1. The Purpose and Scope of the Research

This study aims to examine the works of producers in Turkey regarding microbiome and probiotic products. An interview was conducted with industry expert Haydar Yılmaz to analyze

the history and current state of the microbiome and probiotic market in Turkey, as well as the dynamics of the market in the country.

3.2. Importance, Method, and Limitations of the Research

The microbiome and probiotics market has significant potential worldwide. However, in Turkey, the level of knowledge and awareness in this field has not yet been reached, and the lack of sufficient information among consumers is a limiting factor for market growth. Therefore, it is important to work to understand the potential of the market and increase consumer awareness.

Turkey's production capacity could increase, especially the food industry could play an important role in this area. However, limited knowledge and awareness may hinder more effective use of production capacity.

To examine the specifics of the market, marketing tactics, and export structure, an interview with probiotic industry specialist Haydar Yılmaz was conducted. The conclusions of this approach, however, are purely based on the participant's viewpoint, and the study's scope is constrained.

4. Results

In this research, specific questions were prepared, and answers were obtained from a specific participant. These answers were grouped according to relevant categories.

4.1. History of Probiotics and Yogurt

The discovery of probiotics took place in the 1900s, with the microbiology department of the Pasteur Institute being the pioneer in this field. The Nobel Prize in Medicine for the discovery of probiotics was awarded to a doctor named Pasteur, who worked at the Pasteur Institute. Yogurt, which is considered a fermented food in Europe, did not exist in the past.

Haydar Bey shared the story of Isaac Karasu, a Sephardic Jewish doctor, who had to migrate to Barcelona after facing persecution following Greece's independence. At that time, a disease known as the influenza pandemic caused the death of 40 million people according to official records. However, according to some sources, the actual number could be up to 250 million people, as some countries did not record deaths. Spain's non-involvement in the war allowed for accurate records to be kept and played a role in revealing the actual number of deaths. The

pandemic caused many states to suffer serious losses in the war and even affected the end of World War II.

One story tells of a doctor named İzak Karasu in Spain who reduced the symptoms of influenza patients by giving them yogurt. İzak became famous among the public for the miraculous effect of yogurt, and started selling it as a medicine in pharmacies, eventually growing the business into the world-renowned Danone brand named after his son, Daniel.

In another story, a family of dairy farmers in Samatya made a living by producing yogurt and sent their sons to Paris for education. However, after their father's death and money problems, their plans fell apart. To stay in Paris, they decided to stick with what they knew best and produce yogurt. They set up a yogurt stand under the Eiffel Tower, but the yogurt was unknown in France and received little interest from the public. However, the young men went to Pasteur, who was studying bacteria at the time, and requested that he examine the yogurt. Pasteur wrote a document stating, "*I have examined the yogurt and found beneficial bacteria within. I recommend it to all of the people of Paris."* As a result, yogurt became the second most consumed product after wine, and this process continued until the discovery of antibiotics. This is how yogurt and its beneficial bacteria began to be known in European countries.

The discovery of penicillin by Alexander Fleming in 1927 and its subsequent development into antibiotics by other scientists had a significant impact on the medical world. The use of antibiotics to treat diseases, particularly with the widespread adoption of the Marshall Plan after World War II, has been hailed as a miraculous cure. However, overuse of antibiotics has been shown to weaken the immune systems of individuals. Prior to antibiotics, there were thousands of beneficial bacteria in the human gut. Antibiotics killed off many of these bacteria, leaving only a few types to thrive and leading to weakened immune systems.

Many countries established antibiotic manufacturing facilities and antibiotics were widely used. However, this caused concern among experts. Many medical professionals, including the World Health Organization, began warning about the harmful consequences of excessive antibiotic consumption. Despite these warnings, the pharmaceutical and chemical lobbies were reluctant to lose the huge profits associated with antibiotics. It is considered a turning point in the 1970s and 80s, with the emergence of the knowledge that probiotics strengthen the immune system and shed light on the production of probiotic fermented foods. Thanks to Nestle's pioneering

efforts in this field, many companies have started producing probiotic yogurts. In Turkey, Nestlé made a collaboration attempt with Gönen Mis Süt factory in 1998. However, this attempt was left incomplete at that time due to the inadequacy of regulations in Turkey. He described the next process as follows:

"Actually, it was in 2004, after I started producing kefir, that it became popular in Turkey. The reason I'm mentioning this is because it was around this time that people started becoming aware of the importance of probiotics for boosting the immune system after taking antibiotics. What's interesting is that Turkey has the highest rate of antibiotic use in the world, which is kind of strange considering how much we now know about the negative effects of antibiotics on the body."

Furthermore, the importance of probiotics for the health of people in Turkey has been emphasized, with the statement that due to our weakened immune system, we need probiotics more. Functional foods, which are foods that have a positive effect on health, and probiotics, have become popular worldwide, and it has been suggested that we need to understand and promote probiotic use in Turkey.

4.2. History of the Probiotic Market in Turkey

The probiotic yogurt manufacturer Nestle in Switzerland was approached by the Chairman of Tekfen Holding, Nihat Gökyiğit, in 1998 about producing the product in Turkey. In order to start manufacturing probiotic yogurt in Turkey, they came to an arrangement with Nestle and bought a stake in the Mis Süt facility. However, the Ministry of Health noticed and started talking about the problem because of an overly ambitious promotional campaign during the launch. The Ministry sought an opinion from a probiotic expert professor from the Department of Dietetics at Hacettepe University, who advised against authorizing the consumption of probiotic yogurt. The Ministry of Health at the time forbade the selling of probiotics. Haydar Bey said for that period;

"It's pretty interesting. I also had a chat with some food engineers working at a dairy factory in Gönen. They were thrilled as they had studied probiotics in school and were up to date with the latest academic knowledge. However, they were also shocked and upset about the situation. Afterwards, they even started a kefir project, but unfortunately, the factory management and owners didn't want to hear anything related to culture. They said, 'We've already faced enough

problems. Do whatever you want, but it won't work for long.' The engineers went ahead and did it, but the project didn't last very long."

As Turkey approached 2003, it went through a period in which a rapidly implemented and poorly prepared approach was adopted, which hindered development. The introduction of probiotic products in Turkey was delayed significantly due to inadequate marketing strategies and a lack of awareness. The marketing of traditional yogurt in small portions of 90 grams increased the importance of product presentation. Some brands applied a marketing strategy focused only on reducing bloating, without using the term "probiotic." During this period, there were deficiencies in marketing and creating awareness. Haydar Bey characterized this period as "*an interesting time*" in general.

"At the end of that period, some of them were eliminated, there were only 2-3 brands that could survive in a few years."

The majority of probiotics produced in Turkey are generally intended for industrial use and are rarely accessible to end-users. Therefore, a large portion of the products that reach end-users have to source their probiotics from abroad.

However, in recent years, there has been an increasing interest in probiotic production in Turkey. As people begin to adopt healthier lifestyles, domestic manufacturers are also looking for opportunities in this field. As a result, probiotic production in Turkey has started to increase.

Especially in recent years, domestic probiotic producers are working to offer more natural and organic products that are in line with healthy living trends. Additionally, efforts are being made to ensure that domestically produced probiotics reach end-users more quickly and economically.

4.3. Probiotic Industry World Trends

The global probiotic functional food market is rapidly growing, and the use of direct probiotic supplements is also increasing. When comparing Europe and the United States, the probiotic market in the United States appears to be more advanced. In the European Union, vitamin supplements still dominate the market, but there is an increasing amount of information being shared about the benefits of probiotics. Platforms have been established in America to discuss the functional benefits of probiotics and how they can be proliferated. Topics such as which

fruit powders or enzymes should be consumed are also addressed on these platforms. However, the use of probiotic supplements and yogurts is still not widespread in the European Union and Turkey. Instead, vitamin supplements such as vitamin C or vitamin D are preferred, despite their lack of direct impact on the immune system. It is necessary to increase awareness of the benefits of probiotics and encourage their proper use.

4.4. Challenges in the Industry and Ways to Overcome

The perception and knowledge of probiotics remain insufficient in society. The information provided by nutritionists and dieticians in the medical field is full of misinformation, narrow frames, and templates. There are misunderstandings and misconceptions about what probiotics are. Due to the inadequate knowledge of fermentation among medical professionals, they often provide inaccurate information based on hearsay. For example, a cardiologist may provide incorrect information about yogurt. To overcome these problems, companies have taken it upon themselves to provide information directly to consumers. Haydar Bey has expressed this situation as follows:

"We were really worried, like super worried, about all this false information going around. You know how they say, if you throw a stone in a well, forty-wise men cannot get out! Well, someone's throwing those stones and they're spreading like wildfire. So, I felt like we had to do something about it. I created two groups on social media, one for the second brain-gut probiotics "Ikinci Beyin Bağırsakları Probiyotikler" and the other for probiotic kitchen "Probiyotik Mutfak". The second brain group was meant to be a platform where we could share accurate and scientific information about probiotics, instead of just relying on hearsay from family and friends. We needed to move away from that and create a separate platform. And that's what we did. As for the probiotic kitchen group, we wanted to create a space where people could share their experiences with making their own fermented foods like yogurt, pickles, cheese, and vinegar. People even showcased their own homemade yogurt and gave tips on how to avoid mistakes. We also added some health information there."

The sharing of accurate information on probiotics and the production of probiotic foods at home is facilitated through social media groups. These groups also contain health information.

The Ministry of Agriculture allows only two words in health claims related to probiotics. No information, presentation, advertisement, or promotion can be made about the product other than these two words. The permissible information that can be used is as follows.

"Probiotics regulate the digestive system and support the immune system."

The restrictions and limitations on health claims of probiotics in Turkey make it difficult to properly promote the benefits of probiotics, such as improving digestive and immune system health and alleviating allergic reactions. This hinders the transfer of awareness about the benefits of probiotics. Providing information on the benefits of probiotics is only possible through communication channels such as social media, which allows sharing of studies conducted abroad. To inform consumers outside of these social media channels, the company owner has established a phone line where they can access a dietician. He expressed this problem as follows:

"People have this perception that health issues can only be solved with medication, and they don't consider food or fermented food containing probiotic bacteria as a solution. This is a perception management created by the pharmaceutical lobby. People think that if they have a problem, they should take medication or go to a doctor, who will prescribe them medication. There is no consideration for nutrition outside of that. It's also worth noting that nutrition is not given much importance in medical schools."

During the interview, it was also noted that the medical community in Turkey is still skeptical about probiotics and that pharmaceutical companies are trying to hinder this process. It was stated that even the Ministry of Agriculture and Forestry is behind these lobbies and does not want probiotics to become widespread in Turkey. It was emphasized that even food and nutrition engineers do not have sufficient knowledge on this subject. However, it was noted that people can learn about probiotics through the communication opportunities provided by social media.

Although awareness of the health benefits of probiotic foods has increased in recent years, the lack of social responsibility, profit-orientedness, and lack of vision among businesses in Turkey are obstacles to the development in the field of probiotics. This makes it difficult to promote the production and consumption of probiotic foods that will contribute more to the health of

society. In addition, misunderstandings regarding the presentation and promotion of probiotic foods have led to the withdrawal of some products. However, informing more people about the health benefits of probiotic foods and continuing to work in this field is crucial for public health.

4.5. "Doğadan Bizim" Case Study

During his consultancy work on growth strategies for a small Ezine cheese producer, Haydar Bey's relationship with probiotics began. Due to the cheese's long aging period, he recommended a new product development strategy for the company's growth, and they decided to produce Turkey's first probiotic drink, kefir. The company began producing kefir in 2003 and spent four years on the product's positioning, presentation, and communication.

At that time, there was no regulation or directive regarding probiotic technology, and Haydar Bey stated that relevant individuals were not knowledgeable about this topic.

Before launching a product like “kefir”, it was emphasized that probiotic tests must be conducted to comply with relevant legal regulations. He described this period as follows:

“In 2003, being the first to introduce probiotics in Turkey was quite remarkable. At that time, no one really understood or could even pronounce the term, and you were like a Don Quixote figure. In the dairy industry, where everyone was producing standard products in those small wholesale food shacks, you came up with something called kefir. Sometimes people couldn't even pronounce it properly and would mistake it for something else. It was quite an interesting experience. It was a challenging time for us, and on the other hand, the ministry wasn't prepared for it.”

Haydar Bey worked as a consultant for the company until 2008 and had been away from this field for 9 years. However, during this period, he conducted more research on probiotics to increase his knowledge. In 2014, which was 67 months later, probiotics began to be sold primarily by Danone and then by other companies (Sütaş, Pınar, Eker, Sek, etc.). As he puts it,

"Probiotic yogurt is bombarding Turkey and they have also started making kefir."

In 2003, Turkey made slow progress with a hasty and poorly prepared approach. However, in 2017, a great opportunity arose for small businesses, as debates about industrial yogurts in the media encouraged people to make yogurt at home. Thousands of tons of raw milk began to be transported to cities for yogurt production, and large farms were established during this process.

Tanks that maintained the cold chain were used to ensure the preservation of the raw milk, which was also sold in supermarkets.

He explained his entry to the market by saying:

"*One of the figures in the media was Yavuz Dizdar who kept saying "make yogurt at home, make yogurt at home..." So, I asked myself, okay, let's make yogurt at home, but with which yeast? Fermentation, which is the process of making yogurt, requires a specific type of yeast. What will you make yogurt within the end? Will you use your old yogurt, store-bought yogurt, yogurt from the local market, yogurt from a small shop down the street, yogurt brought in from a village, or yogurt brought in by the milkman? This crucial step was overlooked. We realized that this was a serious mistake because when you use yogurt that has been contaminated with other bacteria and fungi, in addition to the two yogurt bacteria, to make yogurt again, the chain continues. We set a goal to use a standard and established yeast for this process and to emphasize that it is important to do so for health and safety reasons. We started with the story of the natural science safety organization."*

In 2017, Haydar Bey established the business as our packaging facility based on the idea that probiotic yeast-containing bacteria can enhance our development. Since probiotics were not produced in Turkey, they had to import them from abroad. Initially, they started negotiating with probiotic producers in specific countries where we could select suitable flavors. They chose probiotics from Bulgaria that met our criteria of having a taste that would not be too off-putting when making yogurt at home. Later, when domestic production began, they sourced our probiotics from local suppliers and focused on packaging and presentation.

4.5.1. Product Variety

The company has shaped the traditional yogurt-making process by focusing on probiotic yogurt production. Various types of probiotic yogurt cultures have been produced to address different issues such as gas and bloating, constipation, and diarrhea. The statement *"Yogurt is a traditional and widely consumed product in Turkey with a history of thousands of years. Therefore, yogurt holds an important place in our production"* emphasizes the importance of probiotic yogurt in the Turkish market. The goal of probiotics is to enrich the intestinal flora and provide solutions for intestinal problems.

Other than probiotic yogurt culture, people's interest in making probiotic cheese, pickles, vinegar, kefir, and kumis at home is limited, although it is possible to produce products by fermenting every carbohydrate-containing food. However, the popularity of these types of foods is lower than that of ready-to-eat foods, and such home fermentation activities are not yet widespread in Turkey. Nevertheless, such cultures have been produced by the company to fill the gap in the market and sold to consumers.

4.5.2. Consumer Profile

It has been noted that there are certain limitations to the consumption of probiotics and that it is forbidden to give probiotic supplements to children between the ages of 0-6, which may be a restriction made due to the belief that probiotics may have more side effects on children's sensitive digestive systems. It should not be forgotten that more research is needed on the benefits and possible side effects of probiotics. These studies can help us to have more accurate information on the use of probiotics in children.

While there is a category for 4-10-year-olds, there is a separate usage restriction for those over 11 years old. The reason for these restrictions and how effective they have not been mentioned, only their existence has been noted.

The importance of probiotic use according to age groups and the underdeveloped concept of preventive health and nutrition in Turkey have been addressed. The author has stated that babies and children need to use probiotics more and that the elderly and those with weakened immune systems also need to use them more. Additionally, the author believes that there should be information-providing neighbourhood polyclinics and nutrition clinics for the development of the preventive health concept. This way, it will be possible for people to eat healthily and protect themselves from diseases.

4.5.3. Marketing Process in Turkey

The insufficient demand for probiotic products in supermarkets has been attributed to the indifference and disbelief of supermarket managers towards probiotics. Some supermarket managers consider probiotics to be a fad or a passing trend. However, as demonstrated by examples in America, the probiotic market is rapidly growing, and supermarkets need to allocate more space for probiotic products to meet this demand.

Supermarkets focus only on profit rather than showing the necessary interest in health issues. This leads to a greater emphasis on products such as chips and soda. At this point, it has been emphasized that it is important to market probiotic products correctly and increase consumer awareness.

Probiotic supplements are among the products with high sales in pharmacies. However, pharmacies mostly categorize probiotics as drugs and focus on excess demand, like selling drugs. In addition, pharmacists do not have sufficient knowledge about probiotic products and fall short of informing consumers. Therefore, more education and information on probiotic products should be provided by health professionals and experts in the field for consumers to have access to accurate information. He said;

"*So, I've been working on these things for over ten years. I finally decided to withdraw. On the other hand, if you look at pharmacies, they are the best at marketing probiotic supplements. They have no knowledge whatsoever. Unfortunately, I have to say it in quotes again. Pharmacies. They are chasing surplus goods while selling drugs. Have you heard of it? Surplus goods. They used to tell me 'Sg sg' as well. Then I said, explain it to me. They say, if I'm going to sell your product, I must make a 100% profit, and your margin is only 25-30%. You must give me surplus goods, otherwise, they say, I'll sell what your competitor gives me more. Can a probiotic be marketed like this? I said no, won't do it. You, me, and others aren't offering it, but someone else is. But that someone else isn't even related to it."*

Probiotics include both human-origin and soil-origin strains, with soil-origin strains being the leader in Turkey. It has been noted that probiotic supplements obtained from pharmacies mostly contain soil-origin bacteria, which have lower colonization properties compared to human-origin probiotics. It is emphasized that more education and awareness campaigns are needed for a correct understanding and awareness of probiotics, enabling individuals to learn about what probiotics are, their benefits, which products contain them, and how to choose them. By providing correct information on the advertisements and labels of probiotic products and by ensuring their monitoring, individuals can acquire accurate knowledge and choose the appropriate probiotic supplements for a healthy lifestyle. He said;

"*For the past three to four years, congresses have been held. But do you know what they talk about there? An article is written, presented, read, and then passed over. So, there is no in-*

depth analysis. What are the effects of each bacterium? How do microbes affect diseases? There is no information shared about these topics."

Haydar Bey has developed a marketing strategy to communicate with people one-on-one and provide personalized support for their problems for his own company. During working hours, the company's dietitian is accessible to everyone free of charge. Due to legal restrictions on advertising and communication, Haydar Bey listens to people's problems and provides personalized information on which probiotics to use. The company prepares short or long-term probiotic programs for free based on individual needs. They use communication channels such as phone, email, and social media intensively. Haydar Bey mentioned that when people start taking probiotics, some symptoms may appear, but these symptoms are called a healing crisis. He also mentioned that these issues are generally discussed in feedback and can be more easily discussed on social media.

He has approximately 300,000 active members in two Facebook groups he opened. These members can share their experiences, recipes, ask questions, and interact with each other. Haydar Bey regularly feeds these pages with scientific content and visuals. These channels are observed to be effective in one-on-one information sharing as previously mentioned by Haydar Bey, and they are very suitable for interactive communication.

It has been reported that the marketing structure in Turkey creates an expectation of regular price discounts among customers. The company stated that monthly discounts and promotions are offered, and sometimes other probiotics or yogurt cultures are given as gifts with the products, which helps to ensure customer satisfaction and build good communication between the company and its customers.

Haydar Bey, emphasizing that selling products is a challenging task, highlighted the need to work hard to sell products to customers. He stated that e-commerce advertisements are more effective when they are published on Google through the use of artificial intelligence technology, while television commercials and print media are still followed by some people, but their effects are short-lived. He also mentioned that his products are sold only in national supermarkets and some high-end pharmacies, where he sells them with a profit margin that he determines himself. He noted that unique markets that sell ecological and probiotic products can also be sales locations, but their numbers are very limited.

He summarized by saying "*You need to constantly review your marketing strategies to determine the most suitable sales channels for your business."*

4.5.4. Export Processes and Future Opportunities

It has been stated that Turkey encounters obstacles when exporting to countries such as Europe and America due to the need for individual analysis of each product and suspicion towards products from Turkey, making exportation difficult. Turkey's political and economic issues have been noted to exacerbate export difficulties. Despite these challenges, there have been demands for Turkish products, particularly kefir, from some Middle Eastern countries. Requests have also been made to establish kefir factories in the region. However, insufficient milk production or difficulties in transporting kefir have been reported as hindrances. Furthermore, demand for probiotic products in the context of weight loss has been noted, with probiotics being a preferred choice in Saudi Arabia due to the prevalence of obesity and diabetes.

Considering difficulties in importing probiotics from abroad, an individual named Haydar Bey has advocated for supporting domestic probiotic production in Turkey. He has sought the collaboration of universities, relevant organizations, public institutions, and private companies in this endeavor. Initially, Haydar Bey established his own company, but he later partnered with an R&D company composed of academicians from the Sakarya University Faculty of Medicine to begin domestic probiotic production. The R&D company, which operates in the Sakarya Technology Development Zone with academicians specialized in microbiology and chemistry, produces probiotic products, and Haydar Bey has indicated that he helps with the sales and marketing of these products. The market for probiotic products is rapidly expanding, driven by an increase in probiotic supplements and pharmaceutical companies' desire to invest in the field. The established company is meeting this demand and has broadened its product range to include probiotic products in addition to probiotic yeasts.

The individualized identification of microbial flora, facilitated by the development of microbiological analyses, represents another area of advancement in the probiotic field mentioned by the interviewee. This method may have the potential to replace the conventional approach of listening to a patient's complaints and conducting certain tests to detect problems with the identification of the problems caused by microorganisms. Consequently, more specific

treatments could be administered, leading to more effective disease management. Additionally, future projects such as the fulfilment of product demands using domestic probiotics, and eliminating the need for imports, could be a possibility.

"*For example, patients can come for obesity, diabetes, cancer prevention, or just to have a good year. I think this can make Turkey an important and attractive place in the future. Another area is in the pharmaceutical industry where they are running out of new drugs to produce. They come up with a new drug, but then there are side effects and problems. We've seen this with previous cancer drugs. Instead, we could focus on strengthening the immune system. Many of the materials they use in drugs, like petrochemicals, have harmful side effects. However, the human body is amazing and can produce chemicals and compounds that could be used as medicines through fermentation."*

Bioactive agents produced naturally by probiotics, which are compatible with the human body, have the potential to play an important role in strengthening the immune system in the future. The compatibility of these drugs with human tissues, as opposed to chemical active agents, may contribute to a reduction in their side effects. Therefore, the fermentation-based production of probiotics may be a significant alternative to producing these types of drugs. In the future, natural bioactive agents are expected to become more widespread compared to chemical-based drugs, such as antibiotics.

While products such as chemical fertilizers, pesticides, and toxins pose serious health risks to humans and other living organisms, probiotics are considered a natural source of bioactive agents, and their compatibility with the human immune system allows them to strengthen it. Additionally, animals and microorganisms in agricultural areas can also benefit from the positive effects of probiotics. Using natural solutions such as biofertilizers instead of chemical fertilizers and toxins can lead to more productive agricultural products while addressing soil pollution and productivity issues. Using natural methods for purification instead of chemicals can also be healthier in the face of pollution issues around the world.

"There are probiotics that can clean up these ponds or inland seas. Japan is an example of this. They clean up the sea using bacteria. The bad smells go away, and fish and mussels start to appear again. It's amazing. We can do this all over the world. There are bacteria that eat plastics, oil, and even iron. Microbiology is such a deep subject that if we focus on it, we can

easily solve many of the problems we're facing and spending trillions of dollars on. There are bacteria that eat more carbon in the air, so let's release them between the clouds and reduce carbon. What I'm trying to say is that we can solve all the problems we face and make the world a more livable place."

The quote highlights the potential benefits of probiotics and microorganisms not only in the healthcare sector but also in many other areas.

He emphasized that an industrial initiative is required to promote the widespread use of probiotics and that this is of great importance to the world. However, the risks associated with industrial initiatives, such as interference from pharmaceutical and GMO companies, were also noted. Specifically, there may be instances where probiotic collections are purchased for monetary gain and their use as drugs or supplements is prevented. Given the significance and impact of probiotics, it was underscored that research and discoveries in this field may be concealed.

"They buy it, with money. How much money? 100 million dollars, 200 million dollars. He buys it. He seizes all the probiotic collections. Then he can use it in the medicine or as a supplement if he wants."

You have mentioned Turkey's potential in probiotic production and usage and emphasized that Turkey could be a leader in this field. You also highlighted the importance of using food waste as a biofertilizer in animal husbandry, agriculture, and environmental pollution. Additionally, you noted that probiotics are needed for security personnel such as police and military to work more efficiently and maintain their health.

Conclusion

Turkey has high potential in the microbiome and probiotics market (Fortune Turkey, 2020), but there is a need to increase knowledge and awareness levels and make more effective use of production capacity. Further work in this field could contribute to the growth of the market and play an important role in Turkey's future health and food industry strategies. Preparation for Turkey's future requires collaboration between public institutions and the private sector. In this regard, it is known that states that implement supportive policies in research and innovation are more successful. Additionally, it is important for the private sector to invest and collaborate. (Tastan, n.d.).

Turkey also has potential in probiotic production, and in order to be successful in this field, the support and collaboration of different sectors such as the food industry, agriculture, and healthcare are important. The agricultural sector can provide support for the cultivation of materials used in probiotic production, while the healthcare sector should raise awareness of the benefits of probiotics for human health. To prepare for the future and to be successful in value-added areas such as probiotic production, it is necessary for public institutions and the private sector to work together, promote inter-sectoral cooperation and increase investment.

Research shows that probiotics have many benefits for human health, which is why their production and use are increasing. However, there are many challenges related to probiotic production and marketing in Turkey. Overcoming these challenges requires stakeholders in the sector to collaborate and work in a coordinated manner.

Among the efforts to be made in this field are the genetic characterization of microorganisms used in probiotic production and the development of optimized production methods. Additionally, clinical trials are necessary to better understand the effects of probiotics on human health, especially with regard to specific age groups. Consumer attitude research on the product range can also support the proper expansion of the market.

Informing other sectors outside the probiotics industry is also essential for the growth of the probiotics market. Particularly, supporting the use of probiotics in the agricultural sector, such as in the production of biogas, can provide environmental benefits and contribute to both the probiotics industry and the environment. The use of probiotics in healthcare and industry is increasing, and collaborative efforts among stakeholders, technological innovations, and clinical trials are all great importance for the growth and development of the probiotics industry.

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