

# The Blooming Prospects of Probiotic Products in India

G. Lakshmy, B. Seetha Devi, B. Ramesh

**Abstract:** *The history of fermented human food is centuries old. The documentation of Indian foods can be traced to a period before 3,000 B.C. The presence of bacteria known as probiotics is behind the enhanced flavor and medicinal properties of fermented foods. An increase in the life style disorders due to the junk food and fast food culture has created problems among the people all over the world and this in turn has led to the increased dependency on wonder drugs and switching over to many probiotic health products. Adoption of a Probiotic culture in a country like India to prevent various diseases rather than seeking cure for them through the production of Probiotic foods at the household level is quite inevitable.*

**Keywords:** *Probiotics, Prebiotics, Probiotic functional foods, Probiotic Beverages, Bio-preservatives, Human Probiotics, Animal Probiotics, Probiotic-infused juices, Nutraceuticals, Yogurt, Kefir, Sauerkraut, Tempeh, Kimchi, Liquid Probiotics, Life style disorders, Functional Food, Intestinal flora*

## I. INTRODUCTION

Vedas and Upanishads mention the origin of dahi (one of the oldest fermented products) and other fermented milk products as early as 6000 BC<sup>9</sup>. Probiotic bacteria are the source that enhances the medicinal and flavor properties of fermented foods. They aid digestion and nutrient assimilation. These bacteria are also well-known for their beneficial effects on the immune system and health. Many of them produce antimicrobial bioactive molecules that make them effective bio-preservatives and produce nutraceuticals to create functional foods with increased bioavailability of nutrients. For example, lactic acid bacteria have incontestable benefits.

An increase in the lifestyle disorders due to the junk food and fast food culture has created health problems among the people all over the world and this in turn has led to the increased dependency on wonder drugs and switching over to many Probiotic health products. To encounter the lifestyle disease trends, the World Health Organization has advocated the implementation of alternative disease control strategies such as taking advantage of the therapeutic and prophylactic potential of Probiotic bacteria and Prebiotics. Food is no longer judged only in terms of taste and immediate nutritional needs, but also in terms of their ability to improve the health and well being of consumers, thus leading to the advent of "FUNCTIONAL FOODS".

Functional foods consist of some bacterial strains and products of plant and animal origin containing physiologically active compounds, which are beneficial for human health<sup>9</sup>. Probiotics and Prebiotics are the best-known

functional compounds. Probiotics are traditionally defined as viable micro organisms that play an important role in the prevention and treatment of specific pathologic conditions when they are absorbed in the stomach. Currently lactic acid bacteria, particularly Lactobacillus and Bifidobacterium species, are well known Probiotics. Probiotics enhance human health by stimulating immunity, competing for limited nutrients, inhibiting epithelial and mucosal adherence and the production of antimicrobial substances<sup>10</sup>.

Probiotic products have been classified into several types. An international expert group of ILSI has evaluated the published evidence of the functionality of different Probiotics in 4 areas of (human) application, namely, 1) Functional gastrointestinal disorders, 2) Allergy, 3) Infections, and 4) Metabolism. Based on the existing evidences, concrete examples of benefits and shortcomings are listed, and guidelines and recommendations are defined to proceed with the next generation of Probiotic studies.

Probiotic foods are again classified into four, based on their Application, Source, Form and End Users. Probiotics based on application consist of Functional Food and Beverages, Dairy, Non-dairy Beverages, Baked Goods, Meat, Cereals, Dietary Supplements and Animal Feed; on the basis of Source these can be categorized as Bacteria and Yeast; based on Form these can be classified as Dry and Liquid Probiotics and on the basis of End User these can again be categorized as Human and Animal Probiotics.

Probiotic foods include Yogurt, Kefir, Sauerkraut, Tempeh, Kimchi and others. Probiotics should not be confused with Prebiotics, which are dietary fibers that help feed the friendly bacteria that are already in the intestinal gut.

In 2016 the biggest market segment of Probiotics was in the form of liquids. Liquid Probiotics were adopted by consumers having difficulty in swallowing pills, especially infants. New products were available in the market such as Probiotic-infused juices and Yogurt-based drinks, which provided consumers with new options of Probiotic consumption. On the basis of end user, the human Probiotics segment accounted for the largest share of the Probiotics market in 2016. Since then the habitual consumption of Probiotics in regular diets has shown functional improvements in consumer health, which has enhanced the demand for Human Probiotics over Animal Probiotics.

Research has shown that there are scores of different Probiotic bacteria offering health benefits. Lactobacillus and Bifidobacterium are the most common groups. Each group has many different species and within each species there are many strains.

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By consuming a Probiotic-rich diet and maintaining good intestinal verdure, a person can also maintain a healthy immune system. The supplements that help to grow these bacteria in our body is called PRO-biotic. These are exactly the opposite of Anti-biotics which help in killing the bad bacteria in our body. When one is affected with bacterial infection, the panacea is often antibiotics. But antibiotics kill all bacteria, both good and bad, in the intestinal tract. The removal of the beneficial bacteria makes the body vulnerable to various digestive disorders and the overall health can be at risk. Rapid replacement of these beneficial bacteria is very important, and introducing Probiotics in the daily diet as the best health practice is absolutely essential in the current hectic lifestyles.

No serious studies have so far been done either at the academic level or at the government level to the best of the knowledge and belief of the researcher. Hence there arises a dire need to explore the unexplored potential of Probiotic Health Drinks in the Indian context.

## II. STATEMENT OF THE PROBLEM

People all over the world are much concerned about their health. Advanced countries have their own well-formulated health policies and practices. However, in a densely populated and poor country like India it becomes practically impossible to ensure healthy living conditions for all the people. Instead of Government's direct intervention, a participatory health strategy is the main possible way out for improving the health conditions of the people. Adoption of a Probiotic culture in a country like India to prevent various diseases, rather than curing them through the low skill and low investment production of Probiotic foods at the household level is inevitable.

## III. REVIEW OF LITERATURE

S Parvez, K.A. Malik, S. Ah Kang, H.-Y. Kim(2006)<sup>2</sup> in their study mention that the mechanisms by which probiotics exert their effects are largely unknown, but may involve modifying gut pH, antagonizing pathogens through production of antimicrobial compounds, competing for pathogen binding and receptor sites as well as for available nutrients and growth factors, stimulating immunomodulatory cells, and producing lactase. They further say that recent scientific investigation has supported the important role of probiotics as a part of a healthy diet for humans as well as animals and may be an avenue to provide a safe, cost effective and 'natural' approach that adds a barrier against microbial infection.

Edward R. Farnworth (2008)<sup>4</sup> in his study cites some evidences supporting the use of Probiotic health products. He states that some probiotic bacteria have been "generally accepted as safe"; proof of the safety of any probiotic is essential. Japanese health regulatory officials, using their Foods for Specific Health Use system, have approved human health claims for over 20 Probiotic products.

CR SOCCOL *et al.* (2010)<sup>7</sup> in their study on potential of Probiotics have identified some of the Probiotic strains, which exhibit powerful anti-inflammatory, antiallergic and other important properties. Apart from that, the consumption of dairy and non-dairy products stimulates immunity in

different ways. Various food matrices have been used by them with probiotics, which they have briefly documented in their study.

Various studies have been done so far by analyzing the health benefits and other related aspects of Probiotic health drinks. Anita Kumari (2014)<sup>1</sup> in her study on Bioprospecting of traditional fermented foods and beverages of Himachal Pradesh for probiotics states that soymilk through fermentation with LAB isolate has great potential of developing a probiotic soymilk, which has a promising use as bio preservative in the food sector. She concludes that increased antioxidative activities and reduced polyphenol content of soymilk, through fermentation with LAB isolate, have the great potential of developing a probiotic soymilk having health benefits.

Nangia T, et al. Probiotics (2014)<sup>3</sup> point to the fact that traditionally, probiotics have been associated with gut health, and most clinical interest has been focused on their use for prevention or treatment of gastrointestinal infections and diseases. However, during the last decade several investigators have also suggested the use of probiotics for oral health. They further mention that though only a few clinical studies have been conducted so far, the results to date suggest that probiotics could be useful in preventing and treating oral infections, including dental caries, periodontal disease and halitosis.

Ashwani Kumar et al. (2015)<sup>5</sup> in their study report the preparation of Probiotic Yogurt using *Lactobacillus rhamnosus*. The standard starter cultures used for yogurt fermentation were *Streptococcus thermophilus* and *Lactobacillus delbrueckii* subsp. *bulgaricus* and obtained from NDRI, Karnal, India.

Singh Avinash (2015)<sup>6</sup> in their study to develop Probiotic Herbal Yogurt reveal that lower concentrations of herbal extracts are found to be sufficient to stimulate the growth and retain the viability of the selected probiotic organisms and yoghurt culture in yoghurt compared with yoghurt without any herbal extract. The addition of herbal extract to yoghurt increases the index of viscosity as well as consistency in comparison with the control; however, firmness was not much effected during storage at 4 °C.

## IV. OBJECTIVES

Following are the main objectives of the study:

- To give a brief review of the relevance of Probiotic foods in maintaining the overall health of the people in India.
- To analyse the consumers' perceptions of Probiotic Health Products
- To evaluate the prospects of Probiotic foods in our country.

## V. HYPOTHESIS

H1o: Therapeutic Value, Health Concern, Taste, Price and Brand have no significant influence on consumers purchasing Probiotic Health Products.

## VI. RESEARCH METHODOLOGY

The study is partly empirical and partly descriptive. The study makes use of primary as well as secondary data. Convenient sampling technique were adopted for the purpose of eliciting the required information from the sample respondent. Three metropolitan cities, Bangalore, Mumbai and Delhi were selected and from each zone 40 samples were selected with the help of the dealers of Probiotic Health drinks. Altogether 120 samples were collected by adopting telephonic interview method.

An attempt is made to evaluate the Probiotic food market in India through the review of secondary sources of data and by means of interactions with a few dealers of Probiotic food products in India.

Chi-Square test is used for the purpose of measuring the extent of influence of Therapeutic Value, Health Concern, Taste, Price and Brand on the buying decisions of the consumers of probiotic health drinks in the study area.

## VII. INDIAN PROBIOTIC PRODUCTS SCENARIO

Probiotic market in India has been growing tremendously due to the increased awareness of the people regarding such products, consequent upon the wide popularity of social media and the emergence of new online dealers offering these products at the doorsteps of the consumers and also at Cash on Delivery system. This enables the supply of such products to consumers located even in remote areas of the country. As per the study conducted by TechSci Research entitled "India Probiotic Market Forecast and Opportunities, 2019", the probiotic market in India is projected to clock an average growth of 19.80 per cent during 2014-19, in revenue terms. In terms of sales revenue Northern India dominates the Indian Probiotic market and Southern and Central regions follow. Nestle India, Amul, Danone Yakult and Mother Dairy are the leading producers of Probiotic functional foods and beverages in India.

The main reason for the expectation of momentous growth of Probiotic functional foods and beverages market during 2014-19 is the wide popularity of these products among youth through social media<sup>16</sup>. The Probiotic drugs and dietary supplements segment is dominated by Dr. Reddy's Laboratories, Tablets India and USV India, while Zeus Biotech, Unique Biotech and Polchem Hygiene Laboratories are leaders in the Probiotic animal feed segment. Due to the market place being crowded with small and medium players probiotic animal feed market has remained more or less unorganized.

Despite being in nascent development stage, the Probiotic market in India is projected to register a strong growth through 2019 due to growing health concerns, rising incidence of lifestyle related disorders and increasing healthcare cost. The demand for Probiotic drugs and dietary supplements is increasing rapidly, especially due to rising need for women and pediatric nutrition.

The major Probiotic products available in India are Prolife (Amul), Yakult, Probiotic Tea, Coffee, Yogurt, Yakult, Organic Low Fat Kefir, b-Active, ViBact, inLife, NesVita, Neo, Acidophilus Plus, Healthvit, Bio-K Plus, Vista Nutritions, Doctor's Best, Nature Made, Ultimate

Flora etc. An array of Probiotic products is also emerging fast in the market to cater to the changing tastes and preferences of consumers from various walks of life.

Same is the case with the producers of these items. The ever-increasing patent applications filed in India during recent years is also an indication of the wide popularity of Probiotic products among Indians. At present the major players in Probiotics in India are Chr.Hansen (India) Pvt. Ltd., Danone Foods and Beverages (India) Pvt Ltd, Mother Dairy Fruits and Vegetables Pvt.Ltd, Nestle India Ltd., Zytex Biotech Pvt.Ltd. Micrbax (India) Ltd., Yakult Danone India Pvt. Ltd. and Shree Additives Pharma and Foods Ltd.

Many premier institutes in India such as Central Food Technology and Research Institute, Mysore, National Dairy Research Institute, Karnal Institute of Microbial Technology, Chandigarh, National Dairy Development Board, Anand and Nestle Pvt Ltd, Panipat have also been engaged in research works on probiotics, which are the positive signs of the growing importance of such products among Indians.

A Survey conducted among 120 respondents in 3 leading Metropolitan cities, namely, Bangalore, Mumbai and Delhi also reveals certain glaring facts about the consumers of Probiotic Health Drinks in India.

An Age-wise classification of Sample respondents who use to buy Probiotic Health Drinks are given in Table 1

**Table 1: Age-wise classification of Sample respondents who use to buy Probiotic Health Drinks**

Age	Total	% to Total
Less than 35 years	19	15.83%
36 to 55 years	56	46.67%
56 years and above	45	37.50%
Total	120	100.00%

Source: Field Survey

Table 1 reveals that out of the 120 respondents surveyed at random, 46.67 per cent of them are between 36 and 55 years of age, while those who are more than 56 years constitute 37.5 percent. Those who come under the age group of less than 35 years are only 15.83 per cent. It clearly shows that Probiotic Health Drinks are consumed more by the middle- aged and the elderly than by the youth.

Income-wise classification of Sample respondents who consume Probiotic Health Drinks are shown in Table 2



**Table 2: Income-wise classification of Sample respondents consuming Probiotic Health Drinks**

Annual Income (in Rs.)	Nos.	% to Total
Less than Rs.20000	3	2.5
Rs.20001 –Rs..50000	32	26.7
Rs.50001 –Rs..75000	11	9.1
Rs.75001 –Rs..100000	35	29.2
More than Rs..100000	39	32.5
<b>Total</b>	<b>120</b>	<b>100</b>

Source: Field Survey

Table 2 shows that 32.5 per cent of the respondents who buy Probiotic Health Drinks with an average Annual income of more than Rs. 1,00,000 assume the first rank, while those who consume the same with an average annual income of Rs.75001 –Rs.100000, Rs.20001 –Rs..50000 and Rs.50001 –Rs.75000 the second, third and the fourth ranks respectively. Those who have an annual income of less than Rs.20000 represent only a small share of the total, indicating that Probiotic Health Drinks are consumed more by the high-income groups, than the low-income groups. Frequency of consumption of Probiotic Health Drinks by the respondents are given in Table 3.

**Table 3: Frequency of Consumption of Probiotic Health Drinks**

Frequency of Consumption	Nos.	% to Total
Daily	70	58.4
Weekly	21	17.4
Fortnightly	10	8.3
Monthly	19	15.9
<b>Grand Total</b>	<b>120</b>	<b>100</b>

Source: Field Survey

From Table 3 it is evident that a majority (58.4 per cent) of the consumers of Probiotic Health Drinks use these items on a daily basis, while those who use it on a Weekly basis and Monthly basis represent 17.4 per cent and 15.9 per cent respectively. Only a small percentage of the consumers uses such items on a fortnightly basis.

Source-wise details regarding the information about Probiotic Health Drinks by the consumers are exhibited in Table 4.

**Table 4: Source-wise Information about Probiotic Health Drinks**

Sources	Nos.	% to Total
Friends	14	11.67%
Internet	49	40.83%
Literature	20	16.67%
Doctor	37	30.83%
<b>Total</b>	<b>120</b>	<b>100</b>

Source: Field Survey

An analysis of the Source of information of consumers about Probiotic Health Drinks reveals that Internet is the main source of information to the consumers surveyed (40.83 per cent), followed by Recommendations by doctors (30.83 per cent), various literature in the form of articles in journals and periodicals (16.67 per cent) and the recommendations of Friends (11.67 per cent) as is evident from Table 4.

Reasons for buying Probiotic Health Drinks by the consumers are shown in Table 5.

**Table 5: Reasons for Purchase of Probiotic Health Drinks**

Reasons	Nos.	% to Total
Health	52	43.33%
Hobby	41	25.83%
Self Help	37	30.83%
<b>Total</b>	<b>120</b>	<b>100</b>

Source: Field Survey

On analyzing the reasons for buying Probiotic Health Drinks by the consumers, it is observed that 43.33 per cent of the respondents consume these products due to their concern for health. 30.83 per cent of them consume such products because of the involvement of Self Help Groups (SHGs) in promoting these products, while 25.83 per cent of them use such items only as a hobby.

Probiotics offer us the choice of a natural means of overcoming certain illnesses and, at the very least, maintaining good health and well-being. Hence Probiotic products have great relevance in a densely populated country like India where a large number of people die every year due to malnutrition, chronic illnesses and low affordability to undergo expensive treatments to get a cure for their ailments.



Influence of different Factors on Consumption of Probiotic Drinks by the consumers surveyed are shown in Table 6.

**Table 6: Influence of different Factors on Consumption of Probiotic Drinks**

Factors	Nos	% to Total
Therapeutic Value	57	47.5%
Health concern	37	30.83%
Taste	17	14.17%
Price	6	5%
Brand	3	2.5%

Source: Field Survey

On analyzing the factors for buying Probiotic Health Drinks by the consumers, it is observed that 47.5 per cent of the respondents are influenced by the Therapeutic Value of probiotic drinks. 30.83 per cent of them are influenced by Health Concern. Taste, Price and Brand are found as relatively less significant factors which influence the buying decisions of consumers surveyed.

**Table 7: Influence of Therapeutic Value, Health Concern, Taste, Price and Brand on the buying decisions of consumers**

Factors	Yes	No	Total
Therapeutic Value	54	3	<b>57</b>
Health Concern	30	7	<b>37</b>
Taste	10	7	<b>17</b>
Price	2	4	<b>6</b>
Brand	1	2	<b>3</b>
Total	<b>97</b>	<b>23</b>	<b>120</b>

Source: Field Survey

O	E	(O-E) <sup>2</sup>	(O-E) <sup>2</sup> /E
54	46.075	62.80563	1.363117
30	29.90833	0.008403	0.000281
10	13.74167	14.00007	1.018804
2	4.85	8.1225	1.674742
1	4.85	14.8225	3.056186
3	10.925	62.80563	5.748799
7	10.925	15.40563	1.410126
7	7.091667	0.008403	0.001185
4	1.15	8.1225	7.063043
2	0.575	2.030625	3.531522
Chi Square value			<b>24.8678</b>

Here the Calculated Chi-square value is 24.8678, while the Table value at 5% level of significance and 4 D.F is **9.488**. Since the Calculated value **24.8678** is greater than the Table value the null hypothesis gets rejected. It implies that factors like Therapeutic Value, Health Concern, Taste, Price and Brand have significant influence on the buying behavior of the consumers of Probiotic Health Drinks.

## VIII. SUGGESTIONS

The knowledge of use and knowhow to prepare probiotics in a beneficial form for domestic use have to be divulged to the rural areas as a cost-effective product mainly to the people close to and below the poverty line.

The Ministry of Health should take effective steps for highlighting the therapeutic values of various probiotic foods through mass media.

Probiotic food outlets should be opened in rural areas by the local administrative authorities with the assistance of Co-operative societies, N.G.O's and associations of women for popularizing such products in such areas.

Grants and other financial assistance should be given to academic institutions and individual researchers for bringing out innovative probiotic products useful for various age-groups.

Awareness campaigns on Probiotic products should be carried out by the Government with the assistance of Indian Medical Council for creating health consciousness among the people.

Outlets of Probiotic Health Drinks should be opened in all cities with the assistance of the Ministry of Health and also at all main railway stations in the country with the co-operation of the Ministry of Railways to ensure good quality items at a fair price to the consumers.

Awareness campaigns should be carried out by the Government through various media about the health benefits of Probiotic Health Drinks.

## IX. CONCLUSION

The demand for Probiotics in India is driven by rising health concerns, growing hazard of stress and exposure to lifestyle disorders and ever-increasing number of foreign and domestic players in the market. The Indian Probiotic market is rising as one of exponential growth due to various factors such as growing health concerns among consumers, especially among the Gen Y, changing food consumption patterns, increase in diabetes, growing hazard of stress and lifestyle related and cardiovascular diseases, and rising disposable income. The availability of Probiotic foods is also increasing gradually due to the growth of various channels of distribution across the country, which is steadily bridging the demand-supply gap. A majority of the consumers of Probiotic health drinks surveyed come under the age-group of 36 to 55 years of age, indicating that Probiotic Health Drinks are consumed more by Middle-aged and elderly than the youth. The study shows that Probiotic Health Drinks are consumed more by the high-income groups, when compared to the low-income groups. An analysis of the frequency of consumption of these products reveals that a majority of the consumers use these items on a daily basis. An analysis of the Source of information of consumers about Probiotic Health Drinks also reveals that Internet is the main source of information to the consumers surveyed, followed by Recommendations by doctors, various literature in the form of articles in journals and periodicals and the recommendations of Friends.



Moreover, on analyzing the reasons for buying Probiotic Health Drinks by the consumers, it is observed that a majority of the respondents consume these products due to their concern for health, followed by the intervention of Self Help Groups (SHGs) in promoting these products and consumption of such items only as a hobby. On analyzing the influencing factors for buying Probiotic Health Drinks by the consumers, it is observed that a substantial number of the respondents are influenced by the Therapeutic Value of probiotic drinks, followed by Health Concern as the next important influential factor. Taste, Price and Brand are found as relatively less significant factors, which influence the buying decisions of consumers surveyed.

Factors like Therapeutic Value, Health Concern. Taste, Price and Brand have significant influence on the buying behaviour of the consumers of Probiotic Health Drinks as is evident from the Chi Square Analysis. The significant influencing factors point to the fact that therapeutic/health values are the key influencing factors. Though the cost of probiotic drinks is higher, it is not a significant factor influencing the buying decisions. The other significant observation is that the consumers are not concerned about the Brand of the Probiotic drink they consume. The health benefits of Probiotics and rising awareness among the consumers about the same are expected to propel the industry to attain tremendous growth over the next few years. Long shelf life and high stability of the Probiotic products, coupled with high interest from pharmaceutical industry owing to the high-profit margin on these products is expected to usher the growth over the coming years. India being the largest producer of milk and dairy products can no doubt become the largest producer of the high unit value Probiotic dairy products in the world with a little effort and by evolving systematic promotional strategies.

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16. <https://www.statista.com/topics/2157/internet-usage-in-india/> 460 Million mobile internet users with 15% active on social media.