

# Development of Probiotic Pineapple Fruit Fermentation

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**Abstract-** Fermentation is a slow decomposition process of organic substances induced by microorganisms. Pineapple is an economically significant plant and the third most important fruit crop in the tropical and subtropical regions of the world. In this study, fermentation of pineapple juice with probiotic bacteria *Lactobacillus* and *Bifidobacterium* strains as well as changes of some properties in the beverage during storage were investigated. Probiotic are live microorganisms that have health benefits when eaten. They're found in both supplements and fermented foods. Probiotics improve immune function and digestive & health among other benefits. All tested strains exhibited good growth properties on pineapple juice without supplementation of any nutrient compounds. After 24 h fermentation, the cell counts of lactobacilli passed the level of  $5 \times 10^9$  cfu/ml, while the cell number of bifidobacteria reached a level of 109 cfu/ml. Additionally, supplementation with prebiotics at the initiation of fermentation resulted 7 mM lactic acid and 23 mM acetic acid at the end of fermentation. Fructose was the most preferred sugar for both lactobacilli and bifidobacteria. Both total phenolic content and antioxidant capacity increased slightly during fermentation and dropped during the storage period. Our results are very promising and may serve as a good base for developing probiotic pineapple juice.

**Keywords-** pineapple, bifidobacteria, lactic acid bacteria, fermented juice, probiotics, prebiotics.

## I. INTRODUCTION

Today, the concept using foods to promote a state of well-being, improving health, and reducing the risk of diseases has become the new frontier in the nutrition sciences and related fields. Furthermore, this concept is particularly important in light of the increasing cost of health care, the steady increase in life expectancy, and the desire of elderly people for improved life quality. Moreover, the emphasis has moved from medication to prevention. In this context, the development and contribution of functional foods—prebiotics, probiotics and synbiotics—must receive attention and should be key pillars of the health care system. Functional foods not only act as traditional nutrients, but they also have some additional beneficial effects such as improving health status,

preventing and/or reducing nutrition-related diseases, and promoting a state of physical and mental well-being. A wide range of foods have been fermented or enriched in probiotics to be evaluated as possible carriers of these beneficial microorganisms and successfully placed on the market. Several species of *Lactobacillus* and *Bifidobacterium* have become the most commonly used probiotic strains in these food products, but others such as *Saccharomyces cerevisiae* (boulardii), *Enterococcus*, *Bacillus*, and *Escherichia* are also applied.

## Probiotics

Probiotics are foods or supplements that contain live intended to maintain or improve the "good" bacteria (normal microflora) in the body.

## Prebiotics

a non-digestible food ingredient that promotes the growth of beneficial microorganisms in the intestines.

## Most common types of probiotic bacteria

Though there are many types of bacteria that can be considered probiotics, there are two specific types of bacteria that are common probiotics found in stores.

These include:

*Lactobacillus*.  
*Bifidobacterium*

Ways of taking supplement There are several ways you can take a probiotic supplement. They come in a variety of forms, including in:

Foods.  
Drinks.  
Capsules or pills.  
Powders.  
Liquids.

Probiotic supplements may be combined with a prebiotic. Prebiotics are complex carbohydrates that feed the microorganisms in your gut. Basically, prebiotics are the “food source” for the good bacteria. They help feed the good bacteria and keep it healthy. Prebiotics include inulin, pectin and resistant starches.

**Food and Calories:**

Food comes under the basic necessity of human beings. It is one of the essential components of human existence.

Food substance consisting essentially of protein, carbohydrate, fat & other nutrients used in the body of an organism to sustain growth & vital processes & to furnish energy. The absorption & utilisation of food by the body is fundamental to nutrition & is facilitated by digestion.

Plants which convert solar energy to food by photosynthesis are the primary food source. Animals that feed on plants often serve as sources of food for other animals. To learn more about the sequence of transfers of matter & energy in the form of food from organism to organism. "The belly rules the mind".

**Food is very important for: -**

- 1) Growth and repair



- 2) To build immunity



- 3) Energy for the day.



- 4) Helps body to insulate itself.



- 5) Make a person look healthy and attractive.

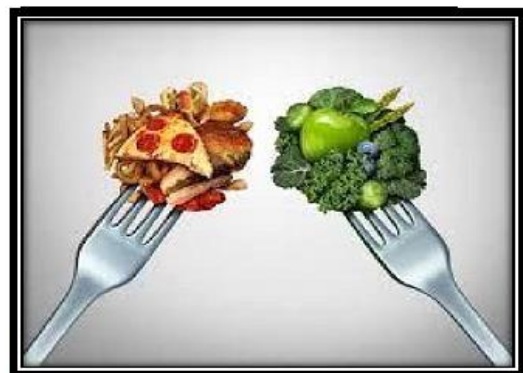


These results will only be seen if food is consumed in appropriate portions, there will be repercussions of it's taken in excess or taken in insufficient quantity. Thus, food has a direct relationship with calories.

**What are Calories?**

- A calorie is a unit of measurement but it does not measure weight or length. A calorie is a unit of energy
- When you hear something contains 100 calories, it's a way of describing how much energy your body could get from eating or drinking it.
- There are 3 energy yielding nutrients that make up a calorie: Carbohydrates, fat and protein.
- These nutrients are known as macronutrients. Calories are made up of these macronutrients.

**\*Carbohydrates & Proteins are measured to be 4 calories per gram and fats are 9 calories per gram.**



Healthy v/s Unhealthy

Table no 1: Calorie Intake according to Age:

Gender	Age	Sedentary	Moderate	Active	
<b>Child(male +female)</b>	2-3	1000	1000	1000	
	<b>Female</b>	4-8	1200	1400	1800
		9-13	1600	1600	2200
	14-18	1800	2000	2400	
	19-30	2000	2000	2200	
	35-30	1800	2000	2200	
<b>Male</b>	51+	1600	1800	2200	
	4-8	1400	1600	2000	
	9-13	1800	2200	2600	
	14-18	2200	2800	3200	
	19-30	2400	2800	3000	
	31-50	2200	2600	3000	
51+	2000	2400	2800		

As a general rule, people need a minimum of 1200 calories daily to stay healthy. People who have a strenuous fitness routine or perform many daily activities need more calories. If you have reduced your calorie intake below 1200 calories a day, you could be hurting your body in addition to your weight loss. Diseases like:

1. Obesity
2. Hypertension
3. Atherosclerosis
4. Hyperlipidemia.

Amongst many other diseases etc.

**FOOD & CALORIES**

Food & calories go hand in hand. Eating right is important and one should understand. Expending what you eat is crucial. Healthifying one's self is essential.

Follow the Do's & Don'ts of food intake. Fitness is the ultimate goal that one should partake.



Food & Calories

**Probiotics: Harvest Fewer Calories:**

- Are a combination of live beneficial bacteria & /or yeasts that naturally live in your body.
- They are a way to add good bacteria to your body
- Probiotics are made of both bacteria & yeast. Common probiotic bacteria can include lactobacillus & bifidobacterum.

The most common yeast found in probiotics is saccharomyces boulardii. These are the combination of:

1. Bacteria
2. Fungi
3. Viruses
4. Protozoa

Where do beneficial probiotics (microbes) live in the body:

1.Gut



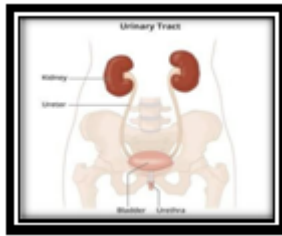
2.Mouth



3.Vagina



4.Urinary tract



5.Skin



6.Lungs



Plant Profile:



Synonym: Ananas

Biological Source: The pineapple (*Ananas comosus*) is a tropical plant with an edible fruit; it is the most economically significant plant in the

Family: Bromeliaceae.

Chemical Constitution:

Pineapple fruits and peels contain diverse phytochemicals, among which are polyphenols, including gallic acid, syringic acid, vanillin, ferulic acid, sinapic acid, coumaric acid, chlorogenic acid, epicatechin, and arbutin

Uses:

1. Loaded with nutrients
2. Contains disease-fighting antioxidants
3. May aid digestion
4. boost immunity

## II. MATERIAL AND METHOD

Sr.No	Drug and Excipients	Supplier
1	Pineapple	Local market of Pusad
2	Probiotic Capsule (Leebiotic)	Leeford
3	Distilled Water	Laboratory
4	Sugar free green	Zydus wellness
5	Apple cider Vinegar	American Garden

### Formulation

A Probiotic Pineapple Fruit Ferment.

### Process:

1. Chop the pineapple into medium sized pieces.
2. Put it into the glass jar.
3. Add to it sugar free green powder (containing stevia) 2 tablespoons.
4. Add the contents of the probiotic capsule.
5. Add distilled water but not upto the brim.
6. Add a very minute amount of apple cider vinegar about 2-3 drops (since bacteria makes its own acid, amount of apple cider vinegar exceeding would kill the beneficial bacteria).
7. Close the glass jar adequately, so as to avoid contact with the air.
8. Swirl the glass jar so that the contents are mixed well.
9. Keep it away from sunlight.
10. It is important to burp the glass atleast once a day so as prevent building up of pressure inside.
11. Keep the solution for about 12-48 hrs, so that proper fermentation and formation of probiotics takes place.
12. Finally, after the required hours open and taste it, it surely will have a sour taste and bubble formations indicate probiotic formation.



1. Chop pineapple vinegar



2. Addition of apple cider



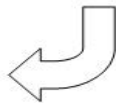
3. Addition of probiotic capsule content water q.s.



4. Addition of distilled water



5. Bubble formation probiotic is ready



Evaluation Parameters:

- a. Sour taste of the fruit.
- b. Bubble formation on top of the liquid.
- c. No Algal growth.

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Application:

PROBIOTICS IN MAINTENANCE OF WEIGHT

- There are two main families of good bacteria in the gut: bacteroidetes and firmicutes. Body weight seems to be related to the balance of these two families of bacteria
- Both human and animal studies have found that moderate-weight people have different gut bacteria than those with overweight or obesity.
- In the majority of those studies, people with obesity had more firmicutes and fewer bacteroidetes, compared with moderate-weight people.
- However, several studies have failed to find a connection between the firmicutes-to- bacteroidetes ratio and obesity
- People with obesity tend to have less diverse gut bacteria than lean people. What’s more, those with obesity who have less diverse gut bacteria tend to gain more weight than people with obesity who have more diverse gut bacteria
- Probiotics seem to influence appetite and energy usage via the production of acetate, propionate, and butyrate, which are short-chain fatty acids.
- It’s thought that certain probiotics may inhibit the absorption of dietary fat, increasing the amount of fat excreted with feces. In other words, they make your body “harvest” fewer calories from the foods you eat.

Certain bacteria, such as those from the Lactobacillus family, have been found to function in this way.

Probiotics may also fight obesity in other ways, including:

1. Releasing appetite-regulating hormones: Probiotics may help release the appetite- reducing hormones glucagon-like peptide-1 (GLP-1) and peptide YY (PYY). Increased levels of these hormones may help you burn calories and fat.
2. Increasing levels of fat-regulating proteins: Probiotics may increase levels of the protein angiopoietin-like 4 (ANGPTL4). This may lead to decreased fat storage.

Uses:

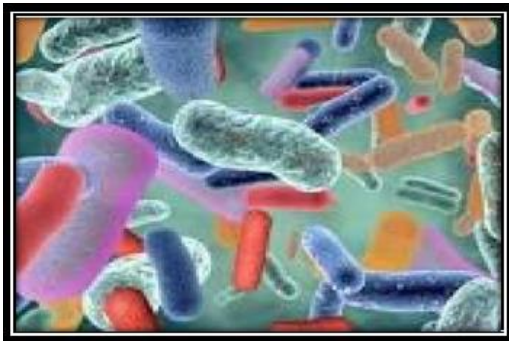
1. Probiotics Help Balance The Friendly Bacteria in Your Digestive System.
2. Probiotics Can Help Prevent and Treat Diarrhea.
3. Probiotic Supplements Improve Some Mental Health Conditions.
4. Certain Probiotic Strains Can Help Keep Your Heart Healthy.
5. Probiotics May Reduce the Severity of Certain Allergies.



6. Probiotics Can Help Reduce Symptoms of Certain Digestive Disorders.
7. Probiotics May Help Boost Your Immune System.

### The Bottom Line

- Probiotics are living microorganisms that provide health benefits when consumed in large quantities. They can be taken as supplements, but also occur naturally in fermented foods.
- Probiotics are safe for the majority of the population, but side effects can occur. The most common side effects are a temporary increase in gas, bloating, constipation and thirst.
- Some people can also react poorly to ingredients used in probiotic supplements or to naturally occurring amines in probiotic foods. If this occurs, stop using probiotics.
- In rare cases, people with compromised immune systems, prolonged hospitalizations or recent surgeries may develop an infection from probiotic bacteria. People with these conditions should weigh the risks and benefits before consuming probiotics.
- Overall, probiotics are a beneficial addition to most people's diet or supplement regimen, with relatively few and unlikely side effects.



Probiotics In The Gut

### III. RESULT AND SUMMARY

- Whether or not one is in a sound health condition can be gauged by one's gut microbiome.
- Yes, your gut microbiome plays an instrumental role in regulating your metabolism or absorbing nutrients of the food you consume, and determining whether or not you are lean or obese. A new study conducted by the researchers of the University of Washington in the United States deduced that certain "good microbes" in the gut of people who were on a diet majorly influenced how many pounds they were able to lose.

- Their stool samples were collected at the beginning and end of the study. The idea behind doing so was to determine which microbes were present in their gut and at which levels.

### IV. CONCLUSION

Out of the many things that probiotics can do for your body and overall health, helping you lose weight could be one of them. While additional research is required to corroborate this, results seem promising. Making probiotic foods or supplements a part of your daily life will help you inch towards your goal. Having said that probiotics will help you as long as you supplement it with a healthy balanced diet along with a regular exercise regime.

### REFERENCES

- [1] How probiotic can help you lose weight and belly fat- by Hrefna Palsdottir-November 20, 2020.
- [2] Fermentation by probiotic *Lactobacillus gasseri* strains enhances the carotenoids and fibre contents of carrot juice – by Yuexu, Mya Mintzu Hlain and Netsanet Shiferaw Terefe
- [3] De Vries W, Stouthamer AH. Pathway of glucose fermentation in relation to the taxonomy of bifidobacteria. *J. Bacteriol.* (1967) 93:574–6. [PMC free article] [PubMed] [Google Scholar]
- [4] Srinivas D, Mital BK, Garg SK. Utilization of sugars by *Lactobacillus acidophilus* strains. *Int J Food Microbiol.* (1990) 10:51–7. 10.1016/0168-1605(90)90007-R [PubMed] [CrossRef] [Google Scholar]
- [5] Lu XH, Sun DQ, Wu QS, Liu SH, Sun GM. Physico-chemical properties, antioxidant activity and mineral contents of pineapple genotypes grown in China. *Molecules.* (2014) 19:8518–32. 10.3390/molecules19068518 [PMC free article] [PubMed] [CrossRef] [Google Scholar]
- [6] Martin LJ, Matar C. Increase of antioxidant capacity of the lowbush blueberry (*Vaccinium angustifolium*) during fermentation by a novel bacterium from the fruit microflora. *J Sci Food Agric.* (2005) 85:1477–84. 10.1002/jsfa.2142 [CrossRef] [Google Scholar]
- [7] Wang Y, Wu Y, Wang Y, Xu H, Mei X, Yu D, et al.. Antioxidant properties of probiotic bacteria. *Nutrients.* (2017) 9:521. 10.3390/nu9050521 [PMC free article] [PubMed] [CrossRef] [Google Scholar]
- [8] Omoya FO, Akharaiyi FC. Studies on qualitative and quantitative characterization of alcoholic beverages from tropical fruits. *Res J Microb.* (2008) 3:429–35. 10.3923/jm.2008.429.435 [CrossRef] [Google Scholar]

- [9] Champagne CP, Gardner NJ. Effect of storage in a fruit drink on subsequent survival of probiotic lactobacilli to gastro-intestinal stresses. *Food Res Int.* (2008) 41:539–43. 10.1016/j.foodres.2008.03.003 [CrossRef] [Google Scholar]
- [10] Succi M, Tremonte P, Reale A, Sorrentino E, Grazia L, Pacifico S, et al.. Bile salt and acid tolerance of *Lactobacillus rhamnosus* strains isolated from parmigiano reggiano cheese. *FEMS Microbiol Lett.* (2005) 244:129–37. 10.1016/j.femsle.2005.01.037 [PubMed] [CrossRef] [Google Scholar]
- [11] Pimentel TC, Madrona GS, Garcia S, Prudencio SH. Probiotic viability, physicochemical characteristics and acceptability during refrigerated storage of clarified apple juice supplemented with *Lactobacillus paracasei* ssp. *paracasei* and oligofructose in different package type LWT. *Food Sci Technol.* (2015) 63:415–22. 10.1016/j.lwt.2015.03.009 [CrossRef] [Google Scholar]