

# [Processes and applications of fermentation](https://assignbuster.com/processes-and-applications-of-fermentation/)

Hort-312 (1+1)

Topic: Fermented Food

* Dr. Ananta Saikia Sir, Murchana Malakar

Introduction

Fermentation is the process of producing a fermented product by the mass culture of micro organisms involved in it [14]. It is derived from the Latin word fevere meaning “ to boil”.

Biochemically, fermentation is a process in which an agent causes an organic substance to break down into simpler substances; especially, the anaerobic breakdown of sugar into alcohol. It is the oldest most which is the most economical method of preserving food [2].

The local people have been using the microbes without knowing their effects to produce the fermented products [10]. For household purpose, fermentation is followed with simple processing methods. Due to the lack of sterility, the end products often contain mixed microbial population [8].

Fermentation promotes digestibility and improve the health of human beings [6]. It promotes the shelf-life reducing volume, less cooking time and higher nutritive value. It helps in the detoxification of undesirable compounds such as phytates, polyphenols and tannins[11]. It also enhances the aroma and flavour of the fermented food.

For industrial purpose, it is carried out on a large scale for manufacturing of the product. But in the second phase Microbiology evolved as a science for the first time in the history of fermentation [3].

Processes involved in fermentation:[7, 13]

1. Acetic Acid Fermentation: Acetobacter spp. is the main microorganism involved in this process. It aerobically converts the alcohol to acetic acid.

Examples: Wine, Cider and melt honey.

1. Lactic Acid Fermentation: It is carried out by lactic acid bacteria. Examples: Pickles, sauerkraut, kimchi
2. Alcoholic fermentation: Yeast is the main micro organism involved in this process which yields ethanol. Example: Brandy, Beer, Whiskey
3. Alkali fermentation: It occurs in case of fish and seeds which are used as condiment. Example: Fish sauce, bagoong.

Types of fermented food:

Cereal based fermented food: Cereal grains are considered to be on one of the most important source of carbohydrate, protein, vitamin and mineral. It improves the texture, aroma of the end product. Most common type of cereals (such as wheat, rice, sorghum or corn) is used for the preparation of fermented foods. The bacteria species involved includes Leuconostoc, Streptococcus, Bacillus, Pediococcus, Lactobacillus, and Micrococcus . Fungi genera include Fusarium, Cladosporium, Penicillium, Aspergillus, and Trichothecium . The yeasts include Saccharomyces [10] (Steinkraus, 1998).

Table 1: Commonly used cereal based fermented food and beverages [1, 4, 5, 9, 12].

|  |
| --- |
| Product Substrate Region |

1. Anarshe Rice India
2. Ang-kak Rice South East Asia
3. Bagni Millet Caucasus
4. Banku Maize Ghana
5. Bogobe Sorghum Botswana
6. Brem Rice Indonesia
7. Busa Rice Egypt
8. Chee-fan Wheat China
9. Chicha Maize Peru
10. Chonju Rice Korea
11. Dalaki Millet Nigeria
12. Dhokla Rice/Wheat India
13. Dosa Rice India
14. Darassum Millet Mongolia
15. Hamanatto Wheat Japan
16. Idli Rice India/Srilanka
17. Injera Wheat/Sorghum Ethiopia
18. Jalebies Wheat flour India/ Nepal/ Pakistan
19. Kanji Rice India
20. Kaffir beer Kaffir corn South Africa
21. Kisra Sorghum Sudan
22. Lao-chao Rice China/ Indonesia
23. Me Rice Vietnam
24. Miso Rice and soybeans Japan/ China
25. Nan Unbleached wheat flour India/ Pakistan
26. Nasha Sorghum Sudan
27. Ogi Maize/Sorghum Nigeria
28. Puto Rice Philippines
29. Pozol Maize Mexico
30. Rabdi Maize India
31. Sorghum Beer Sorghum/Maize South Africa
32. Sake Rice Japan
33. Takju Rice/Wheat Korea
34. Torani Rice India
35. Tape ketan Rice/ Cassava Indonesia
36. Uji Maize/Sorghum Kenya
37. Vada Ceral India

Legume Based Fermented Foods: Pulses are the chief sources of proteins. The micro organisms involved in it are : Mucor sp., Aspergillus spp., Lactobacillus sp. , Saccharomyces sp.

Table 2: Fermented foods of legumes [6].

|  |
| --- |
| Product Substrate Region |

1. Aagya Soybean India
2. Chee-fan Soybean China
3. Dawadawa African locust bean Nigeria
4. Kecap Soybean Indonesia
5. Khaman Bengal gram India
6. Meju Soybean Korea
7. Natto Soybean Japan
8. Soybean Milk Soybean China
9. Tempeh Soybean Indonesia
10. Waries Black gram India

Fermented Milk Products: The fermented milk products have higher nutritive value, better keeping quality and it has a strong therapeutic potential. Micro organisms involved are: Lactobacillus sp, Saccharomyces sp , Acetobacter aceti, Yeast.

Table 3: List of Fermented milk products[6]

|  |
| --- |
| Product Source of milk Region |

1. Buttermilk Bovine USA/ Australia
2. Chhurpi Yak India
3. Curd Bovine, Buffalo India
4. Cultured cream Bovine USA
5. Koumiss Horse, Mare, Camel Russia, Asia
6. Kefir Bovine, Goat Russia
7. Laktofil Bovine Sweden
8. Lassi Bovine India
9. Leben Ewe, Goat, Sheep Labenon, Iraq
10. Quark Bovine Germany, Europe
11. Viili Bovine Finland
12. Yoghurt Bovine/ Goat Turkey

Fermented Fish & Meat Products:

Meat and fish are the rich source of proteins. Fermentation helps in increasing the shelf life and also gives unique flavour and texture to the final product. It involves the micro organisms such as Actinomycetes, Pseudomonas , Yeast, Penicillium, Lactobacillus, and Micrococcus.

Table 4: List of Meat and fish products[6]

|  |
| --- |
| Product Substrate Region |

1. Bacon Cured Meat Europe
2. Bagoong Fish Philippines
3. Fish sauce Fish South East Asia
4. Ham Meat Europe
5. Katsuobushi Fish Japan

Fermented Fruits & Vegetables:

Fermentation is the oldest method of extending the shelf life of perishable products.

Table 5: List of fermented fruits and vegetables[6]

|  |
| --- |
| Product Substrate Region |

1. Gundruk Radish India
2. Kimchi Radish Korea
3. Olive Olive Spain
4. Pickle Vegetable India
5. Yan-taozih Peach China
6. Sauerkraut Cabbage Internatinal
7. Soidon Bamboo shoot India
8. Yan-tsai-shin Broccoli Taiwan

Benefits of Fermented Foods:

1. Variation in the types of fermented products
2. Important ingredients can be prepared from it
3. Quality is increased to a great extent.
4. Preservation increases the shelf life.
5. It helps in the recovery of a disease free life.
6. Raw materials can be digested to a great extent.

Conclusion:

Fermented products which are associated with several cultural and social aspects contain a wide range of probiotics. The tactics which are practised by the ethnic groups reveal the correlation of nature with the people including the micro flora. Value added methods are practised by genetic improvement, strains of micro organisms, using of immobilised systems which will lead to industrialization of the food products. Hence, the fermented products can be maximised and commercializing the technological development in terms of financial support by the governing agencies.

## References:

[1] ] Adams, M. R. (1998). Fermented weaning foods. In J. B. Wood (Ed.), Microbiology of fermented foods (pp. 790–811). London: Blackie Academic.

[2] Billings, T. (1998). On fermented foods. Available: http://www. living-foods. com.

[3] Caplice, E., & Fitzgerald, G. F. (1999). Food fermentations: role of microorganisms in food production and preservation. International Journal of Food Microbiology, 50, 131–149.

[4] Chavan, J. K., & Kadam, S. S. (1989). Critical reviews in food science and nutrition. Food Science, 28, 348–400.

[5] Harlander, S. (1992). Food biotechnology. In J. Lederberg (Ed.), Encyclopaedia of microbiology (pp. 191–207). New York: Academic Press

[6] Jeyaram, K., Singh A., Romi, W., Devi, A. R., Singh, W. M., Dayanithi, H., Singh, N. R. and Tamang, J. P. 2009. Traditional fermented foods of Manipur. Indian Journal of Traditional Knowledge 8(1): 115-121.

[7] Modi, H. A.(2012). Aavishkar Publishers, Distributors, Jaipur, pp-1-203.

[8] Nout, M. J. R. and Sarkar, P. K. 1999. Lactic acid food fermentation in tropical climates. Antonie van Leeuwenhoek 76: 395-401.

[9] Sankaran, R. (1998). Fermented food of the Indian subcontinent. In J. B. Wood (Ed.), Microbiology of fermented foods (pp. 753–789). London: Blackie Academic and Professional.

[10] Sekar, S. and Mariappan, S. 2007. Usage of traditional fermented products by Indian rural folks and IPR. Indian Journal of Traditional Knowledge 6 (1): 111120.

[11] Sharma, A. and Kapoor, A. C. 1996. Level of antinutritional factors in pearl millet as affected by processing treatments and various types of fermentation. Plant Foods for Human Nutrition 49: 241-252.

[12] Soni, S. K., & Sandhu, D. K. (1990). Indian fermented foods: microbiological and biochemical aspects. Indian Journal of Microbiology, 30, 135–157.

[13] Srivastava, R. P. & Kumar, S(2002). Fruit and Vegetable Preservation. CBS Publishers and Distributors Pvt. Ltd, New Delhi, pp-81-82.

[14] Stanbury, P. F. 1999. Fermentation Technology. In Stanbury, P. F., A. Whitaker, and S. J. Hal (Eds), Principles of Fermentation Technology, 2nd Edition, p 1-24. UK: Butterworth Heinemann, Oxford.

[15] Steinkraus, K. H. (1998). Bio-enrichment: production of vitamins in fermented foods. In J. B. Wood (Ed.), Microbiology of fermented foods (pp. 603–619). London: Blackie Academic and Professional.