Processes and applications of fermentation

Hort-312 (1+1)

Topic: Fermented Food

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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.

2. Lactic Acid Fermentation: It is carried out by lactic acid bacteria. Examples: Pickles, sauerkraut, kimchi
3. Alcoholic fermentation: Yeast is the main micro organism involved in this process which yields ethanol. Example: Brandy, Beer, Whiskey
4. 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.

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