***Practical Fermentation Technology***

***Lactic Acid Fermentation***

**Lactic acid fermentation is a metabolic process by which**[**glucose**](https://en.wikipedia.org/wiki/Glucose)**and other  (also,**[**disaccharides**](https://en.wikipedia.org/wiki/Disaccharides)**, e.g.**[**sucrose**](https://en.wikipedia.org/wiki/Sucrose)**or**[**lactose**](https://en.wikipedia.org/wiki/Lactose)**) are converted into** [**lactate**](https://en.wikipedia.org/wiki/Lactic_acid)**. It is an**[**anaerobic**](https://en.wikipedia.org/wiki/Anaerobic_organism#Metabolism)[**fermentation**](https://en.wikipedia.org/wiki/Fermentation)**reaction that occurs in some bacteria and**[**animal cells**](https://en.wikipedia.org/wiki/Animal_cell)**. Lactic acid fermentation is used in many areas of the world to produce foods that cannot be produced through other methods, the most commercially important**[**genus**](https://en.wikipedia.org/wiki/Genus)**of lactic acid-fermenting bacteria is**[***Lactobacillus***](https://en.wikipedia.org/wiki/Lactobacillus)**, Two of the most common applications of lactic acid fermentation are in the production of yogurt and sauerkraut. The main method of producing**[**yogurt**](https://en.wikipedia.org/wiki/Yogurt)**is through the lactic acid fermentation of**[**milk**](https://en.wikipedia.org/wiki/Milk)**. The primary bacteria used are typically**[***Lactobacillus bulgaricus***](https://en.wikipedia.org/wiki/Lactobacillus_bulgaricus)**and**[***Streptococcus thermophilus***](https://en.wikipedia.org/wiki/Streptococcus_thermophilus)**, (though others may be added as probiotic cultures).**[**]**](https://en.wikipedia.org/wiki/Lactic_acid_fermentation#cite_note-yogurt-14)**These bacteria produce lactic acid in the milk culture, decreasing its**[**pH**](https://en.wikipedia.org/wiki/PH)**and causing it to coagulate. The bacteria also produce compounds that give yogurt its distinctive flavor. An additional effect of the lowered pH is the incompatibility of the acidic environment with many other types of harmful bacteria. For a**[**probiotic**](https://en.wikipedia.org/wiki/Probiotic)**yogurt, additional types of bacteria such as**[***Lactobacillus acidophilus***](https://en.wikipedia.org/wiki/Lactobacillus_acidophilus) **or *Bifidobacterium bifidum*are also added to the culture as starter.**

**Yogurt fermentation:**

**Yogurt is made by fermenting milk with friendly bacteria, mainly *Lactobacillus bulgaricus* and *Streptococcus thermophilus*. The milk sugar (lactose) is fermented by these bacteria to lactic acid which causes the characteristic curd to form. The acid also restricts the growth of food poisoning bacteria. During the yogurt fermentation some flavours are produced, which give yogurt its characteristic flavour. Yoghurt can easily be made at home using a live yogurt as the starter culture.**

***Manufacture of yogurt:***

 **To make yogurt use the following process:**

**1- Standardization the fat and solids content of milk.**

**2- Homogenization at 6.9 MPa, 50-55 C.**

**3- Pasteurization: 85C for 30 min (batch process).**

**4- Cool to 42-45C.**

**5- Inoculation: add 1.5% by weight of active culture of *Streptococcus thermophiles and 1.5% by weight of active culture of Lactobacillus bulgaricus***

**6- Incubate for 4-6 hrs. at 42-45C.**

**7- Cool to 2-4C (refrigerator temp.).**

**8- Package in sterile container and store under cooling temperature.**

***Lactic acid calculation:***

**The determination of Lactic acid content can be done by the titration using a standard solution of sodium hydroxide (NaOH) using the following formula.**

**1- Filtrate the yogurt using gauze to separate the whey from the yogurt.**

**2- Transfer 2 ml of whey in 250 ml Erlenmeyer flask.**

**3- Add about 4 ml of distilled water and 12 drops of 10% Phenolphthalein as an indicator reagent.**

**3- Fill the burette with 0.1N NaOH Solution.**

**4- Titrate the mixture with 0.1N NaOH until the mixture starts to turn pinkish and stay pinkish, and then record the amount of 0.1N NaOH used for titration.**

**Lactic acid % = *ml of NaOH x Normality of NaOH x m.equivalent weight of lacti acid x 100***

 ***Weight of sample x Total titration volume***

**#*m. equivalent weight of lactic acid* = 0.09008**

**2 gm = *Weight of sample* #**

 **6 ml (2 gm+ 4 ml) *Total titration volume* =#**