

Significance of Pasteurization of Milk in Saving Energy

Prince^{1*}, Somveer², Dimple³ and Nitish⁴

¹Ph. D. Scholar, Dairy Chemistry Division, ICAR-National Dairy Research Institute, Karnal

²Ph. D. Scholar, Dairy engineering Division, ICAR-National Dairy Research Institute, Karnal

³M. Tech. Scholar, Department of Dairy Chemistry, Lala Lajpat Rai University of Veterinary and Animal Sciences, Hisar

⁴B.Tech. (Dairy Technology), College of Dairy Science and Technology, Lala Lajpat Rai University of Veterinary and Animal Sciences, Hisar

*Corresponding Author: princethanda29111998@gmail.com

Abstract

In the todays growing world the need for energy is increasing day by day. The world is moving towards sustainable energy goals. In this growing world the dairy industry also needs to meet its energy demands with sustainable processes. There are various techniques used for preservation of milk during storage till further processing or after processing till it reaches the consumers. Pasteurization is a process in which the consumption of energy is very low as compared to other processes. There should be more orientation towards energy saving so as to meet sustainable development goals.

Introduction

India is the largest producer of milk in the world since last many periods. Milk is considered as a complete food. Milk is consumed by people of all ages due to its pleasant taste and nutritional significance. Milk contains carbohydrates, fats, proteins, minerals, vitamins and water in significant. Milk also serves as a good medium of growth of milk for microorganisms because it contains all the essential nutrients which are available to the microorganisms also. Milk is highly perishable in nature. As microorganisms grow the quality of the milk is deteriorated making it unfit for consumption by humans. To prevent the milk quality from deteriorating and to make it consumable for longer period of time various technologies have been used from long periods. In others words, various techniques like cooling, pasteurization, boiling and sterilization etc. are used for extending the shelf life of milk.

Various Techniques of Preservation of Milk

Especially in countries like India, where the climate is hot and humid the preservation techniques play an important role. In India the production of milk is largely in rural and distant areas and the demand or the market of milk is mainly in the cities, so the

techniques of preservation of milk must be used to supply the milk to the consumers without being deteriorated. The techniques used in preservation of milk are as follows-

Cooling

Cooling is the simplest technique to extend the shelf life of raw milk. As we all know that milk is highly perishable in nature and the microorganisms starts growing in milk from the moment of milking is done. The quality of raw milk deteriorates within 4 hours of milking. To prevent that the milk is cooled down and often stored in a cold place. Cooling of milk is simply lowering down the temperature of the milk below that of the surroundings. This technique is used by the farmers, households and dairy companies as well. Cooling of milk can be done by putting it in the refrigerator in case of households. In unorganized sector the cooling of milk is directly done by dipping ice blocks in the milk but this method has the disadvantage of dilution of the milk solids. In case pf dairy companies, the cooling of milk is done with the help of bulk milk coolers and chilling centers and then the milk is transported for further processing. With the help of cooling and maintaining low temperature of milk the shelf life can be extended up to 12-24 hours depending on the conditions and temperature of storage.

Boiling

Boling of milk means to raise the temperature of milk to its boiling point by simply heating it. Boiling destroys the pathogens as well as spoilage microorganisms present in milk up to some extent. This technique of preservation is mainly used in houses or un-organized sector by Halwais. The shelf life of milk can be extended up to 24 hours depending on the temperature of storage. Generally, the milk is heated till

boiling then temperature is lowered and then the milk is stored at the refrigerated temperature.

Pasteurization

Pasteurization is the process of heating each and every particle to a temperature of not less than 72°C for not less than 15 seconds or any other time temperature combination having same lethal effect and cooling it immediately below 10°C and then storage at refrigerated temperature is done. Pasteurization is sufficient to kill all the pathogens and most of the spoilage microorganism present in milk. Pasteurization extends the shelf life of the milk up to 72 hours. Pasteurization is the least energy consuming process among the all. The process of pasteurization is done mainly in the organized sector i.e. dairy companies. Pasteurization offers several advantages over other processes like minimal energy consumption because of the regeneration in pasteurization. It destroys all the pathogens so it renders the transfer of zoonotic diseases from animals to milk by milk consumption.

Sterilization

Sterilization is the process of heating of milk to 118-121°C for not less than 15 minutes. The process of sterilization extends the shelf life of milk upto 180 days. The sterilized milk can be stored at room temperature, there is no need of cold storage. In this case the energy required in heating is more than that of pasteurized milk but it has an advantage over pasteurized milk that it can be stored at room temperature. The various parameters of some techniques used for preservation of milk are compared below as shown in table 1.

Table 1- Comparison of various techniques of preservation of milk.

Process	Cooling	Boiling	Pasteurization	Sterilization
Storage temperature	Low	Low	Low	Normal
Destroys Pathogens	No	Yes	Yes	Yes
Energy consumption	High	High	Low	High

Advantages of Pasteurization over Other Techniques

There are several advantages of using pasteurization of milk for preservation of milk over other techniques which are as follows-

- Regeneration- In the process of pasteurization, regeneration is used for heating and cooling of milk simultaneously which helps in saving energy (>90%).
- Killing of all pathogenic microorganisms
- Destruction of huge number of spoilage microorganisms
- Less energy requirement as compared to other processes
- Continuous process

Conclusions

Milk is a highly perishable food product. It must be processed in order to preserve the milk or to extend the shelf life of milk. Various techniques of preservation of milk are used depending on their availability. The pasteurization is best known preservation technique among the above because the energy consumed in pasteurization is less as compared to others like boiling and sterilization. The need to cut the energy demands is increasing day by day to meet these standards pasteurization can play important role because of its ability of preserve milk with low input of energy.

Future aspects

There are large number of people in rural areas who thinks that there are some chemicals are added in the packed milk in order to extend its shelf life because they are unaware of the process of pasteurization so there should be more work in the area to making the farmers as well as consumers aware about the process and its benefit. The process of pasteurization should be exploited more and more to utilize its power to preserve milk by consuming less energy.

* * * * *