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Milk Processing: A Review

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Abstract: *Nutritious milk needs to be processed after milking to improve its shelf life and make it healthy for human consumption. One important factor Microbial contamination is responsible for milk spoilage. There is some internal anti-microbial defense mechanism in freshly drawn milk, but for longer, to avoid or decontaminate microbial growth, some other external anti-microbial preservation measures need to be initiated for storage. This review article provides some information about milk processing.*

Keywords*: milk, milk processing, pasteurization, non-thermal*

I. Introduction

Milk is often known as "Wholesome food "for its high nutritive value and is also proven to have many health benefits. In today's scenario consumption of Milk becomes an Indispensable part of almost everyone's life. But Milk being a highly perishable product it is very difficult to store it for a longer period of time. So in order to extend the shelf life of milk and to produce value added dairy products processing of milk is done. Several techniques which are used to extend the shelf life of milk and several steps which are carried out to produce different dairy products like Ghee, Butter, Milk powder etc.., can be collectively called Milk Processing. The implementation of strategies to improve and strengthen milk process optimization is of vital importance within dairy industry.

As the moisture content in milk is very high (Approximately 87 %) it becomes an excellent medium for microbial growth. And according to US CDC improperly handled raw milk is the cause of almost 3 times more hospitalization than hospitalizations due to other food borne diseases. Milk processing ensures that all harmful microorganisms are killed and the milk is safe for consumption and processing of milk also ensures that it can be stored for a relatively longer period of time when compared to raw UN processed milk. Some common Milk processing techniques are discussed below

II. Pasteurization

Pasteurization is a thermal process which is used to kill pathogens and extend the usable life of milk. Milk pasteurization was introduced to prevent theoral transmission of tuberculosis, brucellosis, and other milk-borne infectious disease. Rapid determination of the presence or absence of alkaline phosphatase is widely used as an indicator to measure the effectiveness of pasteurization.

There are 2 types of pasteurization namely HTST (High Temperature Short Time) Pasteurization and LTLT (Low Temperature Long Time) pasteurization.

HTST Pasteurization

HTST Pasteurization is heating the milk to temperature of approximately 72 degree Celsius and holding it for 15 seconds. HTST Pasteurization ensures the elimination of Coxiella burnetii which is the most heat-resistant organisms of public health significance.

LTLT pasteurization

On the other hand LTLT pasteurization is heating the milk to a temperature of 63 degree Celsius and holding it for 30 minutes. Holding it the milk for longer period results in the change in the milk protein structure which makes it suitable for preparing yogurt. Pasteurization of milk would ensure a shelf life of about 16 to 21 days. The most commonly used pasteurization in the dairy industry is HTST Pasteurization. It should be ensured that there are no chances of Re-contamination of milk during the pasteurization process. The process of pasteurization has also been found to decrease the vitamin B12 and vitamin E content in the milk at the same time it also increases the Vitamin A content in the milk.

III. UHT Sterilization

UHT stands for "Ultra High Temperature ". This sterilizes the milk and completely removes all the spores of the pathogens in milk. A shelf life of Up to 6 months can be achieved on UHT processing of milk. In UHT treatment the milk is heated to temperature above 135 degree Celsius and it is held for up to 2-5 seconds.UHT treatment of milk will result in association of denatured β-lactoglobulin with micelles, and greatly reduced plasmin activity. This milk will be extremely stable over the storage period. There is a possibility of maillard reaction to happen because of which browning of milk can be observedin some cases. After this process is over the milk is then packed into an aseptic sterile packaging.

Other major processing done with mil is the skimming of milk. The removal of fat content from the whole milk results in formation of skimmed milk. The fat content in skimmed milk is between 0.1 % to 0.3 %. Consumption of skimmed milk ensures that the same amount of nutrients are consumed but with a lower calorific value.

Non-thermal processing of milk

A innovative definition of processing that is not only limited to milk but also to other food products is the term non-thermal processing. The goal of non-thermal food processing is to remove microorganisms or other biological entities without causing a large increase in temperature, thereby preventing the chain of unwanted food reactions. Some generally acceptable non-thermal processes are addressed in brief and their applications in the processing of milk.

- High pressure processing (HPP)
- Pulsed electric field (PEF)
- Microfiltration (MF)
- Ultraviolet light (UV)
- Cold plasma

Skimmed Milk

There are two methods to remove fat from the whole milk and produce skimmed milk. The first method is separation of fat from milk using gravity separation method. This is a traditional way of splitting fat from the milk, in this method milk is left undisturbed so that the fat rises up on the surface leaving behind milk with low fat content. In this method the fat is not efficiently removed and takes long time. The second method is the modern method of removing fat from the milk using a cream separator. This is an efficient method of fat removal. Generally skimmed milk is fortified with vitamin A and D as both are lost in the fat removal process because of their fat soluble nature. But there should be no additives in the skimmed milk which is for sale. And Pasteurized skimmed milk comparatively has a lower shelf life than the normal pasteurized whole milk.

Milk processing not only extends the shelf life of milk and removes the pathogens from the milk, it also makes the process of preparing other dairy products easier.

IV. Conclusion

Smarter alternatives to traditional thermal processing are non-thermal methods for the processing of milk and fruit. There are, however, some drawbacks associated with these non-thermal processes, which often prove to be insufficient to affect the desired degree of inactivation of microbes. This includes the need to integrate what can be referred to as a hybrid technology, which incorporates to maximize the efficiency of processing, more than one non-thermal processing system is used, often even combined with mild heat treatment.

Cost is another big downside, as these innovations are still in the growth process and it will take more advancement for the technology's market adoptability, which would ultimately reduce the cost of machinery making them competitive and economical. A lack of understanding and uncertainty among consumers about the adoption of newly produced processed foods would make it difficult for entrepreneurs and daily processors to sell their goods in competition with conventionally processed foods. Standard goods that have been processed. In addition to this, the approval of consumer protection by competitive authorities will be another obstacle to face in the free market.

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