International Journal of Agriculture and Food Science Technology (IJAFST)
ISSN No. 2249-3050, Volume 4 No. 2 (2013)

Food Shelf Life Enhancement: The Preservative Potential of Turmeric

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Abstract

Yogurt is being used in everyday life in some or other way, so increasing its shelf life is important as it gets contaminated due to over production of microbes. As we have prior knowledge about the additive effects of turmeric and thus is being exploited in our present work to somehow validate its positive implications in food industry. We are trying to check the contamination pattern in yogurt and functional components that can be used in increasing the shelf life of the yogurt. Prior literature establishes that food products are spoiled by specific microbial strains and for dairy products like yogurt, the spoilage candidates are yeast and Gram negative bacteria. The target in the experiment was to bring a reduction in Gram negative bacterial count as per the requirement under different environmental storage parameters and depicted interesting results and needs further validation to prove a component to increase shelf life of yogurt. It was found that addition of small amount of turmeric in solution based environment delayed the contamination pattern observed in control set from Day-2 to Day-4. It requires extensive validation to use it at commercial level.

Keywords: Shelf life, Turmeric, Yogurt, storage parameters.

Overview

Yogurt is formed by the fermentation of lactose that is milk sugar by different enzymes secreted by microbes present in milk and starter culture used. This is anaerobic form of fermentation and the Lactose, milk sugar is degraded in two forms of simple sugars: Glucose and Galactose. Further processing of glucose and galactose results into production of Lactic Acid and acetaldehyde. Due to production of these end products the pH of milk lowers down causing sour and tart taste. Moreover, decrease in pH affects casein causing coagulation and precipitation forming solid curd thus, making yogurt. The two bacteria most commonly used to make yogurt are *Lactobacillus bulgaricus* and *Streptococcus thermophilus* (Enege and Frederick.). Since the contamination by micro organisms is leading to problems as food borne diseases thus, it is required to find a suitable solution for the enhancement of shelf life of the yogurt .A shelf life study is an objective, methodical means to determine long a food product can reasonably be expected to keep for, without any appreciable change in quality. A separate study needs to be carried out for each type of product.

Introduction

The product required to be established in market is first of all monitored on the laboratory scale and determination of the cause of spoilage and further testing is done based on the microbes causing contamination. The shelf life study is done in detail till it is been launched in the market. The other forms of factors are: Moisture gain/loss, Chemical change, Light induced change, Temperature change, Physical damage, etc.

The food/ Dairy industry bears the responsibility for fulfilling the increasing requirements of the demanding consumer population. For this, food must be safe, of consistently good quality, healthy and inexpensive; food should be perceived as natural and fresh; and food should keep as long as possible whilst maintaining the required qualities. It is easy to identify the potential conflicts in these requirements, but less easy to understand how to implement effective commercial scientific and commercial strategies.

One of the major problems facing food manufacturers is responding rapidly to the demands of the major suppliers in the market. Rapid response can be driven by a number of factors, such as intense commercial competition and media-driven food issues, with the consequence that new or modified products need to be introduced to the shelves as quickly as possible.

Manufacturers have an increasing range of technologies and ingredients with which to design these qualities into their products, but then face the enormous difficulty of trying to assess how these qualities will be maintained over the intended shelf-life. Commercial pressures are such that the development timescale for a new product can be so short that there is little or no opportunity to establish how the product quality is maintained on storage. The food industries can exert significant control over product safety and shelf-life through careful selection of raw materials/ingredients, the processing they receive and how they are packaged and stored. Poor hygiene practices will result in contamination of products. The shelf-life of food products will be affected by the microbiological quality of the raw materials/ingredients, product formulation, processing stages, packaging and the subsequent temperatures employed during transport, storage, retail display, catering and domestic use. All of these stages must be considered prior to and during determination of product shelf-life.
The determination of product shelf-life typically begins at the product development stage. Food product development involves the initial product concept, through to sample production and finally, a finished product produced on a commercial scale for consumer purchase and use. However, irrespective of the stage a food product is at in its development, it is important to ensure that shelf-life is considered at each stage and determined accurately using all available data.

Experimental set up and methodology: We considered yogurt as a food model and carry an extreme and wide range of contamination study under various possible conditions for a window period of seven days (a week) and took the observation data every day. The data were collected in two sets so that the reported data are authentic and validated. Out of the different conditions where the samples were allowed to suffer contamination, the maximum contamination was seen in the sample of yogurt incubated at 37^0C which was badly contaminated till the 7^{th} day.

Thus for Incubator environment, a second set of yogurt was set but this time with different concentration of turmeric solutions, so as to find the antimicrobial properties of turmeric. After trying out several concentrations, it was found that 2% of turmeric solution applied in 1 ml volume in 50 ml of the yogurt sample was minimally enough to work as a check for the contamination.

A further 7 day window was kept for the sample injected with 2% turmeric and kept in incubator and daily observation was sincerely noted against the data gathered from control samples earlier. Fortunately, it was observed that the 2% turmeric-applied samples were showing lesser contamination as compared to control set and after performing the Gram staining and microscope study of the prepared slides, the turmeric applied samples showed lesser fungal and yeast count compared to the control. Several biochemical tests were carried out(detailed in table below) which also gave similar inference to support the finding and established the effectiveness of turmeric as a

Results of the Biochemical tests performed on 2% Turmeric Solution applied samples set in incubator

Sample	Catalase	Mac conkey	Methyl Red	Voges Proskauer	Indole	Simon Citrate	GramPositive/ Negative
DAY 1	Positive	Positive	Negative	Positive	Negative	Positive	Positive rods, bacillus
DAY 2	Positive	Positive	Negative	Positive	Negative	Positive	Positive rods
DAY 3	Positive	Positive	Negative	Positive	Negative	Positive	Positive Rods
DAY 4	Positive	Negative (Pink Color)	Positive (red color)	Negative	Positive	Negative	Positive rods
DAY 5	Positive	Positive (yellow color)	Positive (red color)	Negative	Positive	Positive	Negative rods

DAY 6	Positive	Negative (Pink)	Positive (red)	Negative	Positive	Positive	Positive rods, bacillus
DAY 7	Positive	Negative	Negative	Positive	Positive	Positive	Positive rods, bacillus

Interference: Almost all samples have shown to contain gram positive strains and have given characteristic color change to confirm the absence or lesser presence of Gram negative strains as compared to the control sample set.

Discussion and Conclusion

Turmeric has shown to work as a preservative in the applied concentration and has effectively delayed contamination in the yogurt sample. A prospective microscopic bacterial colony count revealed a substantial decrease in the bacterial population in turmeric applied yogurt as compared to the control. The Biochemical experiments which showed the presence of Gram positive strains in the sample and not the negative ones also establishes the effectiveness of turmeric which stopped the proliferation of Gram negative spoilage microbes in the sample. preservative candidate against contamination of dairy product like yogurt. .

However, further refining of this experiment will elucidate the active component in turmeric mainly responsible for its preservative property and may lead to the development of a formulation for a greater shelf life product to be launched at a commercial level in the market for yogurt and dairy food lovers.

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