



## Investigating microbial properties of traditional Iranian white cheese packed in active LDPE films incorporating metallic and organoclay nanoparticles

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### ABSTRACT

Iranian white Cheese is a traditional type of cheese in Iran which is popular and widely consumed because of its pleasant organoleptic properties. To manufacture this cheese, raw milk is heated below pasteurization temperature, therefore, pathogenic and spoilage bacteria remain and cause several diseases in public health. In this research three kinds of nanocomposite films based on LDPE incorporated 1) Ag, CuO, ZnO, 2) cloisite 15A, cloisite 20A, cloisite 30B that produced by extrusion method were used for packaging of the cheese and kept in 4 °C during 28 days. Data analysis carried out using SPSS statistical software based on a completely randomized design. The results showed the nanocomposite films incorporated with metal nanoparticles had a significant decrease in the growth of *Staphylococcus aureus*, coliform, mold and yeast after 28 days, while, the growth of lactic acid bacteria decreased but less than control film. Organoleptic properties of traditional Iranian Cheese packed in mentioned nanocomposite films were better. Also, physicochemical characteristics such as pH and moisture were affected significantly by active films. Overall migration of packaging active films in food simulants were within amounts allowed by national and international legislations

### 1. Introduction

Iranian White cheese is a close textured brined cheese made from cow's milk, sheep's milk, or a mixture of them [1]. Because of its pleasant organoleptic properties, this type of cheese is popular and widely consumed all over Iran and is enjoying high economical and nutritional value [2]. For the preservation of these valuable properties, in the manufacture of this cheese, milk is heated to approximately 23°C [3], so pathogenic bacteria especially *Staphylococcus aureus* can be transmitted through the product to public health.

In recent years, the use of nanotechnology has grown significantly in the production of high-performance plastic materials. The use of nano-fillers is very common in the production of composites and the nano-composites exhibit more unique mechanical properties than pure

polymer. It should be noted that nanocomposites exhibit these properties in low amounts of filler (less than 5%). Improvement of nanocomposite properties is due to the high surface ratio of nano-fillers and the uniform distribution of filler particles. Karimi Sania Petroleum polymers (plastics) have some good characteristics, including low cost, good printing, easy plasticity and high chemical resistance, which cause to the increasing application of these polymers [4].

Antimicrobial active packaging is a new generation of food nano-packaging based on metal or organoclay nanocomposite which is made by incorporating metal or organoclay nanoparticles into polymer films [5]. Nanoparticles of Ag [6, 7], CuO [8], ZnO [9, 10], have antibacterial properties and commonly used in active packaging. Nanoclay is a type of purified clay that at least is the nanometer size in one of the dimensions. The

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