Abstract

PVA Based Biodegradable Antimicrobial Films for Food Packaging Application- Molecular Labeling for Sustainability.

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Food packaging is an important part of food products, to maintain the safety and quality of products to enhance their added value [1]. Packaging prevents food quality degradation caused by environmental factors and promotes effective distribution and utilization [2]. There has been a surge of interest in using biodegradable and antimicrobial materials in food packaging in recent years because environmental problems are increases day by day due to the widespread use of plastics. The primary purpose of packaging is to shield and preserve the food from contamination and protect it from food-borne pathogenic bacteria. This function is concerned with the prevention of deterioration, the extension of shelf life, and the preservation of packaged food quality and safety [3]. Biodegradable and antimicrobial polymers are the only ones that can perform all of these functions while posing no risk to the environment and their composite helps in save from the growth of food-borne bacteria. Polyvinyl alcohol (PVA) is one of the few vinyl polymers that is soluble in water and capable of ultimate biodegradation in the presence of properly acclimated microorganisms [4]. PVA is also approved by the food and drug administration (FDA) as an indirect food additive for flexible food packaging and also GRAS (Generally recognized as safe) polymer [5]. In this manner, it very well may be presumed that PVA can be used as a covering material for a variety of foods without raising any health risk. FDA-approved food preservative Epsilon-polylysine (εPL) as an antimicrobial component, shows high antimicrobial activity over a broad spectrum and it is stable at high temperatures also stable in both acidic and alkaline conditions [6]. Polydopamine is recently recognized as a biocompatible crosslinker for biopolymers and also shows antimicrobial properties [7]. In this present work, we have successfully fabricated PVA blend films consisting of glycerol, polydopamine, and different concentration of Epsilon-polylysine (εPL) by a simple solution casting method. The prepared PVA and PVA blend films were evaluated by using FTIR, UV-Vis's spectroscopy, AFM, tensile property, and thermal property. PVA blend films investigated in this study provide highly competitive materials with

excellent water resistance, good thermal stability, excellent mechanical property, achieved fast biodegradation and reasonable transparency for use in sustainable food packaging, especially for lipophilic and acidic foods and we also investigated the shelf life of PVA blend films by packaged the cheese at a different time interval. εPL prepared films, show the outstanding antimicrobial activity against both Gram-positive (*S. aureus*, MRSA) and Gram-negative (*Pseudomonas aeruginosa*, *Acinetobacter baumannii*) bacteria, respectively. This PVA/GL/pDA/εPL film is an antimicrobial packaging material that may reduce the current negative environmental impact of packaging materials.

Keywords: PVA, Epsilon-polylysine (εPL), Biodegradable, Antimicrobial activity.

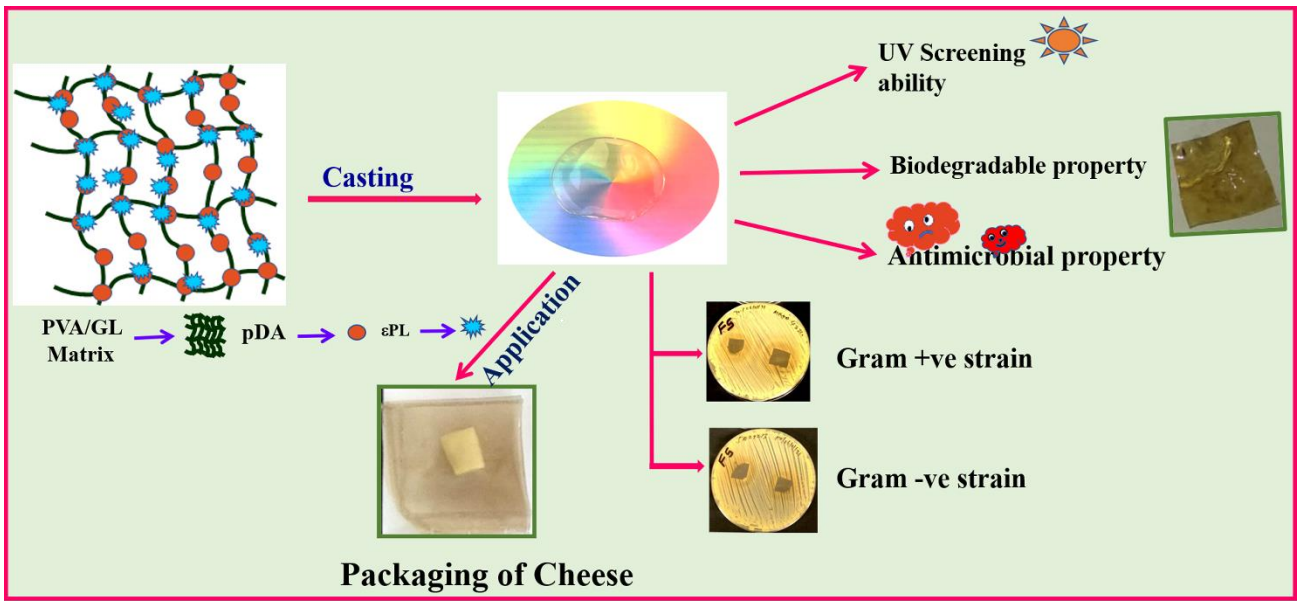

Fig.1: Pictorial representation of the work executed in this study to develop antimicrobial biodegradable food packaging film.

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