9. Antimicrobial Food Packaging Applications

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Antimicrobial packaging is a promising form of active packaging to improve safety and shelf-life of food products. In antimicrobial packaging, agents may be coated, incorporated, immobilized, or surface modified onto packaging materials. Many compounds such as organic acids, bacteriocins, enzymes, spices and polysaccharides (chitosan) have been tried in antimicrobial packaging with varying degree of success.

The three basic categories of antimicrobial packaging systems include incorporation of antimicrobial substances into a sachet connected to the package from which the volatile bioactive substance is released during further storage; direct incorporation of antimicrobial agent into the packaging film; coating of packaging with a matrix that acts as a carrier for the antimicrobial agent. Non-volatile antimicrobial substances must contact the surface of the food, so that the antimicrobial substances can diffuse to the surface of the food product. Therefore, diffusion of incorporated antimicrobial agents from the packaging material to the surface of the food is crucial in exerting the antimicrobial activity. The rate of diffusion of the agent also plays a role in terms of sustaining the antimicrobial activity on the food product. A few research studies examined the ways to affect a controlled release of antimicrobial agents from the polymer matrix. Nano composite films containing antimicrobial agents with improved mechanical, thermal, optical and physicochemical properties are studied for more effective delivery of the agents.

The demand for natural preservative/antimicrobial agents is more than ever at present. Many natural antimicrobial agents like bacteriocins, spices, and enzymes have been effectively incorporated into biodegradable films.

Most of the studies on antimicrobial packaging mainly focused on the initial screening of newly developed films for antimicrobial activity in laboratory media and quantifying the bacterial reductions obtained during storage for different types of packaged food products. In order to commercialize the application, it is really important to know the variation in antibacterial activity of the agents when incorporated into the packaging film from its original activity in order to establish the levels that need to be incorporated for effective bacterial inhibition.

This knowledge about the variation in antimicrobial activity will also be useful to control the factors in the production of antimicrobial films that may reduce the antimicrobial activity of the compounds. Another important aspect that needs to be investigated from an industrial application perspective is the retention of antimicrobial activity of packaging films during storage. A major difficulty in commercializing this technology is the susceptibility of the majority of the antimicrobial compounds to the high processing temperature used for the production of packaging polymers. Development of effective systems to successfully coat the antimicrobial compounds onto the fully formed polymer material is a way to solve this problem.

Conclusion. The effectiveness of the films was tested through measurement of release kinetics and antimicrobial activity on selected microorganism, Penicillium commune. It was found that as the initial casting composition, wet casting thickness and drying temperature increase, porosity and pore size of the films reduce leading to slower release rates. The most significant parameter affecting the release was found as the number of layers.