



Breaking News on Food and Beverage Processing and Packaging

Study hails promise of bio-based plastics in active packaging

By Rory Harrington, 12-Apr-2011

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Bio-based plastics incorporating antimicrobial (AM) substances are fast becoming one of the most promising forms of active packaging, said new research.

The burgeoning demand for eco-friendly products has also spurred greater investigation into the use of biodegradable polymers in food packaging – with interest particularly high in polysaccharides and protein-based materials, notes the study by Stephen Bigger et al.

“Consumer demands for preservative-free, high quality food products, packaged in materials that create less environmental impact have inspired research into the application of biopolymeric materials,” said the paper published in the Journal of Food Science.

The scientists add: *“In combination with antimicrobial (AM) packaging systems, biopolymer materials with AM properties are emerging as one of the most promising forms of active packaging systems.”*

Active packaging is defined by the authors as a system in which the product, the package and the environment interact to extend shelf life or improve microbial safety or sensory properties whilst maintaining the quality of food products.

Properties

The group notes that polysaccharides and protein-based materials demonstrate adequate gas barrier properties - making them highly suitable for use in packaging. They also have the potential to be used in conjunction with a number of common AM agents such as starch, chitosan and alginate.

However, hydrophilic and relatively-high crystallinity properties mean such materials also require blending with plasticizers to improve features such as water barrier and mechanical characteristics.

Bioplastics that have been physically, chemically or mechanically modified also exhibit thermoplastic properties and, in cases such as starch, can be used in conventional manufacturing conversion processes such as compression moulding, extrusion or thermoforming.

Processing techniques for biodegradable films include wet and dry processing – much like synthetic materials. The former involves solvent casting, the most common method used to prepare AM films from biopolymers.

The technique employed *“may significantly”* affect the properties of the finished AM eco-film, said the group.

AM films

The two main types of AM packaging systems are migratory and non-migratory – with the former containing agents able to transfer into the packaging headspace while the latter remain immobile.

Such agents can be incorporated into films, including bio-based materials made from polysaccharides and protein films. They can also be coated onto the surface of packaging materials to provide a high concentration of agent in contact with the food.

Techniques include immersion or spraying of the substrate.

Effective AM packaging can also be achieved by immobilization of AM agents such as peptides, enzymes and proteins.

Successes and remaining challenges

The research concludes that bioplastics when combined with AM agents have the potential to be manufactured into food packaging. Polysaccharide materials – especially with starch-based AM agents, have been studied extensively and have produced commercial successes.

Some of these have been used to package dry foods such as biscuits, snacks and cereals, as well as fresh fruit and vegetables.

But the study noted: *“Developing commercial biodegradable films with improved physical and mechanical properties is still a challenge due to their hydrophilic nature that limits their application for packaging of food products with a high water activity.”*

It also highlights higher cost and difficulty in processing. Regarding cost evaluation, it urges using a full cradle to grave approach that not only looks at financial cost and processability of the material but also the cost for disposal and incineration. This makes the price difference *"much smaller"* when compared to conventional material, said the group.

Antimicrobial Activity of Biodegradable Polysaccharide and Protein-Based Films Containing Active Agents by ***Kuorwel K. Kuorwel, Marlene J. Cran, Kees Sonneveld, Joseph Miltz, Stephen W. Bigger*** published in ***Journal of Food Science*** DOI: ***10.1111/j.1750-3841.2011.02102.x***

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