SeaHealthUCD

Issue 41: November, 2022: This e-bulletin is aimed at personnel in fisheries and aquaculture, at fish packers, processors, distributors, retailers and finally, consumers.

Edible coatings for prolonging seafood shelf life

Use of edible coatings for prolonging shelf life of a wide range of food products, including seafoods, has become a major research area. Fish has a short shelf life and research on the use of edible coatings/films in seafoods has been ongoing for over 15 years and was reviewed by Dehghani *et a*l., 2018. Recurring keywords/themes listed in the large number of publications cited in the review include chitosan, antimicrobials, organic acids, essential oils and gelatin.

Polysaccharide, protein & lipid edible coatings

Foremost among <u>polysaccharides</u> as edible coatings is chitin/chitosan. Chitin is N-acetylglucoseamine $(C_8H_{13}O_5N)_n$, is abundant in fish shells, and is usually used after modification to chitosan (deacetylated derivative). Chitosan and other chitin derivatives are ACE inhibitors (help control blood pressure), antioxidants, have anti-microbial activity, and have anti-cancer and anti-diabetic qualities (Ngo *et al*., 2011). Films can be prepared by dissolving chitosan in acetic/lactic/citric acid aqueous solutions (Singh *et al*, 2015). Films and coatings can also be made using cellulose, starch, pectins, alginates and carrageenan (Costa *et al*., 2014).

Edible coatings from <u>proteins</u> are made from casein, whey, corn zein, collagen, soya, gelatin and wheat gluten (Seyfzadeh *et al*., 2013). However, these coatings have less application for seafoods than those made from polysaccharides. Edible coatings can also be made from <u>lipids</u> but relatively few literature references deal with the effectiveness of lipids as protective coatings for seafood (Dehghani *et a*l., 2018).

Essential oils & antimicrobials

<u>Essential oils</u> from plants are antimicrobial and antifungal agents, and are also antioxidants (Rout *et al*., 2022). Commonly used ones include thymol, eugenol, carvacrol, cinnamon, oregano and lemongrass. They are usually used in combination with chitosan or other polymers for seafood applications; similarly for organic acids. These act as antimicrobials and commonly used ones are benzoic, propionic, lactic, sorbic and acetic acid. Obviously the quantity of acid in a thin film protective coating is too small to have an impact on product flavour (Sánchez-Ortega *et al*., 2014).

Practical applications

Edible coatings act as antioxidants (protect seafoods from atmospheric oxygen), antimicrobials and also prevent surface desiccation thus extending product shelf life. The coatings prevent/minimise bacterial contamination of seafoods during sorting and packing, and also control discolouration, especially in shrimps. Shrimps have been a major and suitable target for the use of edible coatings; presumably this also applies to prawns. For example, chitosan-based edible coatings for preservation of whiteleg shrimp (Huang *et al*., 2012); inhibitory effects of chitosan coating+organic acids on *Listeria monocytogenes* in refrigerated ready-to-eat shrimps (Li *et al*., 2013); chitosan coatings with oregano/thyme essential oils for inhibiting bacterial growth in shrimps (Carrión-Granda *et al*., 2016). Edible films/coatings have also been used for active packing and shelf life extension of fish fillets/portions (Socaciu *et al*., 2018) including cold smoked salmon and salmon fillets; the latter had a high quality shelf life extension of 6 to 11 days. Shelf life of fresh tuna and hake (±MAP) was extended using films containing oregano and thyme essential oils plus rosemary via their antimicrobial effects (Granda, 2016).

Conclusions

While research on edible coatings continues apace with many successful applications at laboratory/pilot level, scaling up to commercialisation has lagged behind due to: (i) inability to make continuous films; (ii) long drying times; (iii) controlling film thickness; (iv) palatability issues; (v) biodegradability; (vi) safety and (vii) consumer acceptance (Jeevahan *et al*., 2022). Overcoming these issues continues to be a major R&D focus.

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