

## Coating using chitosan as a means to prevent dispersion of moist pellet feed in water of aquacultural farm, and bacterial pollution and its lipid oxidation during storage

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### INTRODUCTION

A fish feed being used most widely in aquacultural farm is a moist pellet (MP) feed which has been being prepared by mixing of commercial dry feed and nutritional oil to raw fish fry. The two major problems in the use of MP feed is to be readily dispersed in water of an aquacultural farm, and to cause lipid oxidation and bacteria infection during storage. The former induce an environmental pollution of the farm and the latter lower nutritional values and develop fish diseases. Chitosan is derived from chitin, a polymer of N-acetylglucosamine ( $\beta$ -1,4 linked 2-acetamido-D-glucose), by deacetylation and it is well-known that chitosan possesses a variety of functional properties and bioactivities involving adsorption of mineral, protein and lipid, and immuno-stimulating and antimicrobial effect. Furthermore it has been used as a material for film preparation or a coating of meat or vegetable [1]. It is expected that the use of chitosan might prevent the dispersion of the MP feed in water, lipid oxidation during storage by its coating ability, and the growth of pathogenic bacteria associated with fish diseases due to its antimicrobial effect.

In the present study, MP feed would be coated by chitosan or lipid-mixed chitosans with different ratios and their coating abilities to alleviate dispersion in water, lipid oxidation and microbial growth was investigated.

### MATERIALS AND METHODS

The chitosan (degree of deacetylation, 89%; viscosity 20 cps), used as a coating material, was donated from Kitto Life Co. (Korea). Polyethylene glycol (PEG) and

glycerol was purchased from Amersham Pharmacia Biotech (USA) Three microorganisms, *Vibrio* spp., *Edwardsiella tarda*, and *Streptococcus* spp., for an antimicrobial examination are all wild types and were isolated directly from the intestine of flounder fish.

Coating of MP feed : The coating solutions were prepared by single 1% or 2% single chitosan solution and lipids (glycol or PEG)-mixed chitosan solutions with proper ratios of chitosan to lipid. The MP feed was dipped into the respective coating solutions for 30 sec and allowed to stand at room temperature during 1 hr to remove an excess of the solution. The coated and native MP feed was stocked at -20°C for a week.

Determination of coating capacity : The MP feeds were removed from the frozen-storage room after a week and applied to a test for the determination of coating capacity. The capacity was performed by dipping of the feed in water for 12 hrs, followed by the measurement of protein amount released from the feed.

Assay of lipid oxidation : Lipid oxidation of the feed was determined according to thiobarbituric acid (TBA) and peroxide value (POV) method [2].

Assay of antimicrobial effect : The antimicrobial effect of the coating solution was examined according to our previous method [3]. The resistant ability of the coated feed to those microbial growth was carried out by dipping in a seawater infected with each of the microorganisms, followed by a cultivation on agar-Tryptic soy broth (TSB) as a medium for 24 hrs.

## RESULTS AND SUMMARY

It is found that chitosan solutions used as a coating material of MP feed possessed effective antimicrobial activity against *Vibrio* spp., *E. tarda*, and *Streptococcus* spp. and the feed coated with the solutions also significantly resisted the growth of all bacteria, as compared to the control. Lipid (glycol or PEG)- mixed chitosan coating solutions inhibited the growth of the bacteria too, but the efficiency decreased with increasing an amount of the lipids added to the chitosan solutions. Coating the feed with chitosan or lipid-mixed chitosan solutions prevented a dispersion of the feed in water and alleviated a lipid oxidation during storage.

## REFERENCE

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