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Edible Film/Coating for Fish Products and Their Derivatives

Syahrul Muhamad Barkah[1] and Junianto[2]

1) **Mahasiswa Program Studi Perikanan _ UNPAD**
2) **Dosen Departemen Perikanan_UNPAD**

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ABSTRACT
Fish and its derivative products are easily damaged materials if they are under bad conditions. Currently *edible film / coating* has begun to become a concern because of its potential as packaging for food products made from fish. *The film / coating* can be made from biopolymer waste produced by the food industry based on protein, fat, or polysaccharides that can be degraded naturally, can be consumed but also serve as packaging. The use of *film /*coating as packaging of fish products that have the function of inhibiting the destruction of food. The purpose of this writing is to compare the types of films / *coatings* used and their effect on shelf life. The results showed that the use of various *films / coatings* has a different value added storage period, mostly showing the storage of products that have been packaged film / *coating* in cold temperatures have a large long shelf value. That way it is increasingly clear the potential of film / *coating* as a packaging material for fishery products and derivatives that are safe to use.

Introduction

Edible film and/or *coating* is a biopolymer that is currently being explored as a way to package food/groceries. Recent research combines the concepts of food, preservation and packaging into using *biodegradable* or organically biodegradable edible films, by certainly keeping moisture loss, color fading, fat oxidation, odorless, can increase the shelf life of a food, and provide packaging functionality to fishery products and their derivatives. Edible *film* interception originated from concerns about the deteriorating environment due to the increasing volume of plastic waste that continues to accumulate, in addition to the utilization of industrial waste andthe demand for consumer desire for alaami, nutritious and healthy food materials [19] So the idea of processing biopolymers produced from waste or food idustri waste in the form of proteins, lipids, or polysaccharides that can decompose organically, can be eaten and can also act as an active agent that carries antioxidant, antimicrobial, flavor, and others.

Fish meat became one of the important food sources from the beginning. Fish meat is considered important because it contains proteins, vitamins, minerals, and also micronutrients needed by the body. However, fish meat is a food that is easily damaged*(perisable food)*so it requires a series of processes and good handling to extend shelf life. A common way to do this is to put it in the refrigerator. What's more, if fish meat products that have been stuffed or minced are more susceptible to damage than fresh fish meat. That's because fillet or minced meat has a surface area and contact area exposed to air and microorganisms. Various chemical circuits also occur because they are triggered by the oxidation of fats and proteins. The factors that influence this chemical circuit are composition,materials, air, light, and ambient temperature[16]. What unsaturated fatty acids in phospholipids and triglycerides in meat are very easy to oxidize, in the form of hydroperoxide, the reaction that triggers these changes in aldehydes and ketones.[13] Improper processes and treatments can introduce the presence of harmful microorganisms into the meat, the presence of microorganisms can trigger physical, chemical, And also sensory [12].

The development of new technologies to increase the potential *of edible coatings* is still a discussion until research in the future. The use of *edible coatings* is currently limited. So that further studies are needed related to the development of edible *coatings* and their effect on the shelf life of food.

Factors that affect microbial exposure to fishery products

Fish and their derivative products are easily damaged commodities that require proper handling to extend their shelf life. Preventing the growth of decaying microorganisms is indispensable in the course of the process. The main intrinsic factors that affect microbial growth in meat are pH, moisture content, water activity (aw), oxidation/reduction potential, nutrient composition, antimicrobial active ingredients, and biological structure. It is well known that most microorganisms grow well at pH values with a range of 6.6 – 7.5[9]. Fisheriesand their derivatives are also influenced by extrinsic factors. Product characteristics play an important role in developing preservation strategies for fish meat and its derivative products. For example, storage temperature, environmental relative humidity, the presence of gas concentrations, the presence or absence of other microorganosm may be referred to as extrinsic factors[1]. Temperature is one of the main factors affecting the speed of damage to fishery products. The higher the temperature and length of storage, the higher the reduction in quality such as decay, the appearance of unpleasant odors, to trigger the growth of harmful microorganisms. Relative moisture in storage also affects water activity in meat which also ultimately triggers the growth of aerobic microorganisms.[9]

Chemical aspects of fish meat exposed to microbes

Fish meat and its derivative products tend to decrease in quality due to the high content of fat and protein, where the content is easily oxidizedand becomes a nutrient for microbes.[11] Oxidation of unsaturated fatty acids is when free radicals enter the unsaturated fat tissue. Oxidation reactions will increase in line with supportive factors such as temperature, light, and exposure to metal ions. As a result, the faster the oxidation of fat, the faster there will be adverse effects on quality, nutrition, sensory (such as the appearance of rancid odor), to the formation of various harmful compounds (the formation of carcinogenic substances / cancer triggers). Special attention has begun to be paid to the study of malonaldehyde accumulation during lipid oxidation due to its detrimental effects on the taste of the product and its potential carcinogenic activity.[21]

Another relevant aspect of the decline in the quality of meat, fish and its derivative products is the development of protein oxidation. These reactions are centered on modification of the structure and composition of proteins. Reactions take place when proteins in muscles are exposed to prooxide factors such as free radicals, oxygen, metal ions, and irradiation that lead to protein cross-bonding, modifications to amino acid side chains and protein fragmentation. As a result, protein function is affected which causes a variety of effects in quality nutrition, water-holding capacity, for example. However, it is important to mention that the oxidation of proteins is complex and not a fully understood process that can be attributed to the expected modifications in meat during processing as well as quality decay.[24]

Edible *filming* for fishery products and their derivatives

The preservation of fish meat and its derivative products aims to minimize the decline in quality in food. With this understanding then in packaging it is necessary to pay attention to the level of quality to withstand leakage, protection, preservation, consumer comfort[5]. Approaches to *edible coating* methods are not new but research into the versatility and usefulness of edible *films* that can be easily decomposed by including certain compounds has come to the attention of researchers around the world. The advantages of *edible film* can also improve the quality of food, depending on the composition of the film / *coating* used. TheP of six antioxidant, antimicrobial, flavoring, and probiotic compounds will improve the quality of the food[6]. A commonly used method for making *film* is by printing, while coating is by *dipping*. In short, after the *film/coating* component is selected, this component is then mixed with solvent until dissolved perfectly. Then a plasticizer is added as well as functional ingredients (such as antioxidants and antimicrobial substances). The pH of the solution is arranged and the mixture is heated until a homogeneous solution is obtained. After cooling, there are two ways that can be done 1) coat the food sample by directly dipping it in solution; or 2) wrap the food sample with a *film* that has been made with the solution that has been dried. If using the first method, the excess solution is allowed to drip from the food, then the food is dried in a controlled environment. Meanwhile, if using the second method, a mold is required to print the solution and dry it. Then the layer is used to wrap around the surface of the food.

Performance of storage time of fishery products that have been packed with *edible coating*

Film/coating materials	**Product**	**Save time addition**	**Reference**
Methylcellulose	Goldfish fillets (4 °C for 16 days)	4-12 days	[2]
Fish Gelatin	Rainbow trout (4 °C for 12 days)	8-12 days	[8]
Sodium-alginate	Goldfish fillets (4 °C for 16 days)	8-12 days	[7]
Carboxsimetilcellulose	Trout fillets (4 °C for 20 days)	15-20 days	[14]
Karaginan	Trout fillets (4 °C for 15 days)	6-15 days	[22]
Sodium-alginate	Brem Fish (4 °C for 21 days)	15-21 days	[18]
Sodium alginate-Carboxymethylcellulose	Goldfish fillets (4 °C for 14 days)	6 - 8/14 days	[15]
Chitosan	Shrimp meat	6-10 days	[4]
Karaginan	Kurisi fish sausage (cold temperature)	21 days	[20]
Chitosan	Tuna meatballs (room temperature for 3 days)	1 day	[23]
Chitosan	Wood fish keumamah (room temperature 8 weeks)	42 days	[17]
Karaginan	Female bloated fish (cold temperature)	7 days	[3]

Conclusion

Fish and their derivative products are easily damaged foods under unsuitable conditions and improper storage. The application of *film / coating* proved to be quite effective in slowing the decline in quality in fish and its derivative products. Food safety is considered by consumers while production costs for large scale are considered by industry. The use of cheap and non-utilized food processing byproducts is a potential that can be utilized to produce cheaper films that function like packaging in general. Charachteristic which distinguishes it from films made of polymer. Thus, it can be concluded that *the film /coating* has promising potential in the future for the packaging of fish and derivative products.

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