Octa Journal of Environmental Research
International Peer-Reviewed Journal
Oct. Jour. Env. Res. Vol. 8(2): 017-021
Available online http://www.sciencebeingjournal.com

Apr. – Jun., 2020
ISSN 2321 3655

Review Article

Octa Journal of Environmental Research
(Oct. Jour. Env. Res.) ISSN: 2321-3655
Journal Homepage: http://www.sciencebeingjournal.com

EDIBLE COATINGS: A REVIEW

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Received: 10th May 2020 **Revised:** 22nd May 2020 **Accepted:** 6th June 2020

Abstract: For the inhibition of thriving of any kind of pathogenic or harmful microorganisms and for increasing various barrier properties of any food products, and for increasing the quality of any food product, different kind of edible coating layers are generally used in different food industries. Different type of edible coatings which have the antimicrobial properties in them helps prevent or reduce the growth of pathogenic or harmful microorganisms and help to enhance shelf life for that food or food product.

Keywords: Edible coating, Antimicrobial, Fruits, Vegetables, Quality, Shelf life.

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INTRODUCTION

Edible or consumable coatings are referred to as those films that are coated around any of food products (Kokoszka and Lenart, 2007). These coatings are generally applied on the outer surfaces of fruits, vegetable which help in the preservation and increasing of the storage life of any food. (Guilbert *et al.,* 1996). The consumable coatings also help to prohibit any nutrient loss in fruits and vegetables and also prevent or reduces the undesirable flavor and color changes (Buonocore *et al.,* 2003). So they help in intensifying the quality of any fruits or vegetables. The coating that that are applied can be of two types: Artificial and Natural coating (Kokoszka and Lenart, 2007). The edible coatings basically comprised with materials such as fats, polysaccharides or proteins (Koelsch, 1994).

EDIBLE OR CONSUMABLE COATING DERIVED OF PROTEIN

During the deep frying of chicken and meat, a huge amount of byproducts is produced. Even there are many by- products which are very nutritious are generally discarded. These contain myofibril proteins in them which are further used for edible or consumable coatings (Obiri *et al.,* 2018). These myofibrils based coatings are used within different coating of various muscle foods (Albert and Mittal, 2002).

Table 1. Implication of edible or consumable coating derived of protein to reduce certain oil consumption in thoroughly fried Product

Material used in coating	Concentration (%)	Agent used as plasticizer	Decrease in the amount of taking of fat (%)	Food
Corn gluten	10	glycerol	28	Paste of potato
	5	Glycerine	59	Cuts or pieces of potato
White egg portion	3	No	12	Potato chips
Sodium caseinate	3,5,7,10,15	Glycerine	16	Product composing cereals
	3	No	14	Chips made from potatoes
	6;8	No	0	Fried prepared from potato

Soy protein isolate	10	No	51	Products made out of cereals
	2;6;10;14	Glycerine	54.4	Potato pallet chips
	10	Glycerine,gellan gum	55.1	Doughnut mix and potato disk
Wheat gluten	15	No	48	Thoroughly fried products derived from cereal
	8;12	No	44	Sheets made of various dough
Whey protein isolate	1;3;5;7 10	Glycerine No	49.9 54	pellet chips made from thoroughly fried products derived from cereals
	10	No	30.68	Thoroughly fried chicken containing breast strips
	1;3;5;7	Glycerol	54.4	Chips prepared from potatoes
Whey protein concentrate	3	No	5	Chips made from potato
gelatin	5;20	Glycerine	Not suitable	Products made out of certain cerrals
Fish protein hyrolysate	1	No	2.5-10	Thoroughly fried fish

EDIBLE OR CONSUMABLE COATINGS DERIVED OF POLYSACCHARIDE

Certain polysaccharides such as pectin, alginate, gums and starch are utilized for preparing the polysaccharide established edible coating. They are generally used as some edible coatings as they are usually not harmful or non-toxic and help in little transmission of air such as oxygen and CO_2 (Mohamed *et al.,* 2020).

a) Animal origin polysaccharide

Chitin: The chitosan is extracted from any of outer shells of the any fungi. They have an exceptional antifungal, antibacterial properties (Campos *et al.,* 2011). They are then prepared into films and gels and then coated over different foods as an edible coating on various fruits and vegetable. chitin is generally converted into chitosan by the process of de-acetylation (Campos *et al.,* 2011). They prevent the penetration of oils but they are less resistant to moisture (Mohamed *et al.,* 2020).

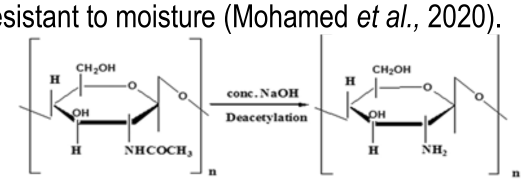


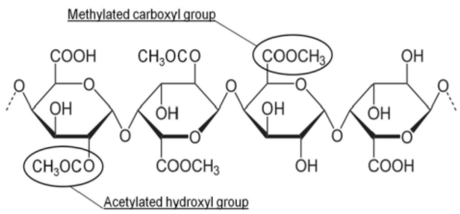
Figure 1. De-acetylation of chitin to chitosan

b) Plant Origin Polysaccharide

Cellulose: They are generally found in the cell wall of plants. They are very sensitized to moisture or water but prevent the transmission of oils through them (Campos *et al.,* 2011). Various cellulose derivative such as hyroxypropyl methylcellulose, hydroxyl propyl cellulose, carboxy-methyl cellulose is implemented for preparation of edible layer coats (Schantz *et al.,* 2014).

Starch: The Starch are generally comprised of amylase along with amylopectin in them (Campos *et al.,* 2011). This is a type of the polysaccharide which is generally tasteless and odorless too (Skurtys *et al.,* 2011). The antimicrobial starch based film can be produced from the starch from various sweet potatoes (Shen *et al.,* 2009).

Pectin: They are comprised of (1-4) alpha-D-galacto-pyranosyluronic acid that are usually esterified along with methanol (Campos et al., 2011). They are used in the packaging of certain food products. They have a very good barrier property to moisture, good oil barrier properties (Liu *et al.,* 2007). They are widely used as an edible coating in many fruits and vegetables (Mohamed *et al.,*2020).



EDIBLE COATING DERIVED OF LIPID

The lipid based edible or consumable coatings are comprising of phospholipids, cerebrosides, mono, di and tri- glycerides, fatty acids including alcohols. The use of lipid based edible coatings are in a growing insistency today (Mohamed *et al.,* 2020). They enhance the appearance of any fruits and vegetables by giving them a glossy and shiny appearance and decreases the loss of moisture from them and finally help in reducing the packaging cost of any fruits and vegetable (Debeaufort & Voilley, 2009).

IMPLICATION OF EDIBLE OR CONSUMABLE COATINGS IN FOODS

a) **Fruits and vegetables:** Edible or consumable coatings are generally applied in various fruits and vegetable to enhance their textural quality, to minimize any kind of growth of microbes or pathogenic organisms. They are generally used to increase the shelf life of perishable fruits and vegetables **(**Lin and Zhao, 2007). By the addition of any antioxidants it prevents the loss of moisture from any fruits or vegetables (Campos *et al.,* 2011). In case of mango slices, chitosan edible coatings are used by inhibiting the growth of mesophilic bacteria that generally survive in the presence of oxygen or air (Durango *et al.,* 2006).

b) **Meat and Meat products:** The meat or any kind of meat products act as a source of many pathogenic organisms such as *L. Monocytogenes*, *E. coli* and *Salmonella triphimurium*. To prevent any kind of contamination during their processing, of the meat and meat products, the edible coating is applied on them (Coma, 2008). As the edible coatings contains the antimicrobial activity so they are applied to prevent or decrease the growth of pathogenic or harmful microorganism on meats and also prevent the other types of flavor or color changes and enhance the quality of any of the food. (Quintavalla and Vicini, 2002).

c) **Seafood and Sea Food Products:** As there are a lot of enzymatic reactions that take place in various types of sea foods so the quality and the freshness of the sea foods gradually decreases as during the time of its storage so the various types of anti-microbial edible coatings generally prevents the multiplication of *L. Monocytogenes* and hence helps in enlarging the shelf life of such foods (Campos *et al.* ,2008).

Table 2. Implication of antimicrobial edible or consumable coatings to upgrade the quality of fruits and vegetables

Hydrocolloid	Antimicrobial	Fruit/Vegetable	Effect
Starch/ polymer of n acetyl glucosamine	Polymer of n acetyl glucosamnine	Pieces made out of cut carrot	Decrease themulyipliaction of total viable count, lactic acid bacteria, psicrotrophic total coliforms and yeast and mould or during the time when it is generally stored at around 10˚C
Starch of the cassava	Potassium Sorbate	Cylindrical shape cuttings of pumpkin	Aerobic mesophills, lactic acid bacteria, yeasts, and moulds growth is generally prohibited
Starch	Extractaction made out of	Noodles which are	Total microorganism

	a porpolis	generally fresh	count was reduced during 4 weeks at 10˚C.
Alginate	Potassium Sorbate	Cylindrical shape cuttings of potato	The current microbial count is declined during refrigeration generally at around 5˚C.
Chitosan	Polymer of n acetyl glucosamine	Squash that is made from butter of nuts	Coating reduce the counts of mesophillic aerobic bacteria

Table 3: Implementation of antimicrobial edible films to upgrade the quality of meat product

Hydrocolloid	Antimicrobial	Meat product	Effect
Polymer of n acetyl glucosamine	Polymer of n acetyl glucosamine	Packed ready roast beef	*Listeria Monocytogenes* growth is controlled by a chitosan coating
Hsin-Tsao leaf gum	Extract made out of the green tea	Pieces of pork meat	*Listeria Monocytogenes* and *Staphylococcus Aureus* multiplication was prohibited
k-Carragenann	Ovotransferrin EDTA Potassium Sorbate	Breast part of the chicken	Total aerobic count declined by the implication of a coating containing ovotransferin and EDTA

Table 4: Implementation of Antimicrobial edible or consumable coatings to upgrade quality of sea foods

Hydrocolloid	Antimicrobial	Foods that we usually get from sea	Effect
Calcium Alginate	Oyester and hen lysozyme, Nysin	Salmon which is usually smoked	Microbial multiplication is decelerated
Chitosan	Chitosan	Silver carp	Total aerobic mesophills counts declined and shelf life is enhaced to around long 30 days during storage during freeze.
Gelatine, Gelatine-Chitosan	Oregano and rosemary extract	Cold-smoked sardine process by high pressure	Microbial multiplication and lipid oxidation is usually declined
Polymer of glucosamine	Polymer of n acetyl glucosamine	Herring cod	Decreased lipid Oxidation, and multiplication of microorganisms is noted, moisture loss is prohibited
Protein of whey	Lacto-peroxidase system	Cold- smoked salmon	*Listeria Monocytogenes* multiplication was prohibited

CONCLUSION

Edible or consumable coatings are in a widely used in the food industries for increasing or upgrading certain quality of various food products including meats and sea foods. They are usually comprised of the different natural polymers that are edible in nature and do not cause any harm to human being. Use of these types of coatings are very beneficial as they help in enhancing different properties of food such as its nutritive value as well as it also makes the appearance attractive to people. Finally, they help in increasing the overall quality of food and also help to enhance the certain shelf life of any kind of foods. As in case of edible coating derived of protein they are also produced from the by-products of certain deep-frying of chicken and meats so we can say that they are also very cost effective. Though some of the edible coatings are not a good barrier to moisture but they along with their other barrier properties prevent the food from rapid spoilage and increases the storage life of food. Thus, they act as a best solution for preventing the transmission of gases to a certain limit and also helps in preventing the growth of certain microorganisms in some food along with their cost effectiveness.

REFERENCES

Kokoszka, S. & Lenart, A. (2007). Edible coatings-formation, characteristics and use-a review. *Polish journal of food and nutrition sciences*, *57*(4):399-404.

Guilbert, S., Gontard, N., & Gorris, L. G. (1996). Prolongation of the shelf-life of perishable food products using biodegradable films and coatings. *LWT-food science and technology*, *29*(1-2):10-17.

Buonocore, G. G., Del Nobile, M. A., Di Martino, C., Gambacorta, G., La Notte, E. & Nicolais, L. (2003). Modeling the water transport properties of casein-based edible coating. *Journal of food engineering*, *60*(1):99-106.

Koelsch, C. (1994). Edible water vapor barriers: properties and promise. *Trends in Food Science & Technology*, *5*(3):76-81.

Albert, S. & Mittal, G. S. (2002). Comparative evaluation of edible coatings to reduce fat uptake in a deep-fried cereal product. *Food Research International*, *35*(5):445-458

Ananey-Obiri, D., Matthews, L., Azahrani, M. H., Ibrahim, S. A., Galanakis, C. M. & Tahergorabi, R. (2018). Application of protein-based edible coatings for fat uptake reduction in deep-fat fried foods with an emphasis on muscle food proteins. *Trends in Food Science & Technology*, *80*:167-174.

Mohamed, S. A., El-Sakhawy, M. & El-Sakhawy, M. A. M. (2020). Polysaccharides, Protein and Lipid-Based Natural Edible Films in Food Packaging: A Review. *Carbohydrate Polymers*, 116178.

Campos, C. A., Gerschenson, L. N. & Flores, S. K. (2011). Development of edible films and coatings with antimicrobial activity. *Food and bioprocess technology*, *4*(6):234-237

von Schantz, L., Schagerlöf, H., Karlsson, E. N., & Ohlin, M. (2014). Characterization of the substitution pattern of cellulose derivatives using carbohydrate-binding modules. *BMC biotechnology*, *14*(1):113.

Skurtys, O., Velásquez, P., Henriquez, O., Matiacevich, S., Enrione, J., & Osorio, F. (2011). Wetting behavior of chitosan solutions on blueberry epicarp with or without epicuticular waxes. *LWT-Food Science and Technology*, *44*(6), 1449-1457.

Shen, Yonghong Chen, and Guohua Zhao. Xiao Li, Jia Min Wu, (2010). Antimicrobial and physical properties of sweet potato starch films incorporated with potassium sorbate or chitosan. *Food Hydrocolloids* 24(4):285-290.

Liu, L., Liu, L., Liu, C. K., Fishman, M. L., & Hicks, K. B. (2007). Composite films from pectin and fish skin gelatin or soybean flour protein. *Journal of agricultural and food chemistry*, *55*(6):2349-2355.

Debeaufort, F., &Voilley, A. (2009). Lipid-based edible films and coatings. In *Edible films and coatings for food applications*. Springer, New York, NY. pp. 135-168

Lin, D., & Zhao, Y. (2007). Innovations in the development and application of edible coatings for fresh and minimally processed fruits and vegetables. *Comprehensive reviews in food science and food safety*, *6*(3):60-75.

Durango, A. M., Soares, N. F. F., & Andrade, N. J. (2006). Microbiological evaluation of an edible antimicrobial coating on minimally processed carrots. *Food control*, *17*(5), 336-341.

Véronique, C. O. M. A. (2008). Bioactive packaging technologies for extended shelf life of meat-based products. *Meat science*, *78*(1-2):90-103.

Quintavalla, S. & Vicini, L. (2002). Antimicrobial food packaging in meat industry. *Meat science*, *62*(3):373-380.

Source of Financial Support: Nil.
Conflict of Interest: None, Declared.