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# Nutraceutical and Nutritional Impacts of Edible Chitosan Coatings on Food Quality and Health

**Muhammad Akram[1], David Pérez-Jorge[2], Momina Iftikhar[1], Sarvananda L[3], Francisco Garcia-Sierra[4], Riyadh S Al-Malki[5], Fethi Ahmet Ozdemir[6], Gaweł Sołowski[6], Najmiatul Fitria[7], Marcos Altable[8], Adonis Sfera[9], Simone Brogi[10], Ho Soonmin[11], Zaryab Fatima[12], El Hadji Seydou Mbaye[13], Isah Suleiman Yahaya[14], Md. Torequl Islam[15], Yahaya Usman[16]**

*[*1]Department of Eastern Medicine, Government College University Faisalabad-Pakistan*

*[2] DISAE Research Group. University of La Laguna. Spain*

*[3]Molecular Nutritional and Biochemistry Laboratory, University of Peradeniya, Sri Lanka*

*[4]Department of Cell Biology, Center of Research and Advanced Studies of the National Polytechnical Institute, Mexico City, Mexico.*

*[5]Department of Pharmacology and Toxicology, Faculty of Pharmacy, Umm Al Qura University, Makkah, Saudi Arabia*

*[6]Department of Molecular Biology and Genetics, Faculty of Science and Art, Bingol University, Bingol, 1200, Türkiye*

*[7]Department of Pharmacology and Clinical Pharmacy, Universitas Andalas, Indonesia*

*[8]Department of Neurology, Neuroceuta, (Virgen de Africa Clinic), Spain*

*[9]Department of Psychiatry, Patton State Hospital, USA*

*[10]Department of Pharmacy, University of Pisa, Via Bonanno, 6, I-56126 Pisa, Italy*

*[11]Faculty of Health and Life Sciences, INTI International University, 71800, Putra Nilai, Negeri Sembilan, Malaysia.*

*[12]Department of Sociology & Criminology, University of Sargodha, Sargodha*

*[13]7BCNet International Working Group, IARC/WHO, Dakar –Senegal*

*[14]Department of Medical Laboratory Science, Faculty of Allied Health Sciences, Bayero University, Kano, Nigeria*

*[15]Pharmacy, Bangabandhu Sheikh Mujibur Rahman Science and Technology University, Bangladesh*

*[16]Federal College of Forest Resources Management Maiduguri Borno State Nigeria*

**[*]Corresponding Author:** Muhammad Akram, Department of Eastern Medicine, Government College University Faisalabad-Pakistan.

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***Abstract***

*Edible chitosan coatings enhance food quality and health outcomes by providing significant nutritional and nutraceutical benefits. These coatings, which are made from chitin, offer a natural barrier that decreases microbial contamination and deterioration, prolonging the shelf life and preserving the freshness of food. Its bioactive qualities, which include antibacterial and antioxidant activities, improve nutritional profiles. Furthermore, chitosan coatings can provide beneficial chemicals and vital nutrients to food, promoting general health and wellbeing. This review highlights the function that edible coatings based on chitosan play in boosting nutritional value and health benefits while examining the diverse effects of these coatings on food quality.*

**Keywords:** Health, Nutraceutical, Nutritional, Benefits, Edible Coating, Chitosan

## Introduction

In recent times, chitosan has been widely employed for an array of biological and medicinal purposes. It can be utilized, for instance, to treat water materials for wound healing pharmaceutical excipients or drug carriers' medication for overweight people and as a framework for tissue engineering [1-6]. Any type of material used to coat various nutrients to extend the shelf life of an item that may be taken with or without additional elimination is known as edible film or coating. Edible films provide fortification and natural layer replacement to prevent moisture loss. This allows for the controlled replacement of vital gases, including as carbon dioxide, ethylene, and oxygen, which are involved in breathing processes. A movie could also provide superficial purity while preserving other important aspects. Typically, the thickness is under 0.3 mm [7]. Edible coatings have been used in the fresh fruit sector to lessen the harmful effects that limited processing has on intact vegetable tissues [8–9].

Chitosan is a fiber that resembles cellulose, but unlike plant fiber, chitosan has unique qualities such the ability to form films [10]. Chitosan has been widely employed in several fields, including waste management, biotechnology, nanotechnology, and medicine. Chitosan is an extremely intriguing substance for use in medicinal applications because of its predicted minimum sensitivity, biocompatibility, and biodegradability. With its inherent antibacterial properties, this natural polycation agent can strengthen the host's defenses against infection [12]. Chitosan has been demonstrated to be a plausible potential fungus in post-harvest fruits, capable of forming a semi-permeable barrier layer on the plant surface [13-24].

Nutraceuticals have been added to edible coatings in a variety of contexts to support and boost the nutritional value of diets [25-27]. Furthermore, it has been discovered that edible coatings improve the carrots' appealing surface color but significantly reducing their texture, flavor, and fresh aroma. While adding them to the coatings can make up for the lack of some important nutraceuticals, such as calcium and vitamin E, edible films may provide a great way to boost the health value of meals like berry fruits [28-31]. Additionally, the coatings significantly decreased the likelihood of deterioration and weight for raspberries and red strawberries, loss and overdue the shift in pH, color, and tithandable acidity during deep freeze, indicating that their moisture-barrier and anti-fungal qualities were unaffected by severe attentions to vitamin E and calcium in chitosan-based films. Edible coatings containing vitamins and minerals can transform fresh-cut fruits into functional foods. Given this background, coating formulations that might contain this probiotic species were thought to benefit from the potential medical benefits and physiological activities of probiotic bacteria in humans, including the development of organic acids in the gastrointestinal tract, infection prevention, a significant reduction in the risk of cancer, a significant reduction in cholesterol levels, increased absorption of calcium, and immune response stimulation [32].

Chitosan has long been used as a potential nutrition stabilizer and antidote to a number of Following the dissolution of the chitosan, lemon essential oil was added and mixed. This obtained liquid was subjected to a second centralization at 165 MPa in a single step using micro fluidization to create the composite chitosan film [40-43]. Either ethanol, chitosan, or a mixture of the two were used to submerge an artificially contaminated berry or cluster. In order to reproduce the long-term industrial cool preservation of grapes, small cluster tests were conducted. In comparison to its application alone, the combination of reduced ethanol and chitosan dosages improved grapes' ability to resist grey mold growth. The effects would frequently be synergistic and at least complimentary [44–47]. Nanotechnology was first developed in the material, chemical, and physical domains in the late 1980s. It is currently becoming more and more popular.

Contrary to normal-sized compounds, chemicals at the nanoscale display effects. surface, macroscopical quanta size, quanta size, and negligible size [52]. Currently, fruit after harvest is preserved using nanosilicon, nanoZnO, and nanoCaCO3. The most likely alternative strategy for preventing post-harvest syndromes has been proposed to be the genetic management of incompatible microorganisms, particularly when it comes to the management of wound-invasive infections [54]. Many commercial products are currently on the market for use after harvesting, such as "Shemer" (Metschnikowia fructicola), recorded in Israel, and "Biosave" (Pseudomonas syringae), recorded in the United States [55]. The question by L. T8 enzymogenes combined with chitosan reduced the number of syndrome seeds by fifty to one hundred percent as compared to the Pythium restrict of frozen cucumbers in four different trials. However, using chitosan or the bacterial inoculant proved unsuccessful [56]. To Many biopolymers have been researched to produce antibacterial, nutritional, and recyclable films for use in food packaging, among other applications [57]. These biopolymers contain cellulose, starch, gums, derivatives, lipids, and proteins (either plant- or animal-based) [58].

To include chitosan into coatings and enhance its potency as a food ingredient in packaging, combine it with multiple additional biopolymers, including proteins, lipids, and polysaccharides [5]. Blends of polysaccharides usually offer numerous advantages. In comparison to lipid or protein blends, the coatings require less material expenditure, have more film assets, are reasonably durable, and have better temperature sealing and water solubility [60]. Given the way that chitosan and alginate interact electrostatically when both polyelectrolytes are charged, the complexity of polyelectrolyte has been investigated. However, mixing is the most dependable and more efficient method of structuring films for mass production. concealed chitosan alginate fibers using a soggy-spinning technique, which was followed by a further classification of the combined coating's antibacterial qualities [60].

Combinations of chitosan and alginate have the following qualities: biocompatibility, biodegradability, low immunogenicity, and low toxicity [61]. The lipid and gas barriers of this mixed film are robust, while the water vapor barrier is very weak [62]. In films with enhanced obstacle sets in opposition to water vapor permeability, both types of mixing result in a significant increase in break elongation. The two types of gelatin extract most frequently combined with chitosan are those derived from shellfish and cattle. Gelatin and chitosan aqueous solution casting (pH4 and @ 60 ° C) is a simple technique for making the mixed film.

## Conclusion

To sum up, edible chitosan coatings are a promising new development for better food quality and health. Its use increases nutritional value by retaining vital nutrients and introducing bioactive chemicals, in addition to extending the shelf life of perishable goods. Food safety is enhanced and spoiling is decreased by chitosan's antibacterial and antioxidant qualities. Furthermore, by offering useful advantages that complement nutraceutical objectives, these coatings promote general health. The incorporation of coatings based on chitosan into food systems presents a useful approach to advancing nutritional enhancement and food preservation as research advances.

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