



Enhancement of Shelf Life and Improved Fruit and Vegetable Quality using Herbal Coatings, Exopolysaccharide. A Review

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ABSTRACT

The Indian fruits market is one of the biggest in the world. It has some characteristics more wastage in value weak transportation and storage, low harvesting technique, As a result large volume of fruits and vegetable are wastage in market, per year then fruits and vegetables price is very high not afford in general people. A growing awareness among the consumer toward their health aspects has increased their interest in use of natural product, natural plant extracts as natural preservatives like Aloe Vera, Neem leaf extract, Cluster beans extract, Marigold flower extract, Tulsi leaf extract, This increasing demand of fresh-cut product presents a challenge for researcher and processors to make more stable and safe products from microbiological standpoint. Various natural extract or additive is observed every year as safe and antimicrobial, antifungal, and antioxidants. Many storage techniques have been developing to expand shelf life of fruits and vegetables. In the current study, Enhancement of shelf life and improved fruits and vegetable quality using herbal coatings, Exopolysaccharide.

Keywords: Herbal coatings, Fruit, Vegetable, Shelf life, Natural plant extract.

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INTRODUCTION

Fruits are important sources of many nutrients, they are really essential to the body and also everybody to eat fruit and vegetables. Fruits and green vegetables are little in calories and are a basis of sugars, fiber, and vitamins, which are vital for our health. Fruits present in soluble nutritional fiber, which help to region low cholesterol and low fats from the body [12]. Fruits compose of many antioxidants such as polyphenolic flavonoids, vitamin-C and anthocyanin but fruit and vegetable are a grave problem because of rapid weakening during handling, transport and storage, that's why use of same herbal coatings like Aloe Vera gel, Neem extract, Lemon grass, Marigold flower extract, Cluster beans extract, Tulsi etc. Enhancement of shelf life and improved quality of fruit and vegetable [6, 13].

HERBAL EDIBLE COATINGS

Herbal coating is a novel method for food manufacturing. It is completed from herbs or mixture of herbs, most general herbs used in herbal coatings like Aloe Vera gel, Neem, Lemon grass, Marigold leaf, and Cluster beans, Tulsi and Turmeric. Herbs have antimicrobial property, it consists vitamins, antioxidants and vital minerals and beneficial for health act as a nutraceutical and medicines [4].

Aloe Vera

Aloe vera gel is applied in herbal edible coating of food industries because of its antimicrobial properties. Aloe Vera is semi-tropical plant with some medicinal properties. "Aloin and Aloe-emodin" are the major components of aloe vera extract [2, 11]. This extract has antifungal, anti-bacterial, anti-inflammatory properties [10]. It also consists of components like glycoproteins, polysaccharides, salicylic acids, phenolic compounds, lignins, amino acids, vitamins and enzymes [8, 3]. It can suppress respiration and can reduce microbial growth, thus can improve the shelf life of fruits and vegetables [6].

Neem

Neem is considered as the holiest, therapeutic and a non-lethal plant, which has antifungal, antimicrobial properties. Neem extracts act against pathogens like *Salmonella*, *Staphylococcus*, *E. coli*, *Vibrio* and other microorganisms. Nimbidin are the major components of neem extract. These components can act as an antimicrobial agent [2].

Tulsi

Tulsi is the most popular homegrown plant of India. Tulsi is a part of the *Ocimum* family with botanical name "*Osmium sanctum*" and known as "*Osmium tenuiflorum*". Tulsi plant that develops as weed. Tulsi has numerous components such as alkaloids, tannins, saponins, glycosides, and fragrant mixes. It use as treatment of numerous infections. It improves shelf life. The extract and lubricate of Tulsi is used against antibacterial, antifungal, antiviral, antioxidative properties [7].

Cluster beans

Cluster beans are used for the ripening process by inhibiting the growth of bacteria in fruits. It maintains firmness but also improved the postharvest quality. This coating is biodegradable, easily applied, and less expensive and it can be used extend shelf life of fruits and vegetables [1].

Fruit are nature marvelous gift to the human. They are life enhancing medicines packed with vitamins, minerals antioxidant and many phytonutrients, delicious is very popular all over the world; however, it is a climacteric in nature and has short shelf life [12]. Lots of work going to improve its quality and reduce its wastage by prolonging its shelf life. In this section most of the recent and relevant literature has been discussed.

Suresh kumar *et al.* [13] studied the effects of non-pathogenic microbes *B.subtilis* which produces exopolysaccharides can be use to check the fruits and vegetables from a variety of biotic and a biotic stresses which enlarge the shelf life of fruits and vegetables. The reason of this study is to notice the influence of storage temperature of, pH, Acidity, Brix % Weight loss % and Decay percentage (%) for the manufacture of EPS. EPS 1% & EPS 5% have antibacterial result and have been proved to growing the shelf life of grapes with and without the mixture of Aloe Vera. The brix % of the protected grapes at room temperature was high at 4°C. Aloe vera 30% + EPS 2% action has given a suitable result by checking the ripening process compared to other treatments. Aloe Vera 30% + EPS 2% was recruit to be best as the decay was too less on compare with the other treatment in different storeroom temperatures.

Kumar and Bhatnagar [15] described that the effects of Postharvest fatalities of fruits are a major problem because of rapid weakening during handling, transportation and storage. Use of edible coatings over fruits is used to develop their quality and self life. These can be also carefully eaten as part of the manufactured goods and do not add unfavorable property to the foodstuff. Lately there has been improved interest in using Aloe Vera gel as an edible covering material for fruits and vegetables focused by its antifungal action. Aloe Vera coagulate originated edible shell have be exposed to break loss of dryness and firmness, delay and decrease microorganism proliferation now fruits such as grapes, sweet cherries, oranges, and papaya. In box of Papaya, the aloe vera covered fruits survived the packing period of 15 days at low temperature while all the uncoated controls decomposed within 10 days. When study remains done of Grapes, it was begin that the storability could be complete up to 35 days at 1°C. Oranges must use for study and it was initiate that Aloe Vera coating in oranges resulted in decrease in weight loss, increase in testability of acids and higher TSS. Thus, Aloe Vera coagulate is existence gradually deliberate as herbal coating in fruits, which would be an innovative and attractive means for profitable application and an alternative to the usage of postharvest chemical treatments foremost to the improvement of shelf life of fruits.

Jemilakshmi [5] investigated that the rapid weakening of fruits and vegetables through pre & post-harvest condition creates a significant issue in the current situation. Fruits and vegetables are affected by transport and stages. The use of fresh coatings on organic products and vegetables is a compelling plan to develop their quality and thus, increase the age of usability. Herbal coatings are a material that cover the sustenance and limits the group of water vapor, oxygen, and carbon dioxide. Polysaccharides, proteins, lipids, and composites are examples of these edible coatings. Because of film shaping property, antimicrobial activities, biodegradability, and biochemical property herbal extracts from Neem, Tulsi, Ginger, etc are found as safe coatings for enhancing preservation.

Chandorkar *et al* [3] investigated that as the demand for high quality fruits and extended shelf life is increasing, efforts were made to explore the potential to meet the needs of consumers. Many natural and artificial preservatives are being used to increase the nutritional value by use of edible coatings, such as EPS (Exopolysaccharide) and Aloe vera gel coating. In current work Exopolysaccharide produced from *Bacillus subtilis*, Aloe vera and combination of Aloe vera and EPS was studied. Results were recorded until three months in interval of 15 days. Combination of Aloe vera and exopolysaccharide coating was proved to be efficient as preservative to keep the nutritive value of fruits.

Sharma *et al* [10] studied that Edible coating extend the post-harvest life of fresh fruits and vegetables. It is used to develop food appearance and provide protection to the food by its ecological friendly nature. Nature of edible covering may be of protein, lipid, polysaccharide, resin alone or in mixture. It acts as a barrier for moisture and gases through processing, treatment and storage. It reduces food decline and enhance protection by their activity or by incorporation of antimicrobial compound. additional

advantages of using edible coating is to decrease wrapping waste, to expand the shelf life of fresh and simply processed product and protect it from harmful environmental effect by maintain the transfer of oxygen, carbon dioxide, dryness, aroma and taste complex in a food system. According to this review, Edible Coatings extends shelf life, decrease water and moisture loss, belated ripens process and also avoids microbial growth especially in fresh fruits and vegetables.

Navya *et al* [7] investigated that one of the grave problems face by our nation is the post-harvest losses of fresh manufacture due to rapid weakening of the fresh manufacture during both pre and postharvest conditions, and in turn affecting the quality of fruits. Herbal edible coating is a novel or exclusive solution to this problem. The main purpose of the above creation is to increase the shelf life of fresh fruits through the use of herbal natural coating on the fruit surface. It is an effective method to improve the quality and thus, increase shelf life of the fruits. They can be extreme safely as a division of our food because of their antimicrobial properties. They are developed from corn starch by incorporating it into aqueous Tulsi (*Ocimum sanctum*) leaf extract. Corn starch and beeswax are natural mechanism of herbal edible coating which is fit for human use. It have been shown to avoid water loss, control ripen process, delay oxidative browning, controls respiration rate, & reduces microbial growth in fruits such as papaya, grapes, orange, apple & mango. These herbal edible coatings increases the storage time at low temperatures and it also increase the shelf-life of fresh manufacture whereas all uncoated fruits will be decayed. Thus, herbal extract are being study increasingly as an preservative in edible coatings on fruits as an new approach for the commercial application and as an substitute for the post-harvest treatment with chemicals on fruits ensuing in enlarged shelf-life.

Shrestha and Pandey [11] studied that a research was carried out to investigate the efficiency of plant leaf extract on elongation of shelf life and preservation of quality of harvest mangoes. Freshly harvested grown-up green mangoes cv. 'Calcuttia maldah' of standardized size and weight were dipped in 50% concentration of different plant leaf extract and store in ambient situation ($32\pm 2^{\circ}\text{C}$ and $65\pm 5\%$ RH). The treatment were leaf extract from five different plants viz. neem (*Azadirachta indica*), chinaberry (*Melia azadirach*), lantana (*Lantana camara*), ashok (*Polyalthea longifolia*) and cinnamomum (*Cinnamomum zeylanicum*) while control was the other treatment. In adding carbendazim (fungicide) was also kept as a benchmark treatment. The treatment with neem leaf extract gave the most capable result as there was minimum physiological weight loss, maximum ascorbic acid content, maximum acidity and minimum pH. Likewise, shelf life, total soluble solids, freshness and determination were highest in neem leaf extract treated fruits next to the carbendazim treated fruits. It was the mainly unsuccessful of all the treatment about all the parameter.

Sandarani MDJC [8] investigated that fruits and vegetables are metabolically energetic, fresh property that have a shorter shelf life. Postharvest treatment of fresh manufacture is use as strategy to minimize main losses in dietary and quality attribute. Moreover, they are crucial in conditions of user safety. Post-harvest treatment will slow down the physiological process in fresh fruits and vegetables such as respiration, senescence and ripening. In adding those treatment also decrease the frequency of pathogen attack and microbial contamination to enlarge the shelf life of fresh fruit. The aim to imprison the state of art on current research about strategies used to decrease postharvest losses of fruits and vegetables.

Arowora *et al.* [2], studied that the significance of good postharvest practice in minimize postharvest losses cannot be overemphasize. Suitable preharvest, harvesting and postharvest chain will result in better quality produce. The sweet orange (*Citrus cinensis*) is the most usually grown fruit tree in the entire world. It is made up of soft texture, and the edible materials are very important in human diet since they contain essential vitamins. Edible surface coating such as wax is often applied to improve the superficial features of fruits and vegetables. These coatings normally contain ingredient such as polyethylene, carnauba or candelilla, all of which decrease water vapour defeat and afford a vehicle for fungicides have report that waxing and coating improve shelf life, slows down ripen retards water loss, reduce decay and enhance visual quality. It has been estimated that 25% to 80% of harvested fresh fruits are lost due to spoilage. Aloe Vera is a tropical and subtropical plant that has been used for centuries for its therapeutic and healing properties. The two major liquid sources of A. Vera are yellow latex (exudates) and a clear gel (mucilage), which gates from the large leaf parenchymatic cells. The major medical uses of the orally ingested gel juice are against ulcerous, gastrointestinal, kidney and cardiovascular problems and also decrease the cholesterol and triglyceride level in blood. Moreover, additional property such as anti-inflammatory and antibiotic actions against some diseases (diabetics, cancer, allergy, AIDS). Although the main use of A. Vera gel is in the cosmetic industry, comprising treatment of burns and scars and in wound healing. There are some reports on the antifungal activity of A. Vera gel protects against some pathogenic fungi with *Botrytis cinerea*.

Sirajunnisa *et al.* [12], studied that the EPS play an general role as biopolymers in the surroundings by replacing artificial polymers as they are degradable, nontoxic, and formed by microorganism. A challenge

was made to develop medium, by the one-factor-at-a-time- technique, for an improved production of EPS from a top soil isolate, *Bacillus subtilis*. The study was carry out by experimenting on various nutrients at different concentration. EPS was precipitate using ethanol, the total carbohydrate substance was determined by phenol sulfuric acid method, and functional groups were detected by Fourier convert infrared (FTIR) spectrophotometry. The finalized medium contained sucrose (20g/L), yeast extract (5g/L), NaCl₂ (0.5g/L), L-asparagine (0.05g/L), and ascorbic acid (0.05g/L). The carbon supply was exchanged with definite agro substrates, cane molasses, and rice bran. Cane molasses at a concentration of 2% provided the highest produce of 4.86 g EPS/L as compare to a medium with sucrose (2.98 g EPS/L). The effect of UV radiation on increase and synthesis was negative, decreasing the growth rate and quantity of EPS produced. Different solvents were check for their effectiveness on precipitating EPS. FTIR study of the extracted product exposed that the polymer was made up of units of sucrose. Thus, the current study presented that the agro waste could be a substitute for artificial substrates, providing a way for an inexpensive production of EPS.

Application of Herbal coating and improving shelf life of Fruit and vegetable.

Herbal coatings can be applied fruits and vegetables by the methods of dipping, spreading, and spraying. Dipping is one of the mainly used methods for applying the herbal coating in fruits and vegetables [6]. Optimization was carrying out by storage temperature and pH and observes different time intervals. Sample containing micro- organism against organic gel, Powder, Tablets, use of different solvent from extraction [5].

Herbal edible coating is usually used to improve food exterior and preservation due to their environmental friendly nature. In adding to the usual role of edible coating as a difficulty to water loss and delaying fruit senescence, the new invention coating are being designed for incorporating for controlled release of antioxidants, nutraceuticals, and natural antimicrobial agents, they could be used as a herbal edible coating for extending shelf life of fruits and vegetables [4].

CONCLUSION

The herbal coating is the most effective method of improvement of shelf life and improved quality of fruit and vegetable by using herbal coatings. The herbal coating is useful technique to preserve fruits and vegetables. It does not create any harm to the environment and can act as an oxygen barrier, moisture barrier thus delaying the fruits from ripening. The herbal coating is the new and developing technology in India that has antioxidant, antimicrobial and antifungal properties. Since the herbal extract consists of vitamins and minerals it can also impart towards the dietary value of herbal coatings. Probably the herbal coating will be the best alternative method for the wax and chemical coating in fruits and vegetables. Postharvest damage of fruit and vegetable is a major alarm for all nations whose backbone is agriculture. In this review, we have discussed herbal coatings, which would have a wide prospect in the coming future for maintaining postharvest quality of fruit and vegetable. These treatments may also be applied in other fruit and vegetable to improve quality of fruit and vegetable. The results have proved the ability of the various herbal coating and exopolysaccharides used in the current study to expand shelf life of different type of fruits and vegetables.

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