

Egg-based Coating: The new alternative to artificial wax coating.

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Abstract—Every year 3% of the total egg produced is discarded by the manufacturers, but now these eggs can be made use of very creatively. This is a very inexpensive alternative which helps using the waste eggs which would otherwise end up polluting the environment. The researchers have found a new alternative to the artificial wax coatings applied on the fresh fruits and vegetables to save them from being deteriorated even before reaching the consumers or being processed. This coating provides answers to the various problems related to the health hazardous artificial coatings and chemical additives used to provide freshness to the produce. It is completely safe and does not have any side effects. Researchers are now working on developing the same kind of coating with the use of plant based proteins.

Index Terms—Artificial wax coating, Egg-based coating, Proteins, synthetic additives

According to the statistics, the worldwide production volume of eggs was more than 76.7 million metric tons in 2018 and it increases every year. The global production volume of eggs has increased by over 100 percent since 1990.

Among this, 3% is rejected by the manufacturers every year which makes up 2.289 million metric tons reaching to the dumping ground.

Around the globe, one-third of the produce is wasted before getting processed or consumed. Nowadays people are learning about the importance of sustainable living- this involves reduction of food shortages in natural ways which does not involve chemical or synthetic additives, inedible coatings, genetic modification.

Since fresh fruits and vegetables are highly perishable, nature has provided them with their own natural protective wax coating known as "cuticle". This serves as a barrier against the various environmental factors and microbial activities which leads to the deterioration of the fruits. However, this natural coating subsides during the various packaging and transportation processes.

To check this problem, researchers had come up with the origination of artificial wax coating preferably made up of polysaccharides, proteins, lipids and composites combined with some chemicals. Although researchers proposed that this artificial wax is of food-grade which indicates that it is safe for consumption as they are not run down by our body for absorption, rather they are removed by the body as it is; there has been outgoing controversies regarding this.

Nevertheless, these artificial waxes are assorted along with morphine and its derivatives (MAID) to make certain that the coating is smeared equivalently as well as in a thin coat.

At a level of 0.03-0.3 ppm, morphine does not cause any serious health issue but exceeding this level it is highly virulent and perilous. If consumed in recurring basis, the morphine along with other chemical agents available in the artificially wax-coated fruits can be a cause to various health hazards.

The normal human diet contains nitrates which has the ability to chemically nitrosate morphine and form N-nitrosomorpholine (NMOR). This NMOR is a formidable cancer producing compound.

Apart from being carcinogenic, it has also shown the ability to be a source of disablement of liver as well as kidney functionality. This morphine when dispensed orally or inhaled by us is sucked up very competently and disseminated in the body fluids which affect the liver and kidney.

Various edible coatings comprises of ingredients like soy, whey protein, casein, peanut proteins etc. which cause allergic reactions in many human beings.

To meet with the aforementioned problems regarding the artificial wax coating, Pulickel Ajayan and his fellow workers from the Brown School of Engineering lab of materials scientist have come about with a micron-thick coating based on the eggs which are rejected by the manufacturers and are dumped in the landfills. This not only resolve the hurdle of consumers, it also makes the environment a little less dirty.

About 70 percent of this coating is made up of the egg albumin and egg yolk and rest 30 percent comprises of nanoscale cellulose unsheathed from wood, a minuscule quantity of curcumin along with a driblet of glycerol.

The nanoscale cellulose extracted from wood succours blockade of water resulting in a great help to the produce by saving it from withering. The tinche of curcumin provides the fruits with antimicrobial shield and the glycerol helps in providing elasticity to the coating.

This multifunctional coating has many benefits. It is edible, natural, resistant to water vapour as well as gas to a great extent, supply shielding against microorganisms and slows down dehydration. Since it is almost impenetrable to water vapour and gas, it prevents premature ripening of fruits and vegetables.

The coating can be applied on the fresh fruits and

vegetables using simple and cheap techniques like spraying the coat over the fruits and vegetables evenly and directly dipping the fruits and vegetables in the prepared coating.

Before bringing it to the consumers, various tests have been conducted on this coating. Fruits like strawberries and bananas were dipped into this egg-based coating and kept along with uncoated strawberries and bananas for comparison. It concluded that the coated fruits' shelf life was extended more than that of the uncoated fruits. The freshness of the coated fruits remained intact while the uncoated fruits were dull and soft.

Compression tests were held which showed that coated fruit were notably rigid and more firm than uncoated and exemplified the coating's potentiality to retain water in the produce which then proves to make the ripening process slow.

Freestanding films analysis was performed which showed that the coating was exceptionally pliable. It could withstand fissure and thus permit superior shielding properties to the produce.

The tensile properties of the coating was also tested which concluded that this coating is durable and tough as that of other products, for instance synthetic films used for packaging of produce.

Another batch of tests were held which stated that the coating is completely non-toxic and its solubility tests concluded that it is washable. This coating is a little thicker than the usual artificial wax coating. This coat can be easily washed off by rinsing in water for a few minutes. This is a bonus point for the people who are sensitive to egg or has any type of egg allergies, as this egg coating can be easily washed off and eliminated and no traces of it can be left in the washed produce which would make the produce perfectly safe for people.

Some other tests concluded its astonishing expertise to combat decaying for an increased duration corresponding to calibre coatings like wax or other synthetic coatings.

The research is yet not completed; researchers are trying to make the composition of this coating more refine and searching for other source materials. Moreover, this egg-based coating is made up of waste eggs which are discarded by manufacturers, since it not only becomes a useful alternative to artificial wax coatings but also serves to be helping in the cleanliness of the environment from the discarded eggs; but fresh eggs can also be used for the same. Also, since discarded eggs are used, it cuts off the price to a great extent, making it an inexpensive product. Not only this, research is going on to develop similar kind of coating using plant proteins rather than egg proteins.

REFERENCES

- [1] Rice University "Egg-based coating preserves fresh produce: Protein coating extends shelf life of perishable fruits and vegetables." ScienceDaily 4 June 2020. <https://www.sciencedaily.com/releases/2020/06/200604120548.htm>
- [2] Melita Fernandes "Fruit Waxing" 28 February 2018 <https://www.google.com/amp/s/www.medindia.net/amp/dietandnutrition/fruit-waxing.htm>
- [3] M. Shahbandeh "Egg production worldwide 1990-2018" 20 February 2020

<https://www.statista.com/statistics/263972/egg-production-worldwide-since-1990/>