Edible Coatings for Fruits and Vegetables
Post-harvesting:

Need for development

Postharvest losses of fruits and vegetables occur at all points in the value chain from production in the field to the food being placed on a plate for consumption. Postharvest activities include handling, storage, processing, packaging, distribution and marketing.

Fruits and vegetables have a short shelf life varying from few days to few weeks. They continue to lose water after harvest, causing shrinkage and loss of weight. They are also easily damaged by insects or microorganisms during post harvesting conditions. Hence multiple efforts have been taken to protect fruits and vegetables from such damaging factors and improve their shelf life.

From data collected globally, it is seen that about 14.5% of losses occur during the storage phase. As a consequence of growth in the global consumption market, efforts need to be taken to reduce wastage in the supply chain process.

Losses in different steps along the fruit supply chain

- Agricultural production: 8%
- Storage: 15%
- Processing and Packaging: 26%
- Distribution: 14%
- Consumption: 37%
Edible Coatings: An Introduction

Fruits and vegetables are coated in nature by a natural waxy coating called cuticle, consisting of a layer of fatty acid related substances, with low permeability to water.

Edible Coatings can be defined as a thin layer of material that covers the surface of the food and can be eaten as part of the whole product. Edible coatings must follow some functional requirements such as:

- **Sensory properties**: Edible coatings must be transparent, odorless and tasteless.
- **Barrier properties**: Edible coatings must have an adequate water vapor and solute permeability and selective permeability to gases and volatile compounds.

**Sustainable**
- Reduce plastic waste
- Biobased & edible

**Aesthetic**
- Delays ripening
- Prevents flavor and aroma loss

**Shelf Life**
- Water vapor barrier
- Prevent oxidation
- Reduce weight loss

**Protection**
- Light & UV
- Microbial growth
- Water & gas barrier
Edible Coatings: Technology Overview

The technology of edible coatings dates to 12th century when waxes were used in China, to protect citric fruits such as oranges and lemons from external microbial attack. Over the years different technologies have been researched and discovered, each having their own benefit. The basic component of the coating can be broadly classified into three categories:

a. Polysaccharide  
b. Protein  
c. Lipid

<table>
<thead>
<tr>
<th>Compound</th>
<th>Water Vapor Resistance</th>
<th>(O_2) and (CO_2) permeability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Polysaccharide</td>
<td>Low</td>
<td>Moderate - high</td>
</tr>
<tr>
<td>Protein</td>
<td>Low - moderate</td>
<td>Moderate</td>
</tr>
<tr>
<td>Lipid</td>
<td>High</td>
<td>Low</td>
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Along with the type of edible coating, it is also important to remark that coating thickness plays a critical role in the protection phenomenon.

Commonly, three types of coating application techniques are followed to achieve the desired coating thickness:

a. Dipping method  
b. Spraying method  
c. Manual application

The coating must then be allowed to dry under ambient conditions and adequate air flow, with minimal heating to avoid any damage to the food.
Texcoat FV Pro

Technical datasheet

Texcoat FV Pro is a proprietary triglyceride based edible coating. It is free from waxes and has been designed with optimal hydrophilic-hydrophobic balance to achieve good water vapor resistance and barrier properties. The coating matrix results in good film forming and mechanical properties.

The coating helps in delaying the tissue senescence in fruits and vegetables. It also maintains the equilibrium between $O_2$ and $CO_2$ transfer, to reduce respiration rate and prevent internal fermentation.

Typical properties:

- **Appearance**: Yellowish transparent
- **% solids**: 16% ± 1%
- **pH**: 5.0 – 7.0
- **Washability**: Good

Application guidelines:

- It is recommended to use the coating without any further dilution.
- 1 L of coating can be used to spray on 900 kg – 1100 kg of apples.
- Provide adequate airflow to ensure complete drying of the coating.

Above mentioned procedure is a guideline, and every applicator must optimize the process according to the facility and equipment at their disposal.
Real time performance

Texcoat FV Pro was applied by dip coating method on freshly bought Mahabaleshwar strawberries. After coating the strawberries were allowed to air dry in open atmospheric conditions (31°C, 59% humidity). The strawberries were then left open in the same condition, without any covering, for analysis.

After 4 days, all 6 non coated strawberries showed significant tissue senescence and fungal growth. Whereas only 1 coated strawberry showed fungal growth, indicating an efficiency of about 85%.

Also, the coated strawberries looked fresh from the inside when cut after 4 days, indicating increase in shelf life by more than 100%.
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