

Enhancing fruits and vegetables shelf-life by applying edible coatings: towards a more sustainable packaging system

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I. INTRODUCTION & AIM

This demand is particularly challenging when dealing with **perishable products** such as **fruits and vegetables**.

Consumers are increasingly aware of these issues and are **demanding eco-friendly packaging** solutions that preserve the quality of food products.

The Food Industry is confronted with **significant challenges** due to the **detrimental impact of plastic usage and food waste on sustainability**.

Edible coatings are thin layers of **biopolymers** applied to the **surface of food products**, providing **protection** by inhibiting microbial growth, preventing mechanical damage, and reducing water loss. Thus, **shelf-life is extended**.

II. RESULTS & DISCUSSION

II.A Film formation and application of the coat

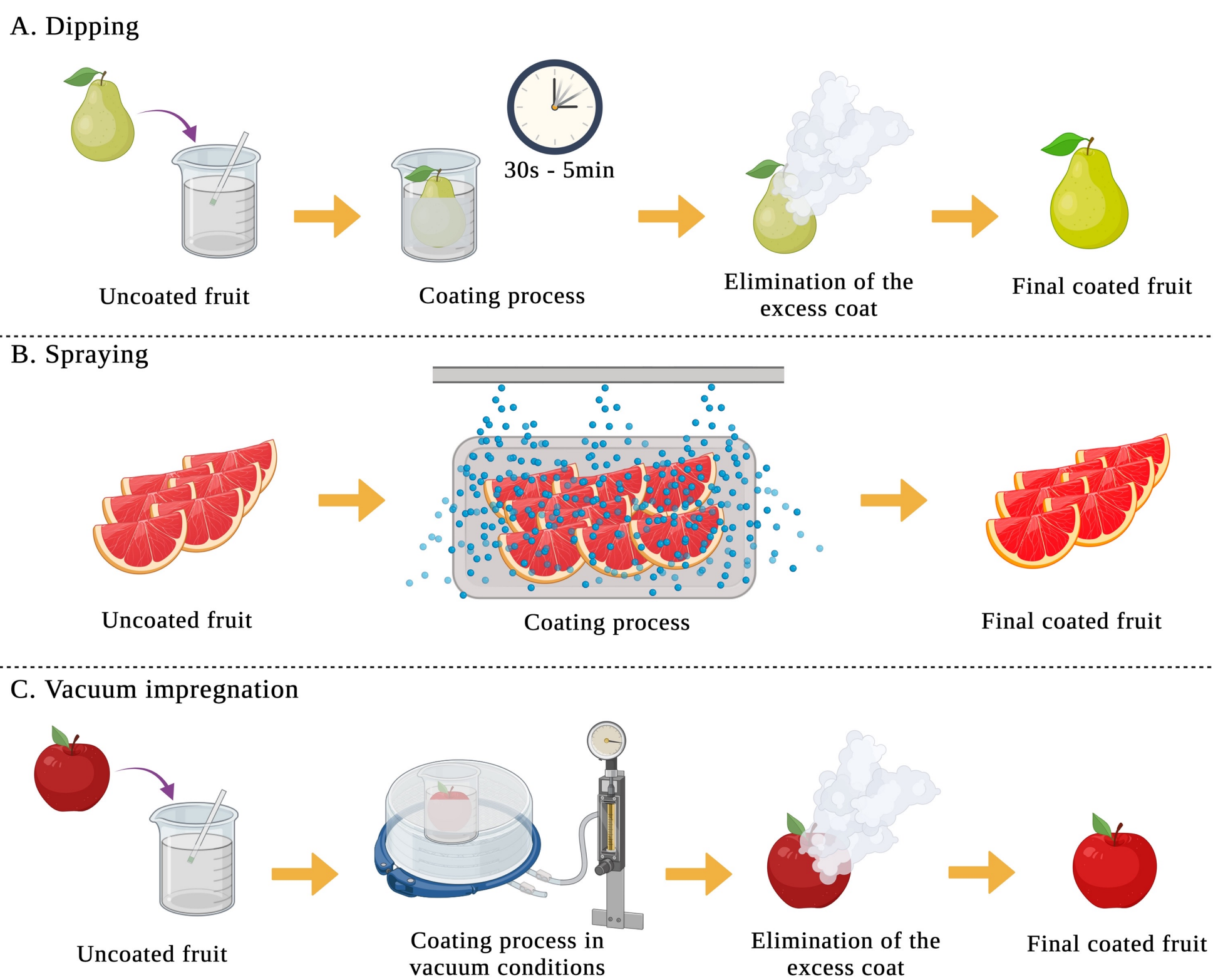


Figure 1. Schematic representation of the processes used for the coating application in fruits and vegetables.

II.B Food by-products as materials for edible coatings

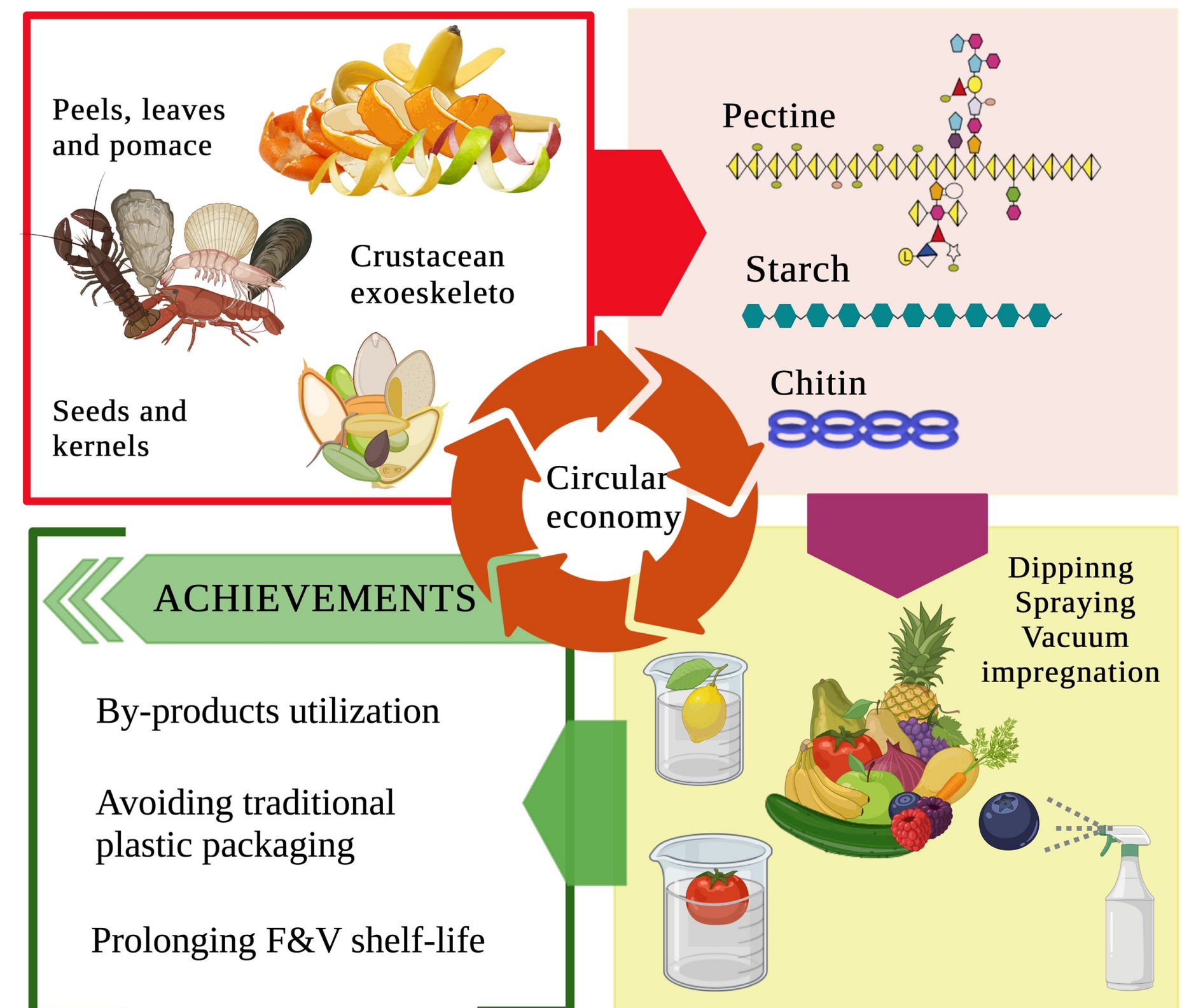


Figure 2. Application of food industry by-products as potential components to be used as edible coatings and films in fruits and vegetables.

II.C Functional improvement of coatings

Active component	Source/Component	Function/Activity
Essential Oil	Seeds, stems, flowers, fruits and leaves	Antimicrobial effect Antioxidant ↓ Weight loss
Nanoemulsions	Aqueous phase, oily phase and surfactant	↑ Bioavailability ↑ Chemical reactivity
Bionanocomposites	Chitosan, starch, cellulose	↓ Vapour and O ₂ penetration ↓ Weight loss
Nanoparticles	Inorganic molecules and elements (Ag, Fe, Ti, O ₂)	Antimicrobial effect ↑ Bioavailability

Figure 2. Principal components used for the improvement of edible coatings and their function.

CONCLUSIONS

Edible coatings serve as a viable **alternative to traditional plastic packaging**, especially in perishable products like fruits and vegetables.

Key drivers for the increased interest in edible coatings include: **the need to reduce food waste, consumer demand for fresh products, and growing environmental awareness.**

Edible coatings present a **promising opportunity** for the food industry to **extend shelf life of perishable goods** and **utilize food by-products** (e.g., pectin and chitosan) as biopolymers

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