VITAE, REVISTA DE LA FACULTAD DE CIENCIAS FARMACÉUTICAS Y ALIMENTARIAS
ISSN 0121-4004 / ISSNe 2145-2660. Volumen 23 número 1, año 2016
Universidad de Antioquia, Medellín, Colombia. págs. 9-10
DOI: http://dx.doi.org/10.17533/udea.vitae.v22n3a01

# EDITORIAL

## Development and application of edible coatings in minimally processed fruit

Desarrollo y aplicación de recubrimientos comestibles en frutas mínimamente procesadas

The consumer's interest to purchase safe, nutritious, minimally processed, and healthy food has increased consumption of various fruits and vegetables. Generally, the quality of fruits depends on nutritional, microbiological and organoleptic properties, all of which are exposed to dynamic changes during harvesting, storage, and marketing. These changes are mainly due to the interactions between the fruits and its surroundings or migration among different inner components, which can result in loss of moisture and some volatile compounds (1, 2).

The edible coatings technique is a good alternative to control some of these factors, it includes thin layers of edible materials formed directly onto the surface of the food that can be eaten as part of the whole product. Although edible coatings have been used for centuries to prevent moisture migration or to create a shiny surface for esthetic purposes; recently, there is considerable interest and more research on this application, driven to minimize the environmental impact of non-biodegradable materials and the increasing demand for minimally-processed foods (3, 4).

Edible coatings are made from various materials, such as polysaccharides (starch, cellulose, pectin, alginate), proteins (gelatin, casein, albumins), and lipids (beeswax, fatty acids). Usually, mixtures of these materials are used to take advantage of each constituent. Polysaccharides and proteins based edible coatings could form cohesive molecular networks by strong interactions between molecules, which provide good mechanical properties and barrier to gases, $O_2$ and $CO_2$ (5). However; generally, these are polar polymers, resulting in a matrix with low cohesion and high water vapor permeability. Different alternatives have been used to improve this property, including the addition of hydrophobic compounds as lipids, modifying the polymer network and addition of nanocomposites (6).

New matrices have been evaluated for coating fruit and minimally processed products; for instance, aloe vera mucilage has important biological, antimicrobial and antiviral properties. Aloe vera coatings have shown the capacity of reducing moisture loss, respiration rates, growth of microorganisms and oxidative browning in various fruits, such as strawberries, papaya and mango (7). Applying aloe vera coating on minimally processed mango (Tommy Atkins) has shown outstanding results, increasing shelf-life up to three days (8). Likewise, in Kiwi it has proved more efficient than other coating-forming matrices (alginate and chitosan), maintaining the sensory attributes, especially texture (7).

The coating process involves a humectation (wettability) of the fruit coated by the suspension, a possible penetration of the suspension into the fruit, followed by a possible adhesion between the suspension and the fruit. Wettability stage is important, because it is a measure of compatibility between the suspension and the fruit; it affects the coating's time and film thickness on the food surface (9). In order to develop and to apply edible coatings in fresh and minimally-processed fruits is very important to evaluate the physical properties of suspensions (density, viscosity and surface tension), because the mechanical, thermal, optical and barrier properties of the coatings are directly related to their microstructure developed.

To evaluate the efficacy and quality of edible coatings, different parameters of the storage-coated fruits can be determined, such as water loss, respiration rate, texture, color, concentration of microorganisms, pH, total acidity and content of soluble solids. Furthermore, these parameters should not affect flavor and surface appearance must be attractive in order to improve consumer acceptance (4). Edible coatings can be applied using various techniques such as dipping, panning, fluidized-bed coating and spraying. Spray coating is one of the most common methods applied to coat fruits at industrial levels, it has many advantages, such as control of thickness, uniform coating, no pollution and controlled temperature of the coating solution; furthermore, automation is facilitated in continuous processes (10). However, other methods of coatings used at industrial level should be examined, such as electro-sprays, micro-sprays and atomic layer deposition (2).

Finally; even though the great potential of fruit coatings, the progress of industrial applications is relatively limited. One of the factors limiting the development and implementation of this technology is the high number of variables that determine its effectiveness, which will have to be considered when selecting edible coating formulation. Additionally, edible coatings are developed and formulated for specific needs applied on food, which may limit their versatility and implementation in the industry.

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