PALM-BASED EDIBLE COATING (ElaeisCOAT) EXTENDS THE SHELF-LIFE OF FRUITS AND VEGETABLES

SITI HAZIRAH MOHAMAD FAUZI and ASTIMAR ABDUL AZIZ

814

MPOB INFORMATION SERIES • ISSN 1511-7871 • JULY 2019 MPOB TT No. 661

ElaeisCOAT is a palm-based edible coating developed to preserve the freshness of perishable produces, *i.e.*, fruits and vegetables, on supermarket shelves for a longer period.

Derived from non-toxic, edible and biodegradable materials, ElaeisCOAT forms a transparent thin layer film that reinforces the protective action of the natural skins in preventing water loss, colour changes, mechanical injuries, and even microbial spoilage, while providing shine to the surface.

This novel edible coating has the potential to substitute the widely used petroleum-based synthetic materials and application of fungicides. Therefore, MPOB has taken steps to diversify the potential uses of oil palm materials.

THE PRODUCT

How Does ElaeisCOAT Work?

In this invention, ElaeisCOAT constitutes of two key materials; (1) palm oil fraction (lipid) and (2) palm-based carboxymethyl cellulose (CMC) derived from oil palm empty fruit bunches (Fauzi and Abu Hassan, 2016). Palm oil in its original form cannot be used as a coating material because it cannot form a coating film upon exposure to air (Fauzi and Abu Hassan, 2017). Thus, palm oil fraction was combined with CMC for inherent coating film formation.

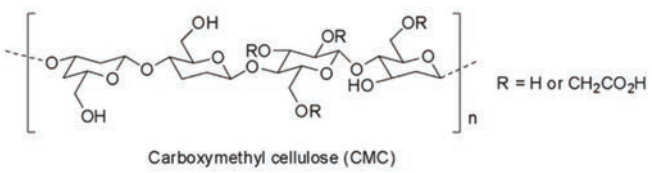

Figure 1. Structure of palm-based CMC.

CMC provides a uniform and stable matrix, and maintains high structural integrity during storage while imparting little gloss (Arnon *et al.*, 2014). This material can be obtained from oil palm empty fruit bunch, which is considered as a waste in palm oil mills (Soom *et al.*, 2004). Thus, emulsion of lipid-polysaccharide may pose good structural cohesion, imparted by the long-chain polymers and hydrorepellancy conferred by lipid (Cheng *et al.*, 2008).

Among the various biopolymeric materials currently available, cellulose derivatives such as CMC and methylcellulose (MC) are well-known for their good film-forming properties and clarity. Polysaccharides-based films have the desired gas barrier properties and could adhere to the surface of fruits or vegetables. On the other hand, the hydrophilicity of these films contributes to the increase of water permeability. In this situation, the incorporation of hydrophobic compounds such as a lipid to the films may be alternatively used to improve the moisture barrier properties (Diaz-Sobac *et al.*, 2002).

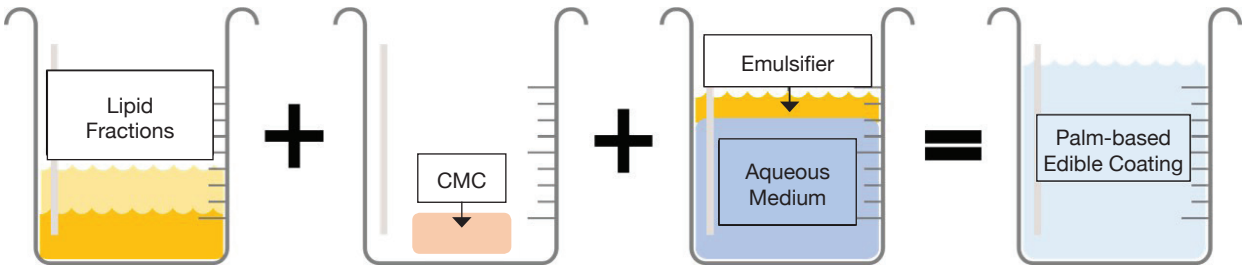

Figure 2. ElaeisCOAT combines two key components: lipid and polysaccharides.

ISSN 1511-7871
9 771511 787001

Head of Corporate Implementation and Consultancy Unit, Malaysian Palm Oil Board. 6, Persiaran Institusi, Bandar Baru Bangi, 43000 Kajang, Selangor, Malaysia.
Tel: 03-8769 4574 Fax: 03-8926 1337 E-mail: tot@mpob.gov.my Website: www.mpob.gov.my

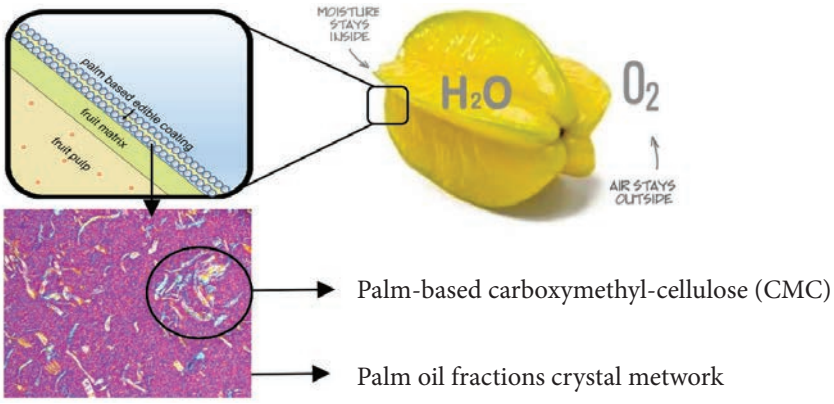

Figure 3. Microstructure of a palm-based edible coating (ElaeisCOAT) captured using Polarised Light Microscope (PLM) with magnification of 200X at 20°C.

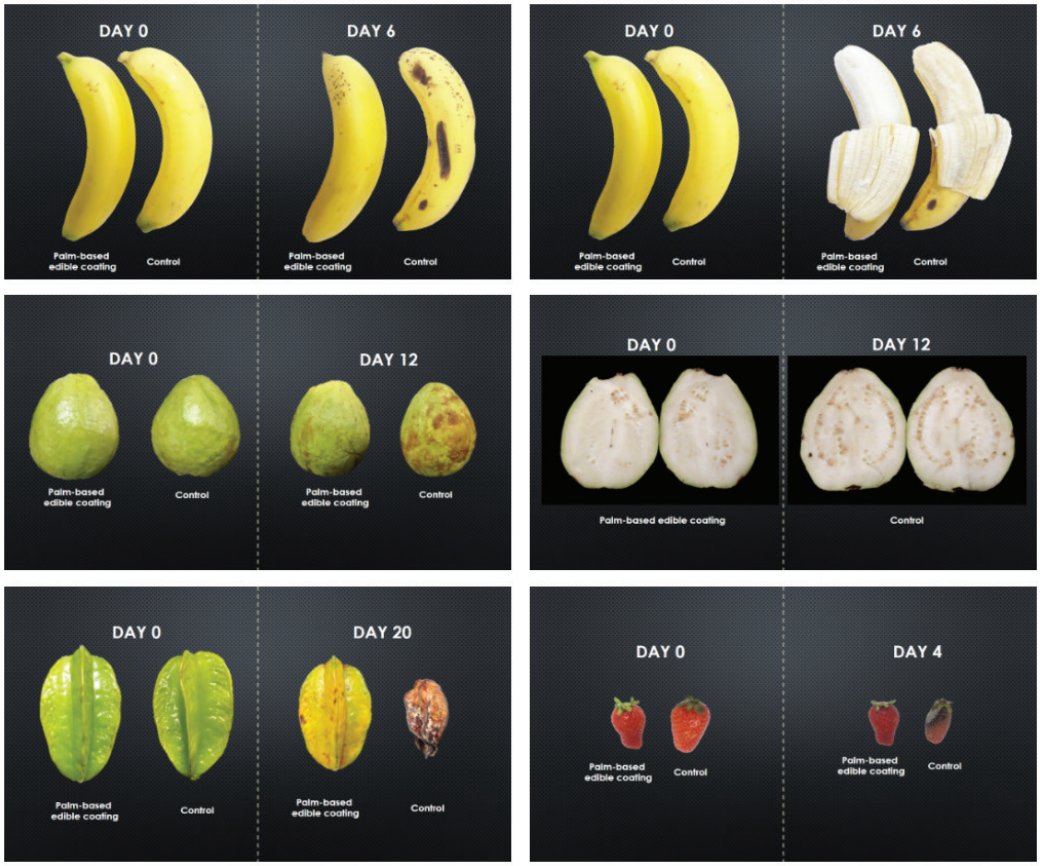

Figure 4. Effect of ElaeisCOAT on physical appearance of fruits during storage (24 ± 1°C, RH 88%-85%) compared to untreated (control).

Visual Appearance of Fruits

Compared to untreated fruits (control), ElaeisCOAT is effective in maintaining a better physical visualisation until the end of the storage period. ElaeisCOAT also successfully retained the colour changes of fruits for longer period, and significantly extended the post-harvest shelf-life of fresh fruits by limiting the penetration of pathogens as a barrier.

NOVELTY OF THE PRODUCT

In comparison to the untreated produces and existing synthetic coating, ElaeisCOAT offers:

- Extension of post-harvest shelf-life of fresh produces.
- Homogenous and maintain its stability when exposed to cold storage and shelf-life conditions.

- Easy to prepare, requires no harmful solvents such as ammonia and sulphur acid
- Translucent in colour, non-sticky, dry well and covers the fruit surface adequately.
- Safe and biodegradable.

BENEFITS AND ADVANTAGES

- ElaeisCOAT is formulated from renewable and non-toxic materials as an alternative to synthetic and petroleum-based waxes as commercial fruit coatings.
- Derived from cost-effective, abundant and readily available plant-based materials (palm oil fractions and palm-based cellulose).
- Simple and proficient technology compared to other preservation techniques (application of fungicides, modified atmosphere packaging, irradiation treatment) that are more expensive and has raised some health concerns.

ECONOMIC ANALYSIS

The estimated investment cost of producing ElaeisCOAT using our technology is given below based on a plant capacity of 144 000 kg yr^{-1}:

TABLE 1. ECONOMIC ANALYSIS OF ElaeisCOAT TECHNOLOGY

Economic analysis	Value
Net present value (NPV) @ 10%, RM	8 681 882
Internal rate of return (IRR), %	153.55
Discounted payback period, years	0.8
Discounted BC ratio	1.18

REFERENCES

Arnon, H; Zaitsev, Y; Porat, R and Poverenov, E (2014). Effects of carboxymethyl cellulose and chitosan bilayer edible coating on postharvest quality of citrus fruit. *Postharvest Biology and Technology*, *87*: 21-26.

Cheng, L H; Karim, A A and Seow, C C (2008). Characterisation of composite films made of konjac glucomannan (KGM), carboxymethyl cellulose (CMC) and lipid. *Food Chemistry*, *107(1)*: 411-418.

Diaz-Sobac, R; García, H; Beristain, C I and Vernon-Carter, E J (2002). Morphology and water vapor permeability of emulsion films based on mesquite gum. *J. Food Processing and Preservation*, *26(2)*: 129-141.

Soom, R M and Ab Gapor, M D Top (2004). Production of carboxymethyl cellulose (CMC) from oil palm empty fruit bunch (EFB). *MPOB Information Series No. 228*.

Siti Hazirah Mohamad Fauzi and Noor Armylisas Abu Hassan (2016). Palm-based materials: Renewable resources for film and coating technology. *Palm Oil Developments No. 65*: 7-11.

Siti Hazirah Mohamad Fauzi and Noor Armylisas Abu Hassan (2017). Nanomaterials-Recent advancements in edible coating technology. *Palm Oil Developments No. 66*: 1-4.

For more information, kindly contact:

Head of Corporate Implementation
and Consultancy Unit, MPOB
6, Persiaran Institusi,
Bandar Baru Bangi,
43000 Kajang, Selangor, Malaysia
Tel: 03-8769 4574
Fax: 03-8926 1337
E-mail: tot@mpob.gov.my
www.mpob.gov.my