

EXPRESSION OF INTEREST FOR TECHNOLOGY TRANSFER

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**DEVELOPMENT OF BIODEGRADABLE FILMS FROM
HIBISCUS ROSA-SINENSIS LINN. (MALVACEAE) MUCILAGE BASED
COMPOSITES**

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Patent Application & priority date

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Patent Grant date:19/10/2022

Brief description of the patent (Abstract):

Development of Biodegradable Films from *Hibiscus rosa-sinensis* Linn. (Malvaceae) Mucilage Based Composites

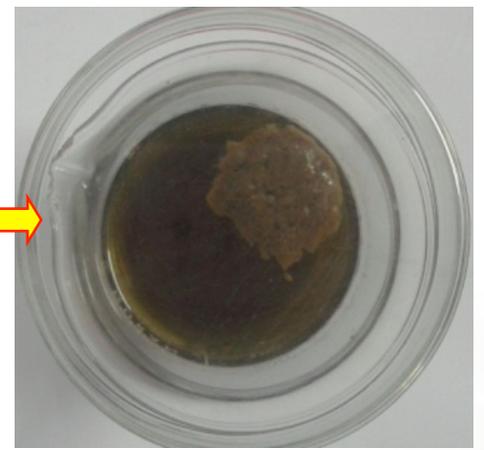
The present invention relates to the preparation of a biodegradable, edible film forming suspension comprising, *Hibiscus rosa-sinensis* mucilage, gelatin, chitosan, cassava starch, acetic acid and glycerol. The prepared film from the suspension showed ideal properties of folding endurance, tensile strength, percent elongation, water vapour barrier properties, light transmittance, moisture content, antibacterial activity and transparency and further could be used as food packaging wrappers. The suspension could be used as a coating for fruits to enhance shelf life.

Graphical abstract:

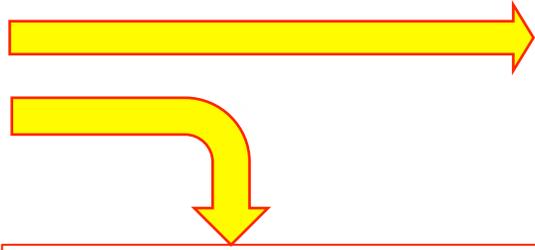
Additives
Gelatin,
Chitosan,
Cassava starch,
Acetic acid and
Glycerol



Hibiscus rosa-sinensis
leaves



Precipitated mucilage



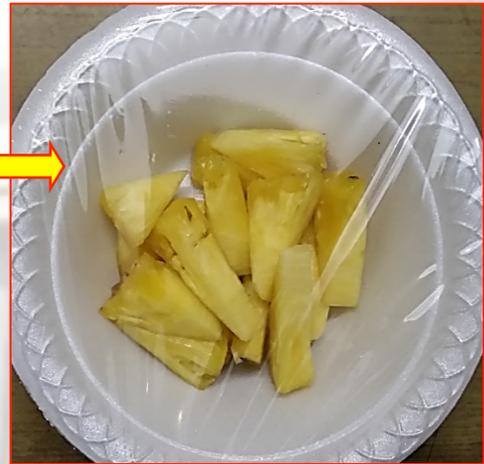
Edible film formed from
the suspension mixture



Tomatoes coated with film forming suspension



Fresh cut fruits coated with film wrappers



Novelty of the invention:

The development of a novel biodegradable and edible film forming suspension from the commonly available plant source, *Hibiscus rosa-sinensis* along with easily available additives for possible utility as packaging material for fresh produce.

Utility of the invention:

The films can be used as edible and biodegradable packing wrappers for fresh fruits and cut fruits.

The film forming suspension can be used for coating whole fruits and thereby increase their shelf life.

As the edible biofilms have ideal properties, these can be used as a potential packaging material by the food industry and thereby replace harmful synthetic plastics

Edible, biodegradable and hence ecofriendly.

Non-obvious nature of the invention:

The constituents and the proportion of the constituents used in the preparation of the film suspension/films are novel. The combination of source materials has not been used previously to show the properties reported here.

Additional benefits of the developed product.

(i) The components blended smoothly and got integrated suitably to produce the desired effect

(ii) Films developed possess increased antibacterial activity and mechanical strength. They are thin, smooth, transparent and light weight. The films have nearly zero UV transmittance.

Results: *Hibiscus rosa-sinensis* Linn. is a perennial shrub, native to tropical Asia. The plant contains mucilage and has been exploited by the pharmaceutical industry for various purposes. The present study focuses on the extension of its use in food industry with reference to the production of edible biodegradable films. A novel combination of film forming suspension based on biologically derived materials has been standardized. The composite basically contains a mixture of *Hibiscus rosa-sinensis* leaf mucilage, cassava starch, gelatin and chitosan. All the components employed in the current formulation serve as edible components in the food industry.

Results:

The suspension was subjected to wet solvent processing method to prepare films on a small scale. Ideal films of desirable thickness could be prepared by varying the volume of casting suspension. The developed films were subjected to physico-chemical characterisation and the developed films showed ideal properties for most of them, including folding endurance, tensile strength, per cent elongation, water vapour barrier properties, light transmittance and moisture content. The prepared films were found to be transparent which is best for product visibility. FTIR spectral studies indicated increased interactive stability in the mucilage based film. The film forming suspensions were also found to exhibit antibacterial activity.

Results:

Fruit shelf-life could be extended when fruits were coated with the film forming suspensions. The films were also studied for their application as wrappers in packaging of cut-fruits. Thus, it could be concluded that films loaded with the mucilage of *Hibiscus rosa-sinensis* have ideal properties to be used as a potential packaging material for food industry.

Clauses applied for /protected (for granted patents):

1. A biodegradable, edible film forming composition comprising a suspension comprising.
 - a) 0.5 g of *Hibiscus rosa-sinensis* mucilage in 100ml distilled water,
 - b) 1g of gelatin in 100 ml distilled water;
 - c) 0.5 g of chitosan in 100 ml of 5% acetic acid;
 - d) 0.5g of cassava starch in 100ml distilled water; and
 - e) 0.5ml of glycerol as plasticiser;wherein the said suspension is made upto 500 ml using distilled water.
2. A biodegradable, edible film prepared by casting a suspension on suitable trays and keeping in a hot air oven at 50°C, wherein the suspension comprising a) 0.5 g of *Hibiscus rosa-sinensis* mucilage in 100ml distilled water; b) 1g of gelatin in 100 ml distilled water; c) 0.5 g of chitosan in 100 ml of 5% acetic acid; d) 0.5g of cassava starch in 100ml distilled water and e) 0.5ml of glycerol as plasticiser and made upto 500 ml using distilled water.
3. The biodegradable, edible film as claimed in claim 02, wherein the film possesses physico chemical characteristics of transparency, lower water vapour permeability (WVP) values, resembled as fine quality plastic with folding endurance, greater tensile strength, percent elongation and increased stability.

Clauses applied for /protected (for granted patents):

4. The biodegradable, edible film as claimed in claim 02, with average thickness of 50 microns.
5. The biodegradable, edible film as claimed in claim 02, having antibacterial activity.
6. The biodegradable, edible suspension as claimed in claim 01, for coating fruits to enhance their shelf life.
7. A wrapper for packaging food materials produced from the biodegradable, edible film as claimed in claim 02.
8. The wrapper for packaging food materials as claimed in claim 07, wherein said food materials include, but are not limited to fresh cut fruits, cut or fresh vegetables.

Fields where the patent finds application:

Could have application in the Food sector

The edible films can serve as a biodegradable packaging material



Whether the work has been published:
(Authors, year, title of publication, Journal name, volume, page no)

1. Vignesh RM and Bindu R Nair (2019). Improvement of shelf life quality of tomatoes using a novel edible coating formulation. *Plant Science Today* (<https://doi.org/10.14719/pst.2019.6.2.443>) ISSN: 2348-1900 April 2019
2. Vignesh RM and Bindu R Nair (2018). Development and characterisation of edible films based on the mucilage of *Hibiscus rosa-sinensis* Linn. (Malvaceae) *IJCRT* Volume 6 (2): 542-555 April 2018 ISSN: 2320-2882 <https://www.ijcrt.org/papers/IJCRT1892084.pdf>

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