

Functionality of mangosteen pericarp extract – the impact of food processing

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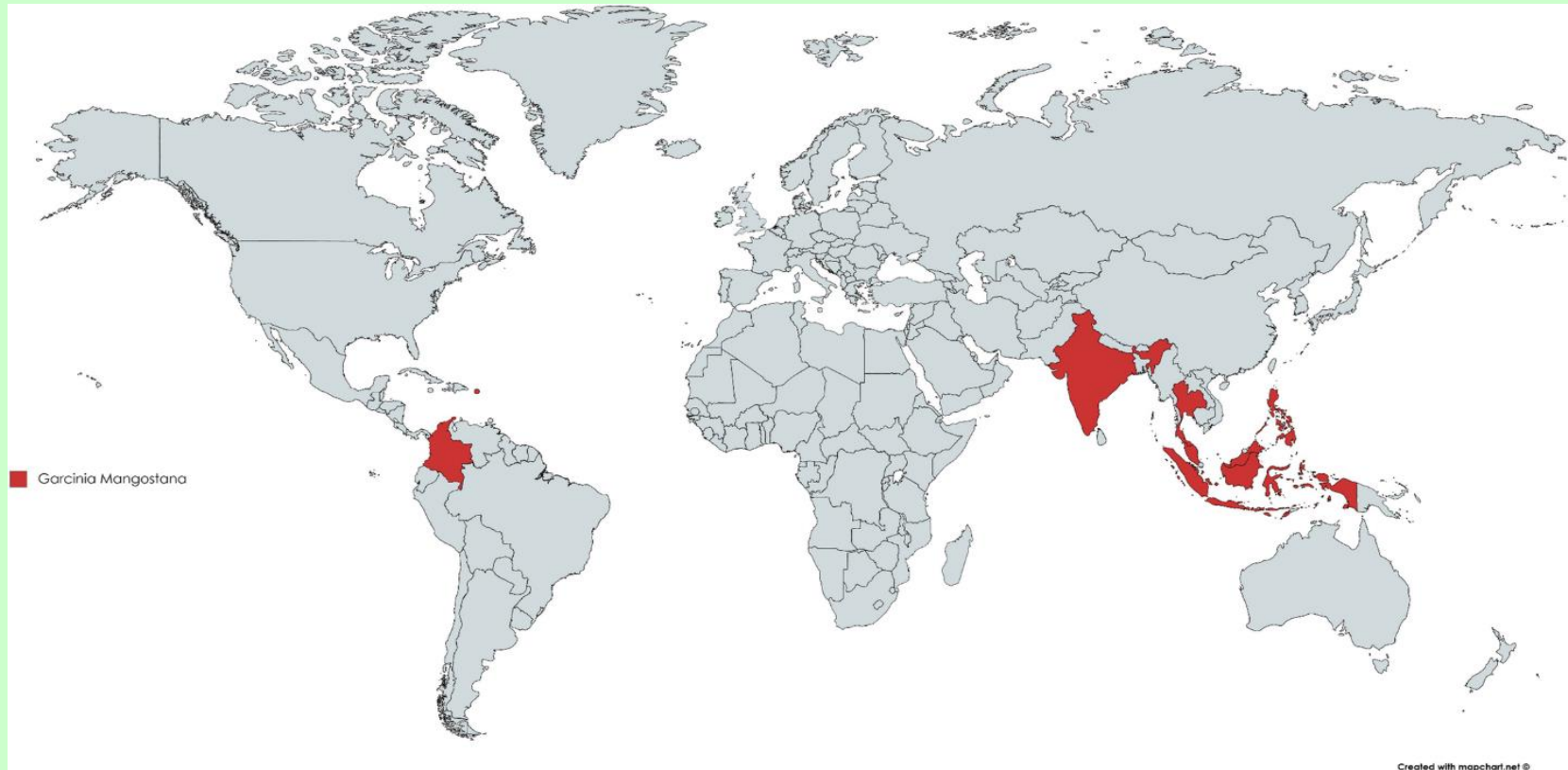
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NutriClaim BV

- Health Claim & Novel Food Consultancy
 - EU Food Legislation
 - Since December 2006
 - Netherlands-based
-
- Project: EU-marketing authorization Mangosteen pericarp extract as a Novel Food.

Mangosteen - (*Garcinia mangostana*)

Global Occurrence



Mangosteen

- Mangosteen (*Garcinia mangostana* Linn.) is the finest fruit of the world it has high potential for both domestic and export markets.
- The fruits dark violet or deep brownish-purple skin and white edible portion make it one of the most valuable fruits of the tropics.
- It is consumed fresh and also in processed forms.
- Mangosteen *is* known as "Queen of Fruits" belongs to family Guttiferae.
- Its origin is in Malasya and can now be found in many tropical countries.
- In India, *it is* generally cultivated in the lower elevations of Nilgiri hills and to a limited extent in Kerala and West Bengal.

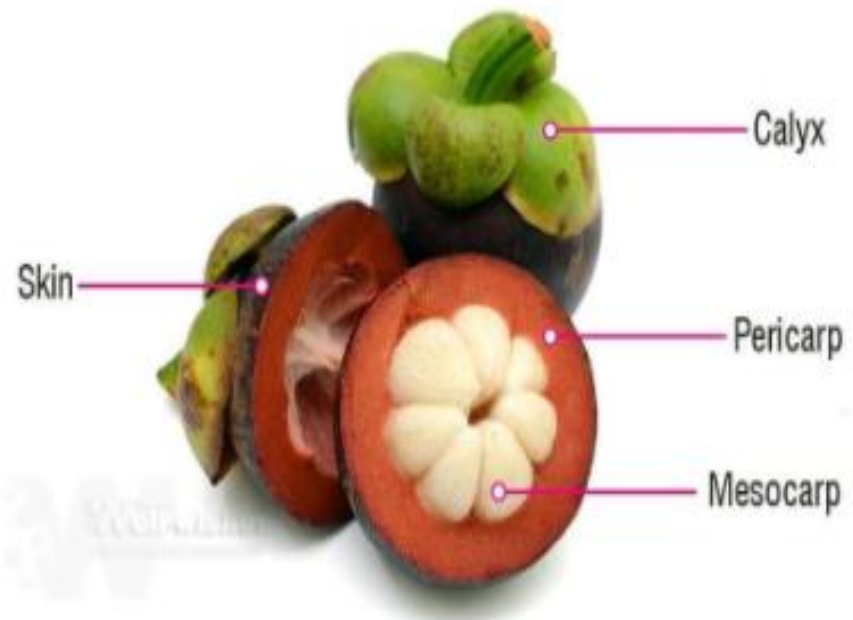
Origin of Mangosteen

- Mangosteen (*Garcinia mangostana* L.) is a tree, 6–25 m
- thought to originate in Southeast Asia.



Mangosteen fruit

The mangosteen fruit is reddish/dark purple with a juicy, soft, edible pulp and delectable taste



Pericarp of Mangosteen

Traditionally, cure for:

- chronic intestinal catarrh and dysentery
- respiratory disorders
- skin infections
- Relieve of diarrhea
- astringent

Extract of Mangosteen pericarp

Several biological activities were reported for the pericarp extract of *G. mangostana*:

- antioxidant
- antimicrobial
- antidiabetic
- antiproliferative antitumor activities

Mangosteen pericarp extract

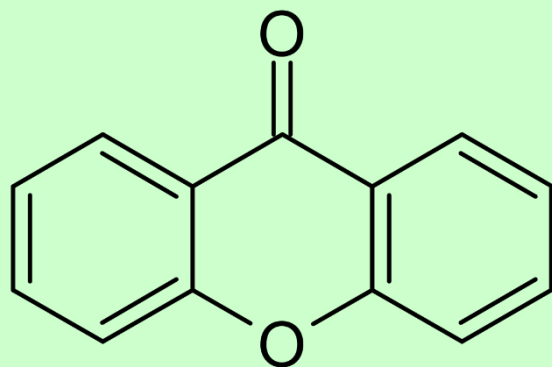
Biological activities of herbs/crops are related to their phytochemical constituents.

Biological activities (mainly Xanthones) of *G. mangostana* are significantly correlated with the concentration of α -mangostin

The extraction process of α -mangostin from the mangosteen pericarp is critical:

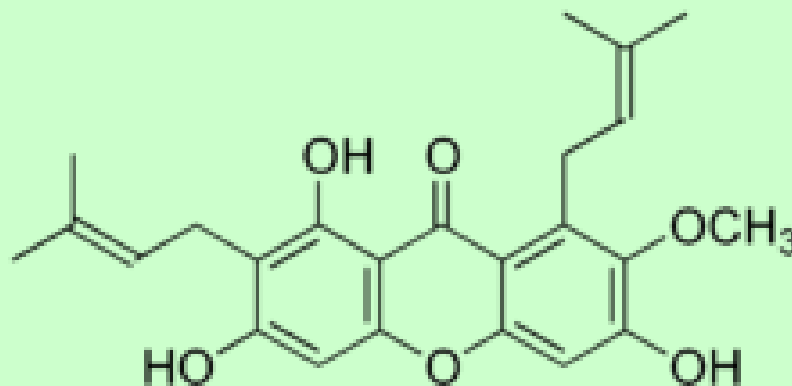
- the polarity and concentration of extraction solvents

Bioactives



Xanthone

α -mangostin



Extraction methods

There are many extraction techniques to recover bioactive xanthenes from mangosteen pericarp.

Most of the conventional extraction methods such as maceration in water bath method consume a high quantity of solvent and extended extraction time.

Extraction methods

- various advanced extraction techniques have shown high capability to extract α -mangostin compound from mangosteen pericarp.
- Supercritical carbon dioxide (SC-CO₂) method
- Ultrasound-assisted extraction
- **Microwave-assisted extraction (MAE)**
- However, methods primarily tested on a lab scale

α -mangostin extraction from pericarp

To extract on a large scale, an essential step is the optimization of the variables that are critical in the extraction process to obtain the maximal yield of the targeted compound.

α -mangostin extraction from pericarp

Previously, only two optimized extraction methods - the supersonic wave and the supercritical CO₂ method

Setback: specific equipment required to extract α -mangostin.

α -mangostin extraction from pericarp

In recent years, a microwave extraction method was developed for the extraction of bioactive compounds from herbs.

Finding a simple method with a higher extraction yield such as the microwave extraction method could be useful for extracting α -mangostin from the mangosteen pericarp on a large scale

Microwave-assisted extraction (MAE)

Critical parameters:

- solvent types
- solvent volume
- power
- temperature
- irradiation time
- size of raw material

Microwave-assisted extraction (MAE)

many studies have attempted to extract optimum yield extraction via advanced methods, the condition at which the optimum antioxidant-rich extract obtained has not been fully reported.

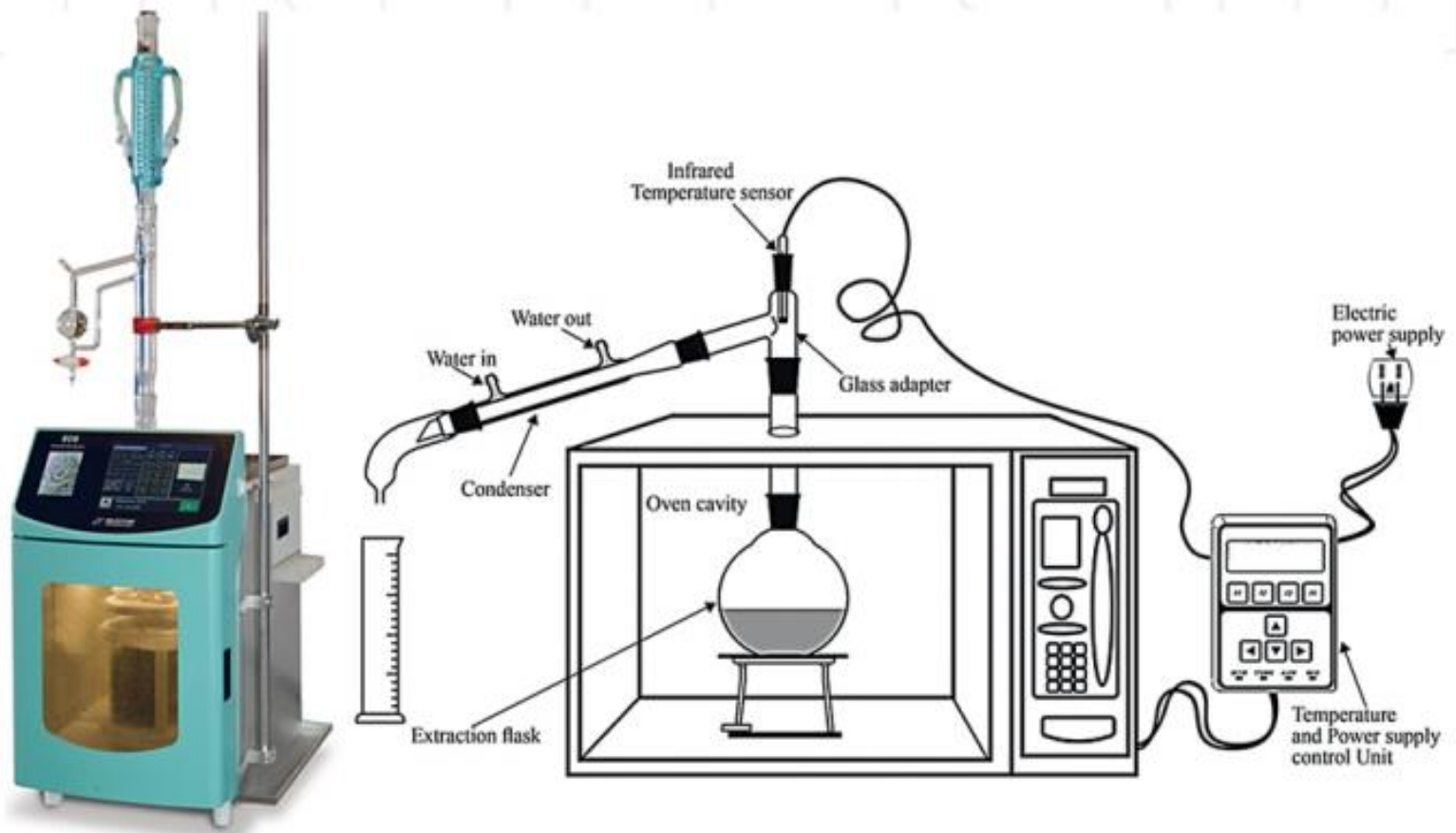
Response Surface Methodology (RSM)

RSM is a multivariate statistical technique applied in the optimization of analytical methods.

Optimization refers to improving the performance of a system, a process, or a product in order to obtain the maximum benefit from it.

Microwave-assisted extraction (MAE)

Nor Azizah Mohammad et al. (2019) investigated the optimum MAE extraction conditions by using response surface methodology (RSM) for the high recovery of antioxidant-rich xanthenes from mangosteen pericarp.



Schematic representation of a microwave-assisted extraction equipment used at laboratory scale.

MAE is a simple, environmentally friendly, and efficient alternative to conventional extraction techniques

Microwave-assisted extraction (MAE)

For industrial application, the obtained models can be the basis for pilot-scale in operating MAE as a green and safer extraction technology for the extraction of antioxidant compounds from bio-waste, mangosteen pericarp.

RSM optimized Microwave-assisted extraction (RSM-MAE)

In conclusion:

RSM-MAE is a sustainable technology that can also be applied in the enhancement of stability of high-value α -mangostin to produce and develop the potent natural antioxidant for functional food (and pharmaceutical) applications.

A vibrant landscape featuring a large field of tulips in various colors (yellow, orange, red, pink, purple) in the foreground. In the background, a traditional Dutch windmill stands on a grassy hill under a blue sky with scattered white clouds. A white fence and a small building are visible in the distance.

Thank you!

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