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Antiaging Properties of Topical Cream Formulas with Active Ingredients of Pegagan Leaves and Merbau Wood Extracts and Its Nanophytosomes

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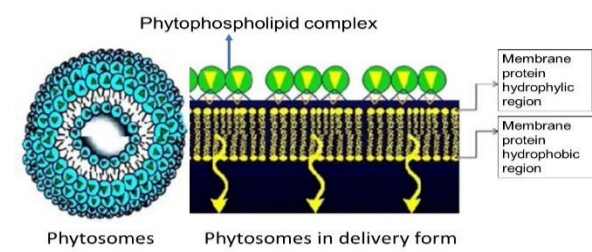
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INTRODUCTION

The whole tree utilization and multi-business of forestry can increase the efficiency and value-added of the forest products

Previous research has shown that the ethanol extract of merbau wood (*Intsia sp*) has antioxidant and skin lightener (antityrosinase) activities and pegagan leaves (*Centella Asiatica L*) extract have the activity of sunscreen and improves skin elasticity.

Nanophytosomes is nanotechnology currently in use for their enhanced delivery of phyto compounds in skincare



Kumar et al. 2020



> 80% of the active ingredients in antiaging cosmetics are synthetic, side effects and imported



The antiaging cosmetics with natural active ingredients are growing, but 90% of them on the market have not been scientifically tested



The research purposes :

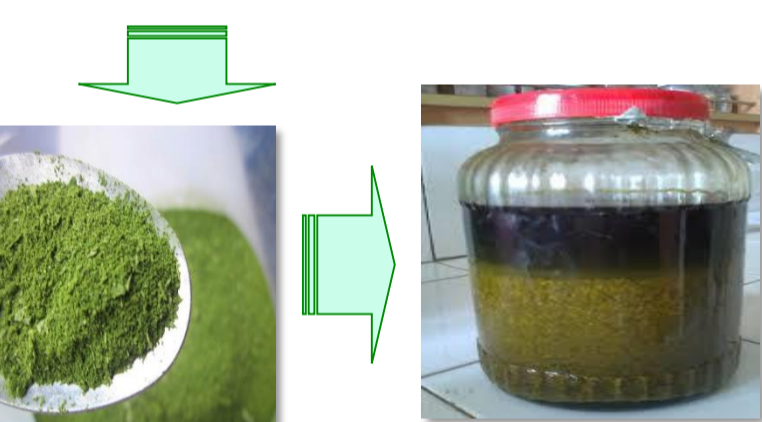
- Analyze the chemical content and determine the in-vitro antiaging properties of the extract of merbau wood extract (*Intsia sp.*) (MWE) and pegagan leaf extract (*Centella Asiatica L*) (PLE) and its phytosomes.
- Determine the in-vitro antiaging properties of topical cream formulas with the active ingredients of MWE, PLE, a combination of MWE + PLE, and combination of its phytosomes.

METHOD

1. Extracts preparation

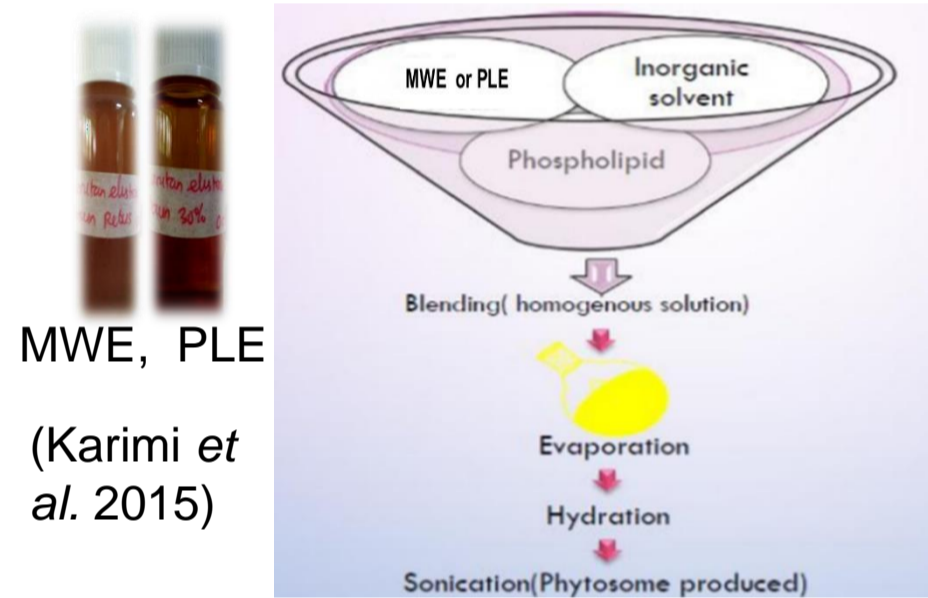


Merbau wood from Papua
Pegagan leaves from Bogor



powder: 40-60 mesh
Maceration 3x@ 24 hours
Solvent : ethanol

2. Nanophytosome preparation



MWE, PLE
(Karimi et al. 2015)

Determination:

- Yield
- Phytochemical Analysis by LCMS
- In-vitro anti-aging properties: Antioxidant (DPPH and CUPRAC), Sun Protection Factor (SPF), antityrosinase Assay

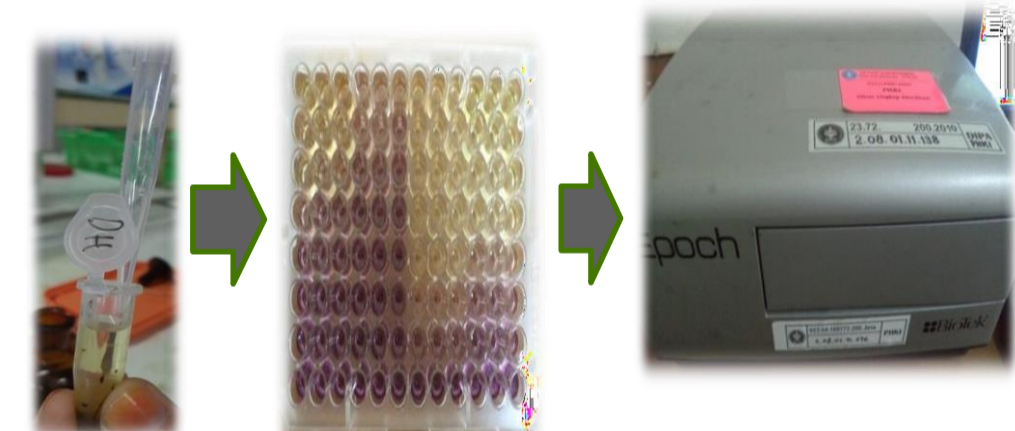
3. Topical cream formulation

| Kind of Formula | Active Ingredients |
|-----------------|---------------------------|
| 1 | MWE |
| 2 | PLE |
| 3 | MWE + PLE A |
| 4 | MWE + PLE B |
| 5 | MWE + PLE C |
| 6 | Nanophytosome MWE + PLE A |
| 7 | Nanophytosome MWE + PLE B |
| 8 | Nanophytosome MWE + PLE C |

4. Determination of the in-vitro antiaging properties of Formulas

In-vitro anti-aging properties:

- Antioxidant (DPPH and CUPRAC)
- Sun Protection Factor (SPF)
- Antityrosinase Assay



In-vitro test in microplate
Absorbance measurement with Elisa reader

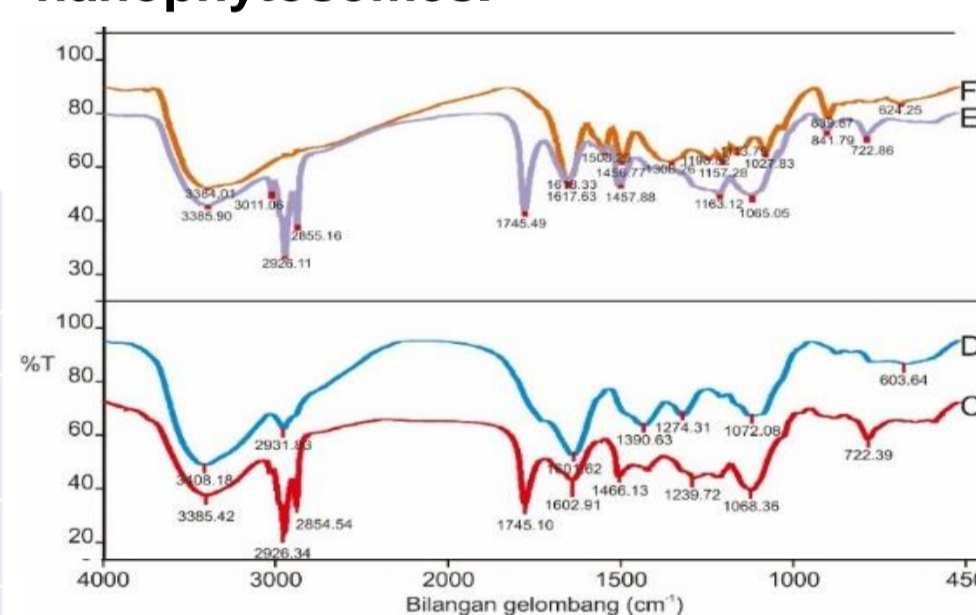
RESULT

The yield and in-vitro antiaging properties of the MWE and PLE extracts and its nanophytosomes.

| Parameter | Kind of extract | | Kind of phytosome | |
|-------------------------------|-----------------|-----------------|-------------------|-----------------|
| | MWE | PLE | MWE | PLE |
| Yield (%)w/w of dry weight | 15.6±1.5 | 19.5±1.5 | 73.3±0.1 | 91.8±0.1 |
| Antioxidant* µmol trolox/g | | | | |
| a. DPPH | 69.3±0.3 | 36.3±1.5 | 66.8±0.0 | 81.7±0.0 |
| b. CUPRAC | 862.9±0.7 | 657.0±0.4 | 1187.7±0.1 | 300.2±0.0 |
| Sunscreen* (SPF) | 14.1± 0.4 | 18.5±0.4 | 11.1±0.0 | 16.4±0.1 |
| Antityrosinase** (ppm) | 15.7±0.4 | >2000.0 | 23.4±1.0 | >2000.0 |

Note: * : Greater value means more active
** : Smaller value means more active
the antityrosinase of kojic acid (synthetic active ingredient) with IC₅₀ of 32.06 ppm

FTIR Profile of the MWE, PLE, and its nanophytosomes.



Note: C : Phytosome of PLE D: PLE
E : Phytosome of MWE F: MWE

The FTIR chromatogram shows the shift in the wavenumber between the spectrum of extracts and phytosomes. This shows that phytosomes occur the interaction between extracts and lecithin by forming complex bonds.

The chemical content of Extract and Phytosomes

| Name of the compound | Relative concentration (%) | |
|----------------------|----------------------------|-----------|
| | Extract | Phytosome |
| PLE | | |
| Madecassoside | 3.77 | 5.09 |
| Asiaticoside | 14.00 | 14.98 |
| Asiatic acid | 18.78 | 16.07 |
| MWE | | |
| Resorcinol | 28.69 | 30.44 |
| Robidanol | 3.01 | 4.37 |
| Benzoid acid | 15.56 | 18.97 |

The in-vitro antiaging properties of topical cream formulas

| Kind of Formula | Antioxidant* (µmol trolox/g) | | SPF* | Antityrosinase (ppm)** |
|----------------------|---------------------------------|--------------|-------------|------------------------|
| | DPPH | CUPRAC | | |
| 1 | 53.4 | 135.9 | 7.8 | >2000.0 |
| 2 | 39.7 | 67.2 | 4.5 | >2000.0 |
| 3 | 81.5 | 112.8 | 5.7 | >2000.0 |
| 4 | 84.2 | 117.8 | 7.9 | >2000.0 |
| 5 | 81.6 | 121.1 | 12.6 | 1879.9 |
| 6 | 66.1 | 106.5 | 4.9 | >2000.0 |
| 7 | 72.7 | 95.4 | 5.3 | >2000.0 |
| 8 | 61.3 | 108.3 | 4.7 | >2000.0 |
| Day cream commercial | 61.2 | 107.2 | 14.3 | >2000.0 |

Note: * : Greater value means more active
** : Smaller value means more active

CONCLUSION

- The highest antioxidant, sunscreen, and antityrosinase activities are the phytosome of PLE against DPPH, the phytosome of MWE against CUPRAC, the PLE, and the MWE, respectively.
- The PLE contains madecassosides, asiaticoside, and asiatic acid, while the MWE contains resorcinol, robidanol, and benzoic acid. The FTIR chromatogram confirms the phytosome formation formed from a complex bond between extract and lecithin
- The best cream formula is F5. This formula has higher antioxidant activity against DPPH (81.6 µmol trolox/g) and CUPRAC (121.1 µmol trolox/g) and antityrosinase activity (1879.9 ppm) than the commercial day creams. But, this formula has an SPF value lower than the commercial day creams.

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- Karimi N, Ghanbarzadeh B, Hamishehkar H, Keivani F, Pezeshki A, Gholian MM. 2015. Phytosome and liposome: the beneficial encapsulation systems in drug delivery and food application. *Appl Food Biotechnol* 2(3):17-27

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Declaration of conflict

No potential conflict of interest was reported by the authors.