Product for skin brightening, anti-inflammation

SCOTI-HORSETAIL

Scottish novel cosmetic ingredient

the garden of naturalsolution

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PLANT STORY

Equisetum fluviatile commonly known as water horsetail or swamp horsetail grows well in shallow water or swamps. *Equisetum* means ‘horsetail’ and *fluviatile*, the species name, means ‘growing in rivers’ in Latin. *E. limosum*, *E. heleocharis*, and *E. maximum* are synonyms of *E. fluviatile*. It is abundant in Great Britain, particularly in Scotland. It is often confused with marsh horsetail (*E. palustre*). Water horsetail has hollow stems and lacks proper leaves and flowers. The stems contain the constituents used in skin care and the dried stems are used as an herb tea.

PLANT STORY

Medicinally, water horsetail was used as treatment for eye infections and for skin problems. However, scientific research on its pharmaceutical effects or nutritional benefit has still to be done. Chemical analysis of its constituents identified protoapigenine, protoapigenone, protogenkwanone, and their derivatives. Another study on its phenolic compounds suggested anti-oxidant and anti-microbial activities.

RESEARCH PROJECT IN SCOTLAND

Royal Botanic Garden Edinburgh

The collaborative research project between Natural Solution and Royal Botanic Garden Edinburgh was started in 2012. The aim of the research is to develop novel ingredients for skincare products using Scottish plants.

The traditional medicinal use and modern knowledge of Scottish plants were surveyed followed by plant cultivation in Scotland as most of the plants in the research are not commercially available. Cultivated plants were then scientifically studied to find new efficacies and skin benefits.

CULTIVATION IN SCOTLAND

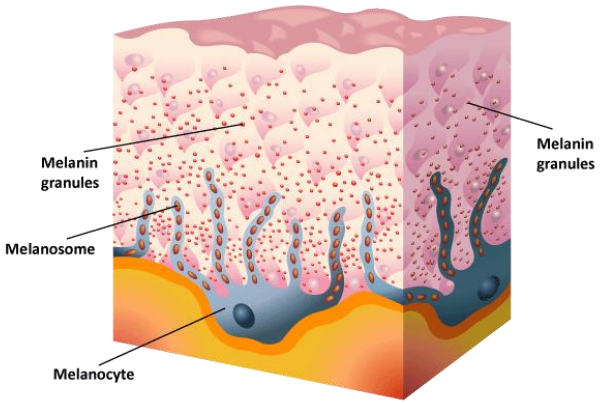
Equisetum fluviatile is grown and harvested in Scotland.

IN VITRO EFFICACY EVALUATION

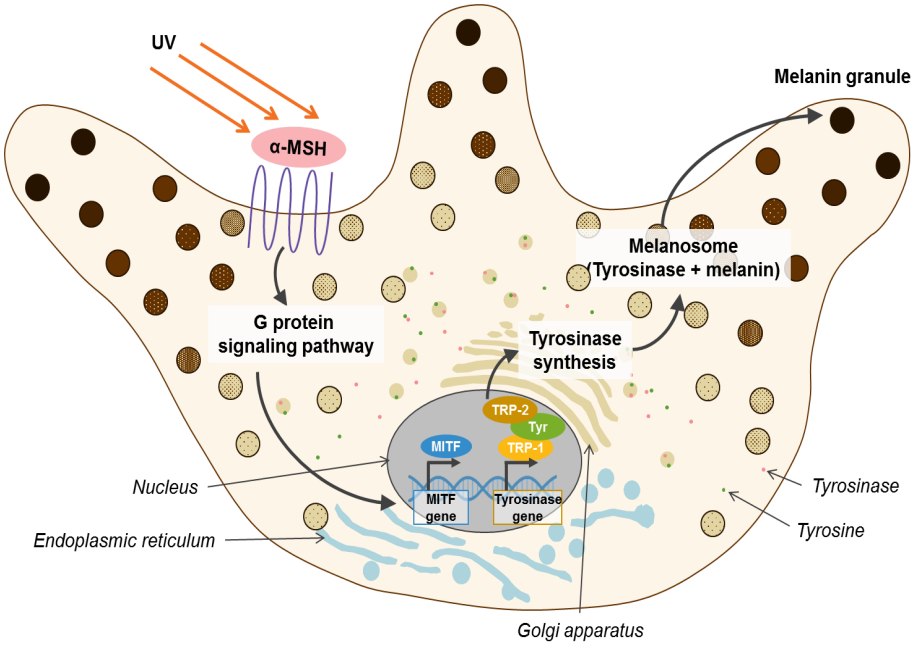
- Skin Brightening Efficacy
  - Melanin Synthesis Inhibition Activity
  - Tyrosinase Expression Inhibition Activity
- Anti-inflammatory Efficacy
  - NO Synthesis Inhibition Activity

SKIN PIGMENTATION

Melanin plays an important role in protecting human skin from the harmful effects of UV sun radiation and in scavenging toxic drugs and chemicals. Melanin is synthesized in melanocytes located at the dermal/epidermal border. Epidermal melanocytes occur at an approximate ratio of 1:10 among basal keratinocytes and distribute the melanin they produce to approximately 40 overlying suprabasal keratinocytes via their elongated dendrites and cell-to-cell contacts. Skin pigmentation problems, such as melasma, freckles, age spots and dark spots, are caused by the abnormal accumulation of melanin in keratinocytes.

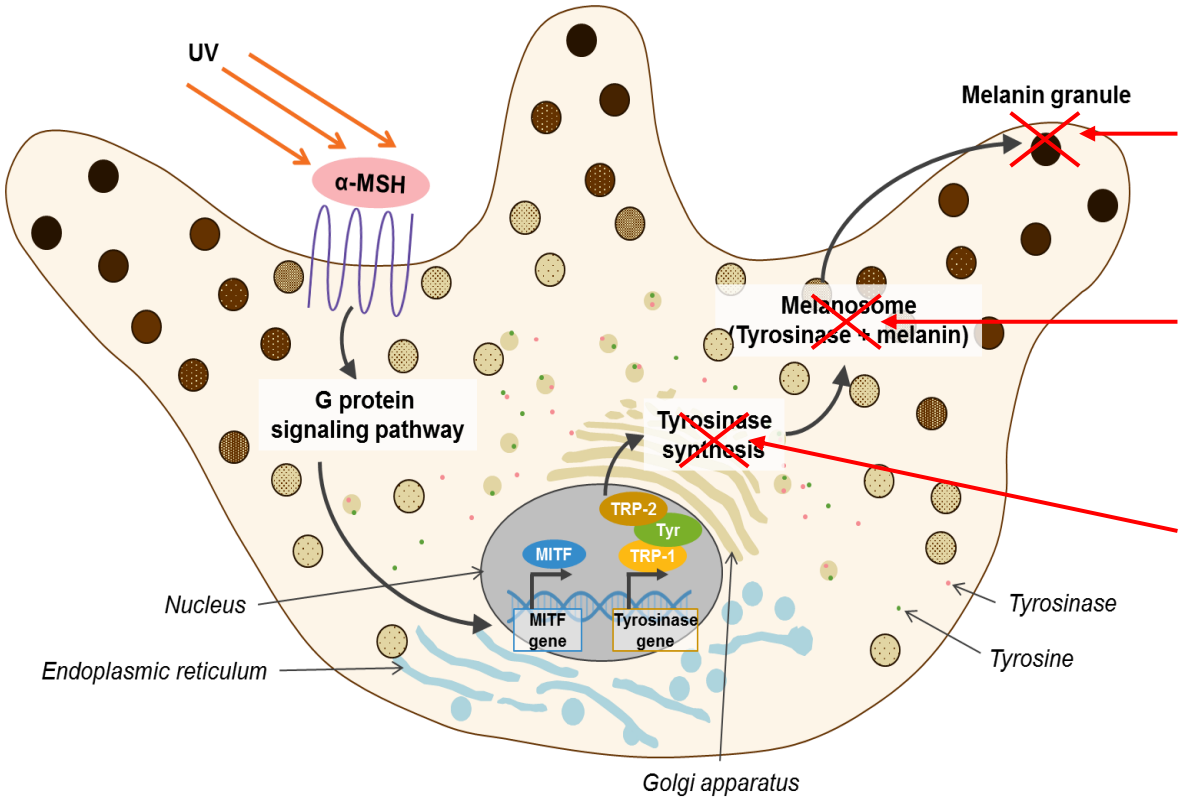


MELANIN SYNTHESIS



Upon exposure to UV radiation, DNA damage triggers cytokines, growth factors and other inflammatory factors to stimulate melanin production. Melanin is synthesized in melanocytes through a series of oxidative reactions involving amino acid tyrosine in the presence of the enzyme tyrosinase. This leads to the production of melanin, and melanin granules synthesized in the melanocytes are transferred to keratinocytes.

SKIN BRIGHTENING ACTION

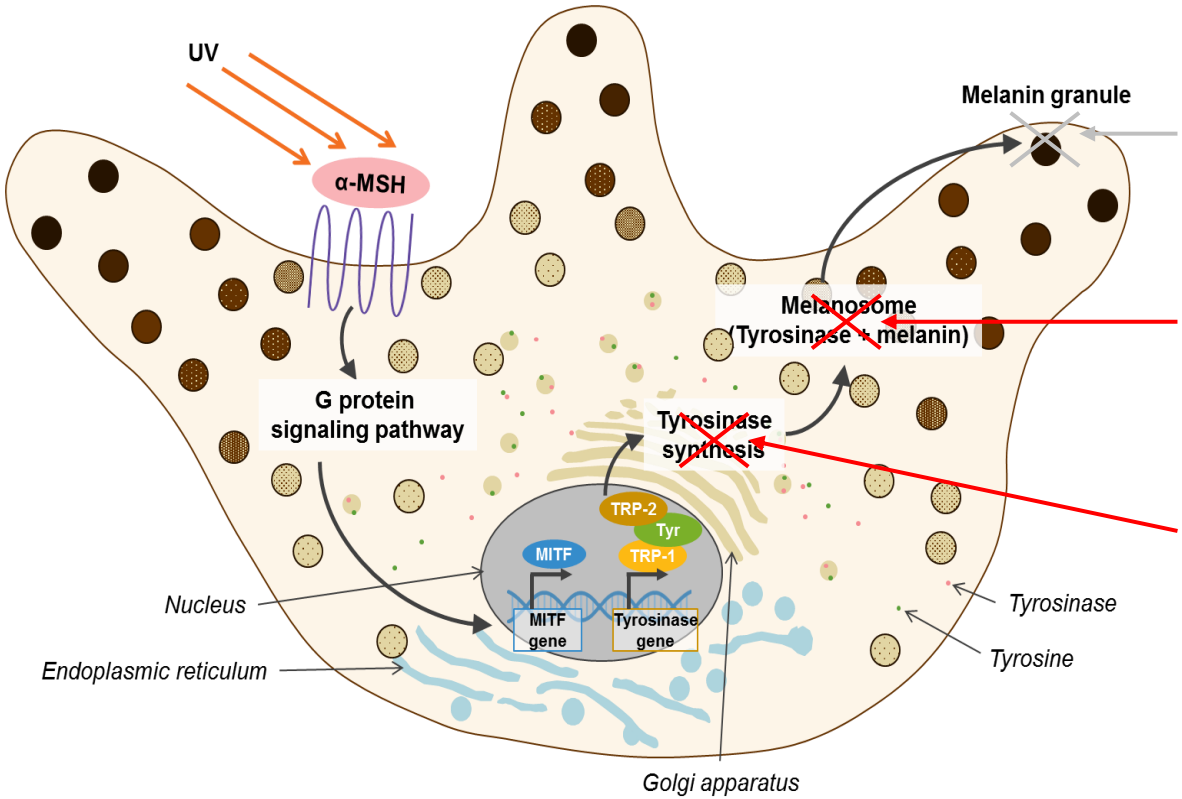


Inhibition of melanin transfer

Inhibition of melanin synthesis
Inhibition of tyrosinase activity

Inhibition of tyrosinase expression

ACTION MECHANISM OF SCOTI-HORSETAIL



Inhibition of melanin transfer

Inhibition of melanin synthesis

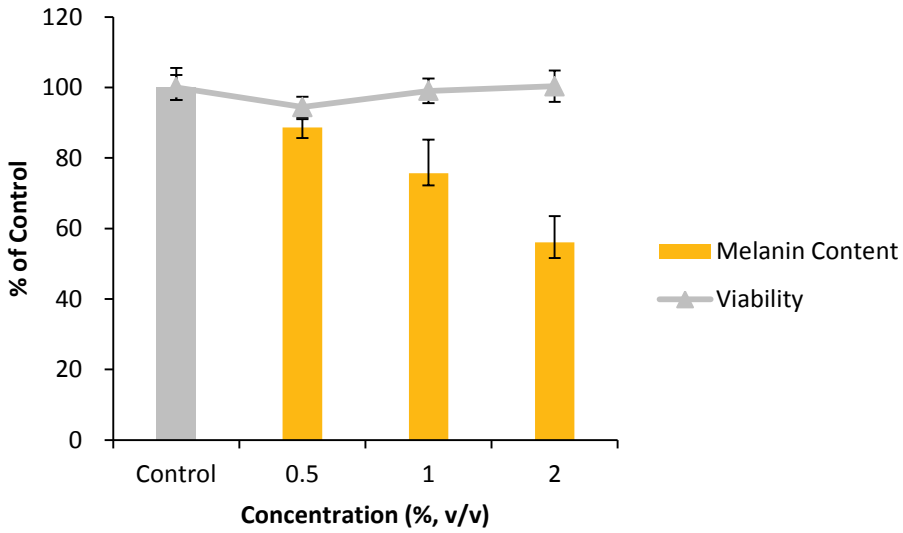
Inhibition of tyrosinase activity

Inhibition of tyrosinase expression

IN VITRO EFFICACY EVALUATION

Skin Brightening Effect

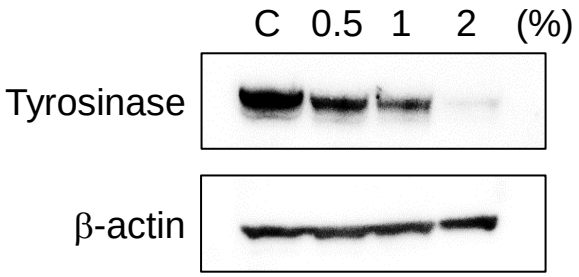
Melanin Synthesis Inhibition in Melanocytes



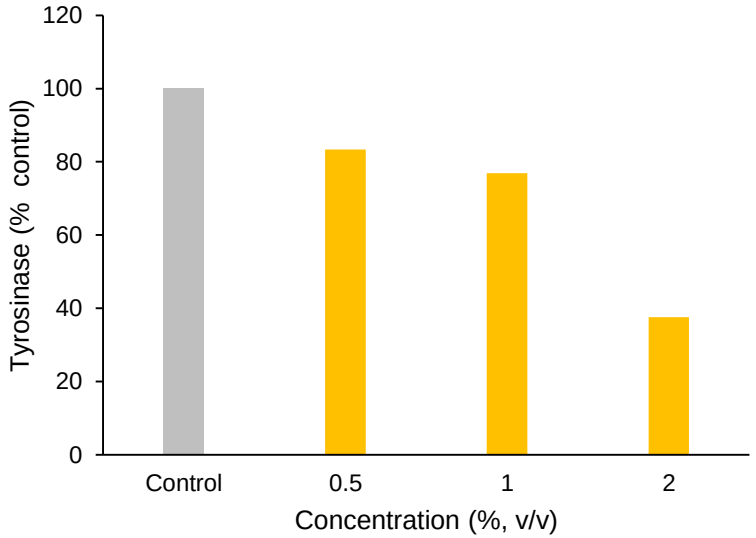
Melanin is a broad term for a group of natural pigments primarily responsible for the color of skin. Upon exposure of the skin to UV radiation, DNA damage triggers cytokines, growth factors, and other inflammatory factors to stimulate melanin production. The skin brightening potential of cosmetic active ingredient is generally quantified by measuring the inhibition level of melanin produced and by measuring the level of tyrosinase activity inhibited by cosmetic active ingredient.

IN VITRO EFFICACY EVALUATION

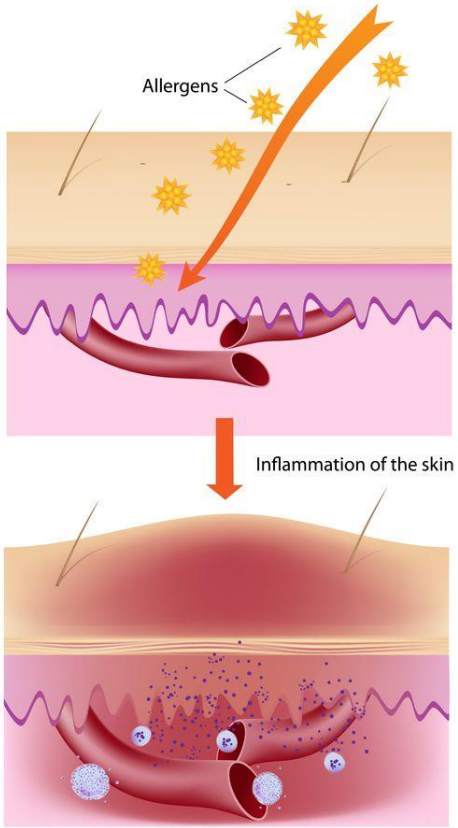
Skin Brightening Effect
Tyrosinase Expression Inhibition Activity



Skin Brightening Effect
Relative Intensity of Tyrosinase Expression

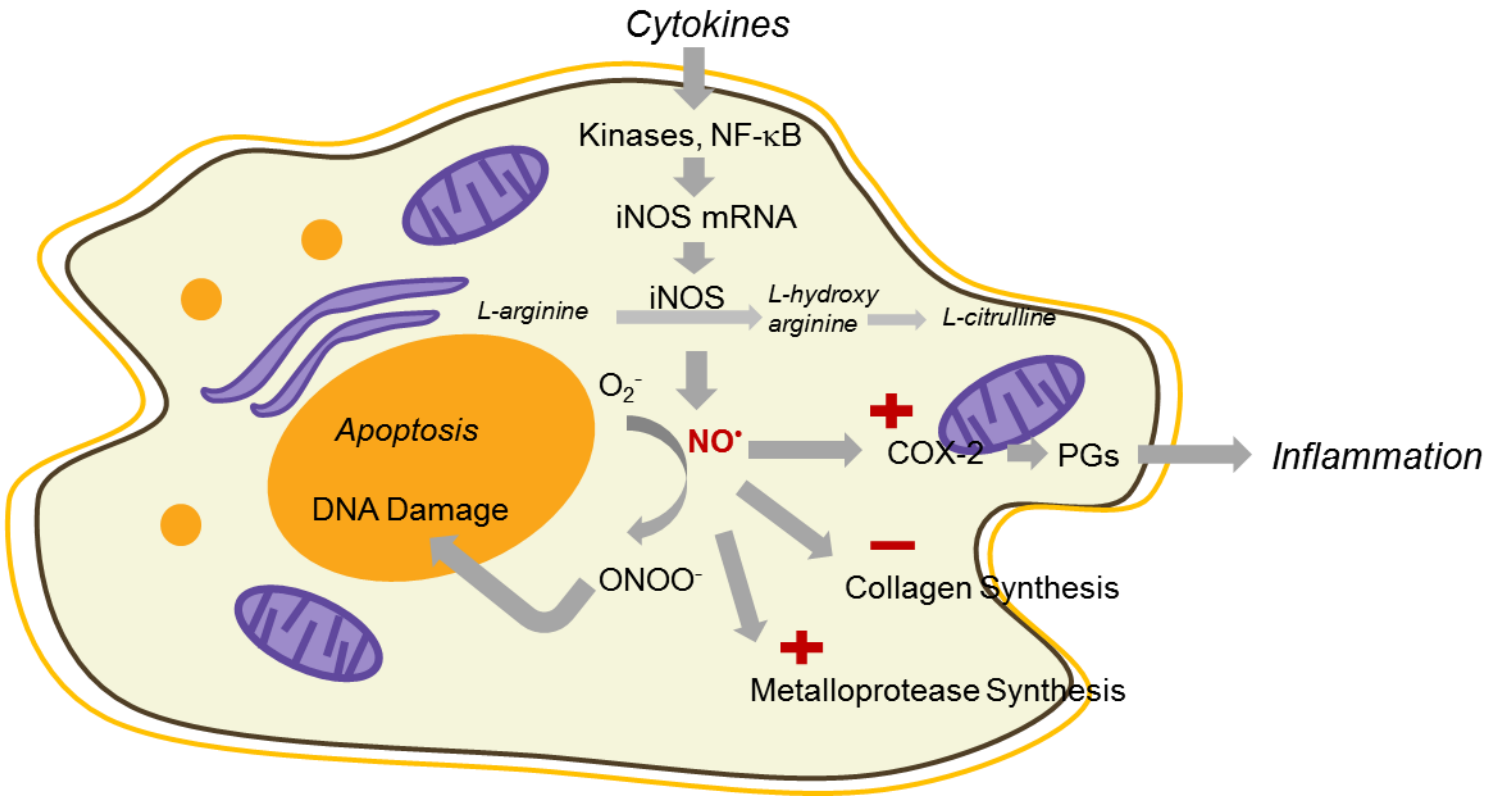


What Is Inflammation?



Inflammation is part of the complex biological responses to wide range of harmful stimuli including injury, tissue necrosis, infection, and irritants. The purpose of inflammation is to destroy (or contain) the damaging agent, initiate repair processes and return the damaged tissue to useful function. The symptoms of inflammation are redness, swelling, heat, and pain, which are caused by increased blood flow into tissue. The immune system is responsible of protecting our body from the harmful stimuli and of maintaining homeostasis. Disorders of the immune system can result in autoimmune diseases, inflammatory diseases, and cancer. In an attempt to protect the body, the immune system might overreact to the stimuli, and this might cause allergy or inflammatory reactions.

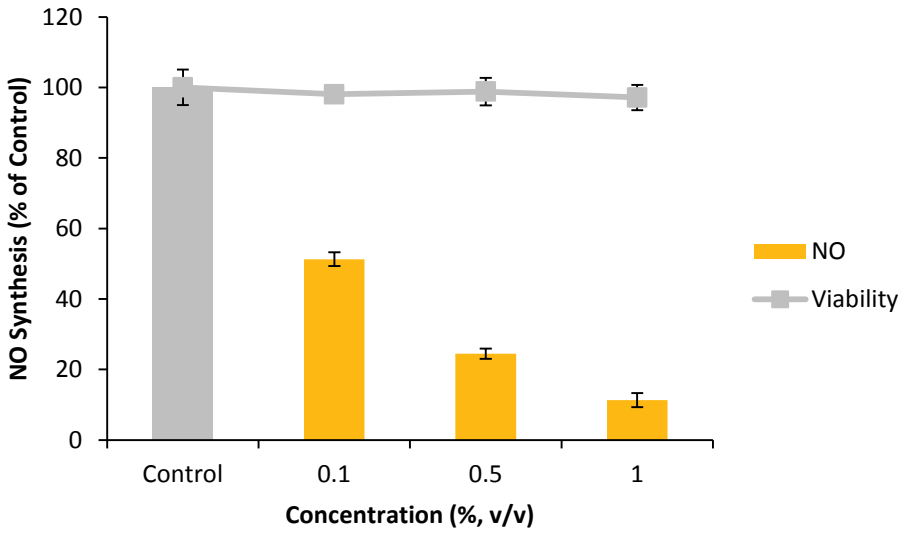
INFLAMMATION MECHANISM



IN VITRO EFFICACY EVALUATION

Anti-inflammatory Effect

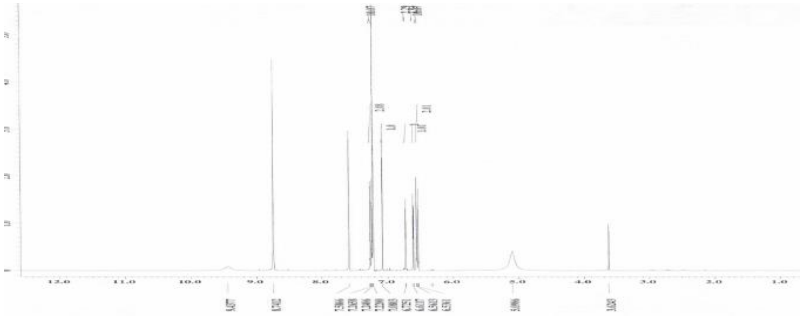
NO Synthesis Inhibition in Macrophages (RAW 264.7)



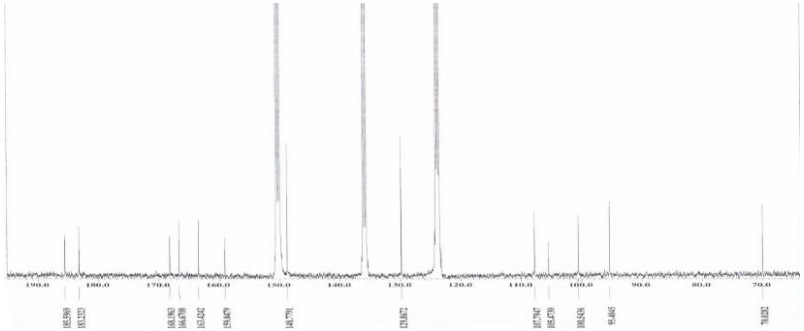
Nitric Oxide (NO) is a signaling molecule with immunomodulatory properties. Macrophages are important cells in inflammatory responses, and have been shown to produce NO through the inducible nitric oxide synthase (iNOS) pathway in response to inflammatory stimulus. The inhibition of expression or enzyme activity of iNOS have been shown to have anti-inflammatory effects. The anti-inflammatory activities of Scoti-Horsetail were shown by measuring the levels of NO in macrophages.

ACTIVE COMPOUND IDENTIFICATION

- ^{1}H NMR spectrum (400 MHz, , pypidine-d_5)



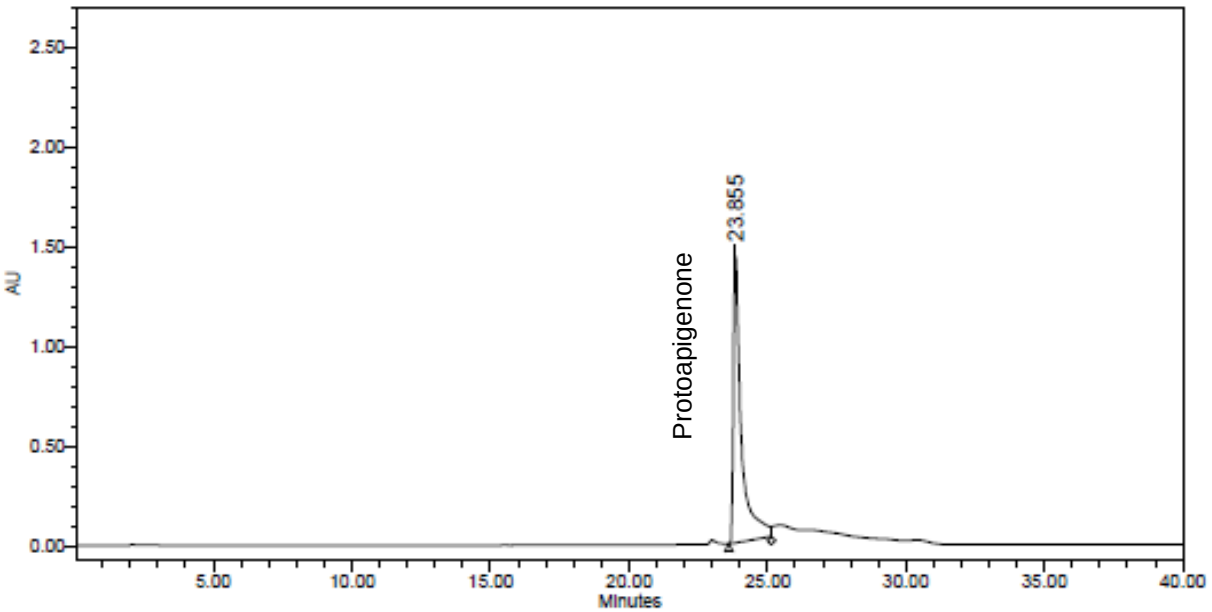
- ^{13}C NMR spectrum (100 MHz, pypidine-d_5)

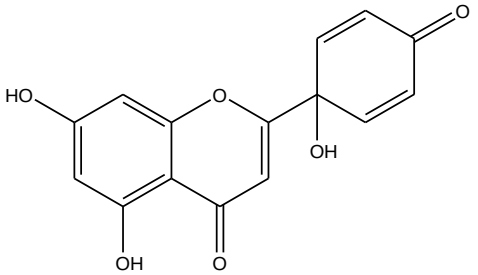


Protoapigenone

No.	δ_H (int, mult, J Hz)	δ_C
2		168.1
3	7.08 (1H, s)	107.7
4		183.2
5		163.4
6	6.60 (1H, d, 1.8 Hz)	100.5
7		166.6
8	6.72 (1H, d, 2.2 Hz)	95.4
9		159.0
10		105.4
1'		70.0
2'	7.25 (2H, d, 10.0 Hz)	148.7
3'	6.54 (2H, d, 10.0 Hz)	129.8
4'		185.5
5'	6.54 (2H, d, 10.0 Hz)	129.8
6'	7.25 (2H, d, 10.0 Hz)	148.7

ACTIVE COMPOUND: PROTOAPIGENONE

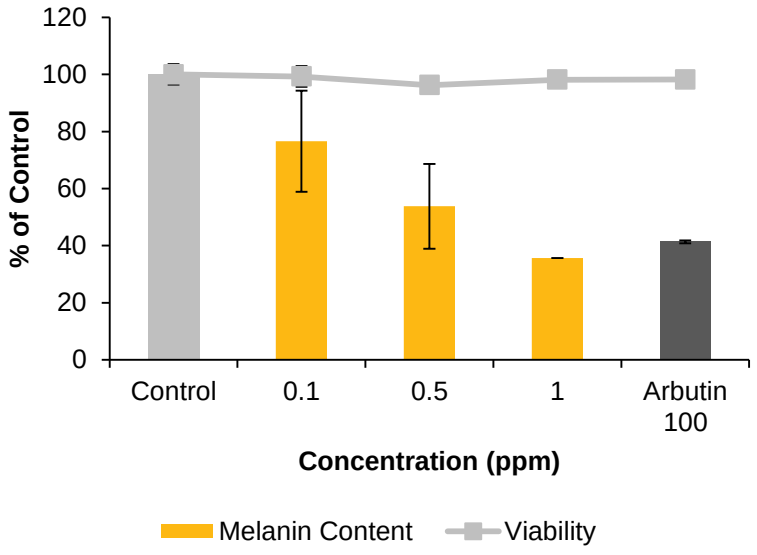




IN VITRO EFFICACY EVALUATION: PROTOAPIGENONE

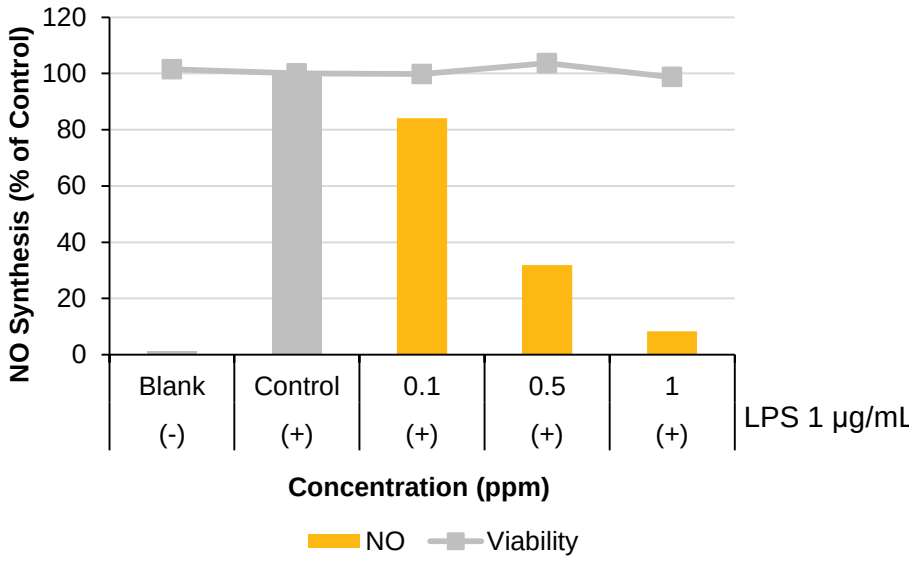
Skin Brightening Effect

Melanin Synthesis Inhibition in Melanocytes

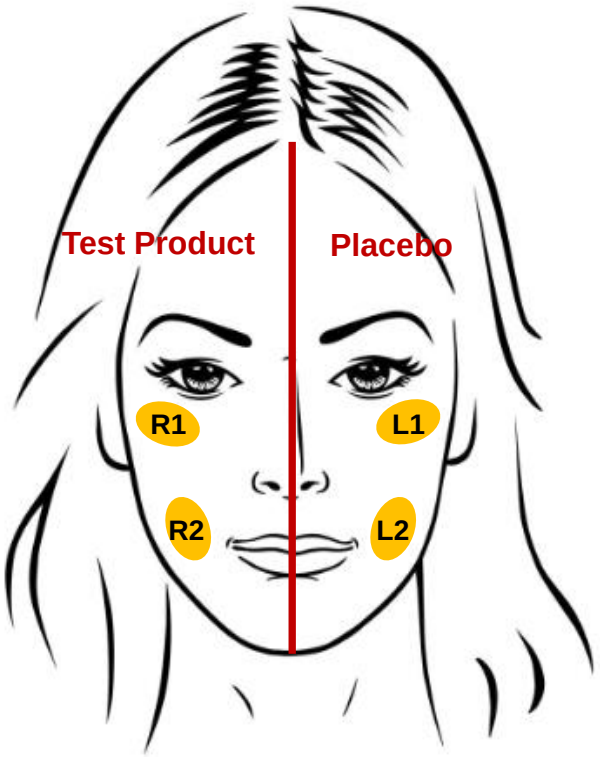


Anti-inflammatory Effect

NO Synthesis Inhibition in Macrophages (RAW 264.7)



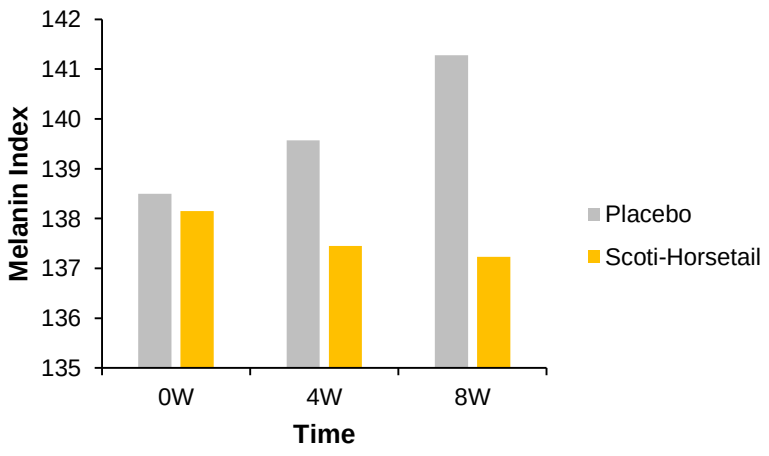
IN VIVO EVALUATION: SKIN BRIGHTENING EFFECT



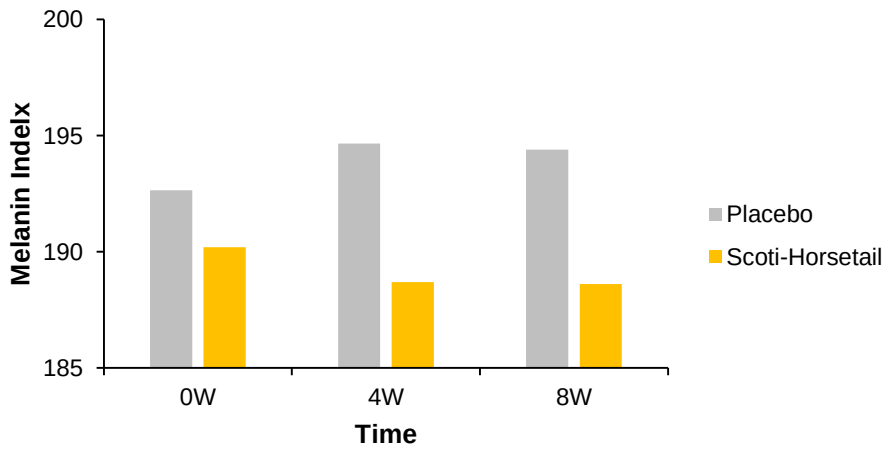
- Target site: R1, L1 - Dark spot area
  R2, L2 - Cheek
- Subjects: 22 female, aged between 30 to 55 years old
- Test item: Cream with 2% Scoti-Horsetail
- Application: Twice a day for 8 weeks
- Test instrument:
  - Mexameter MX18 (CK Electronic GmbH, Germany)
  - Spectrophotometer CM-700d (Konica Minolta, Japan)

IN VIVO EVALUATION: SKIN BRIGHTENING - MELANIN INDEX

Cheek

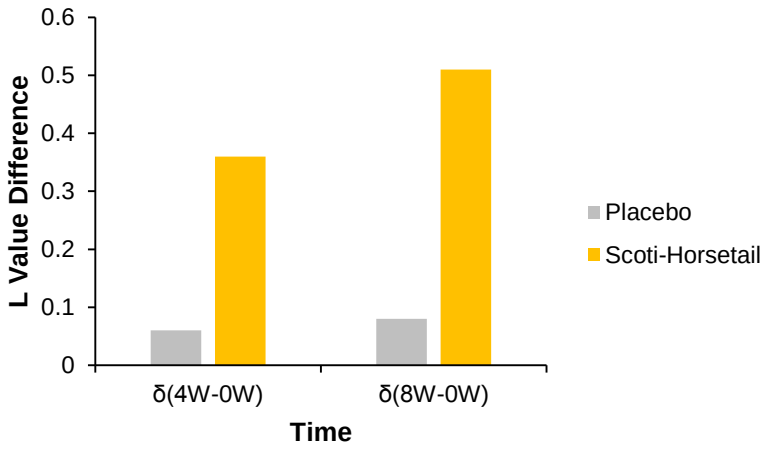


Dark spot area

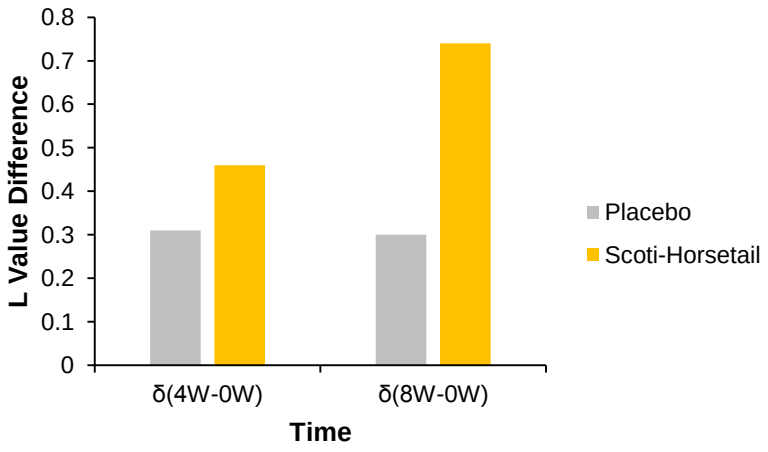


IN VIVO EVALUATION: SKIN BRIGHTENING - LIGHTNESS VALUE

Cheek

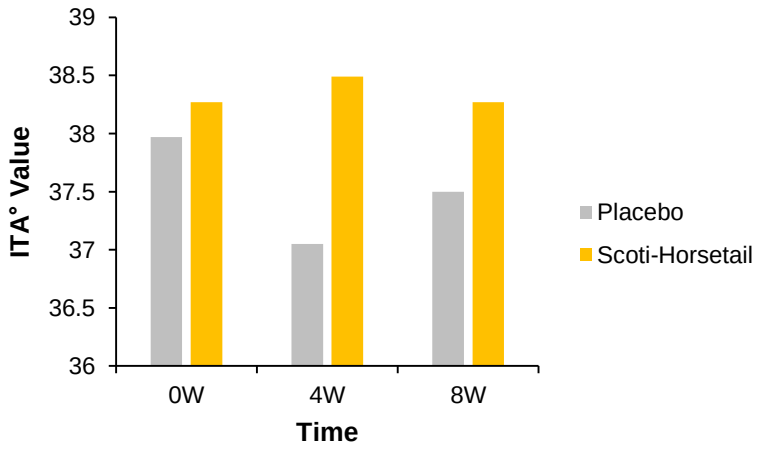


Dark spot area

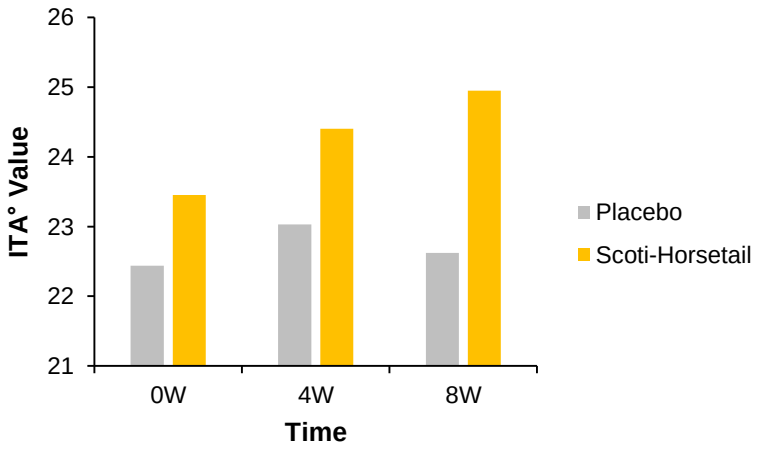


IN VIVO EVALUATION: SKIN BRIGHTENING - ITA° (INDIVIDUAL TYPOLOGY ANGLE) VALUE

Cheek



Dark Spot area



PRODUCT INFORMATION

- **Product Name:** **Scoti-Horsetail SPD**
- **INCI Name:** Equisetum Fluviatile Extract
- **Dosage:** 1 – 3%
- **Formulation:** Add to the formulation when the temperature is lower than 55°C. Recommended to add after the cooling process.
- **Storage:** Avoid direct light or UV. Keep it in a cool and dry area.

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The Garden of Naturalsolution, the one who knows natural products