

Citrus Junos Callus Extract

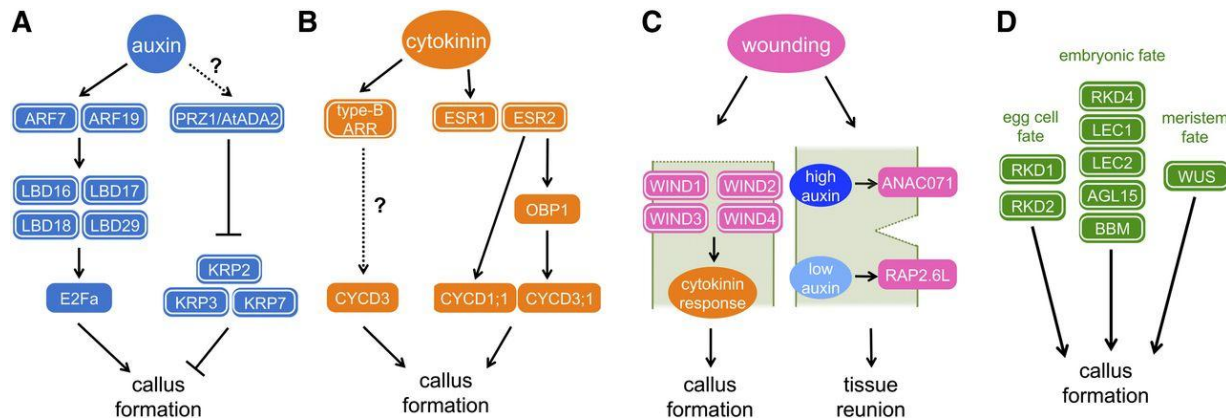


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Plant Callus

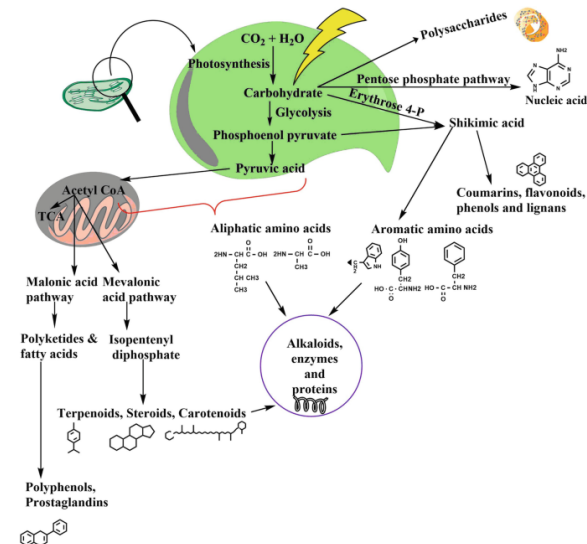
- Callus refers to an undifferentiated mass of plant cells induced through plant cell culture technology.
- Depending on the plant species, callus cells may develop unique shapes and colors, and can proliferate into clusters consisting of tens to millions of cells.
- Plant callus is characterized by totipotency, the ability of a single cell to regenerate into a complete plant, and cell plasticity, which allows cells to differentiate into various cell types.

Mechanism of Callus Formation



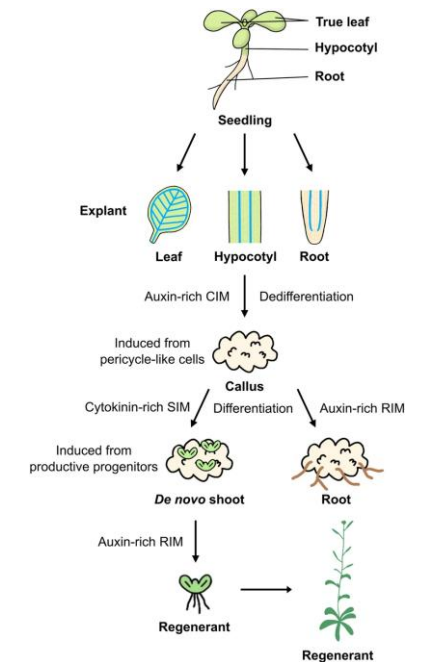
Ref. Momoko Ikeuchi, Keiko Sugimoto, Akira Iwase, *Plant Callus: Mechanisms of Induction and Repression*, *The Plant Cell*, Volume 25, Issue 9, September 2013, Pages 3159–3173,

Bioactive Compounds Derived from Plant Callus



Lakshmaiah et al., 2022, *Nutraceuticals Production from Plant Cell Factory*

Totipotency of Plant Callus



Ref. Adapted from Lakshmaiah et al., 2022

The Golden Vitality of Yuzu Tree for Radiant Skin

Yuzu is a representative yellow citrus fruit of Korea, known for its fresh aroma and bright, vibrant image. For generations, yuzu has been valued as a botanical symbol of vitality, freshness, and purity. Yuzu contains a variety of plant-derived active compounds accumulated as part of its adaptation to external environmental stress. In particular, flavonoids such as rutin, quercetin, tangeretin, and naringin are known to be present in yuzu. These plant-derived components are associated with the physiological antioxidant defense system of plants against oxidative stress.

Bright Tone · Antioxidant Vitality · Firming Care



Bright Tone Care

Inspired by the clear golden vitality of yuzu, this concept focuses on brightening care. Citrus Junos Callus Extract is proposed as an ingredient that helps support a clearer, fresher-looking skin appearance.



Antioxidant Care

An antioxidant care concept designed to support skin condition affected by external environmental stress. Based on yuzu-derived plant cell energy, it provides a fresh and balanced vitality concept for the skin.

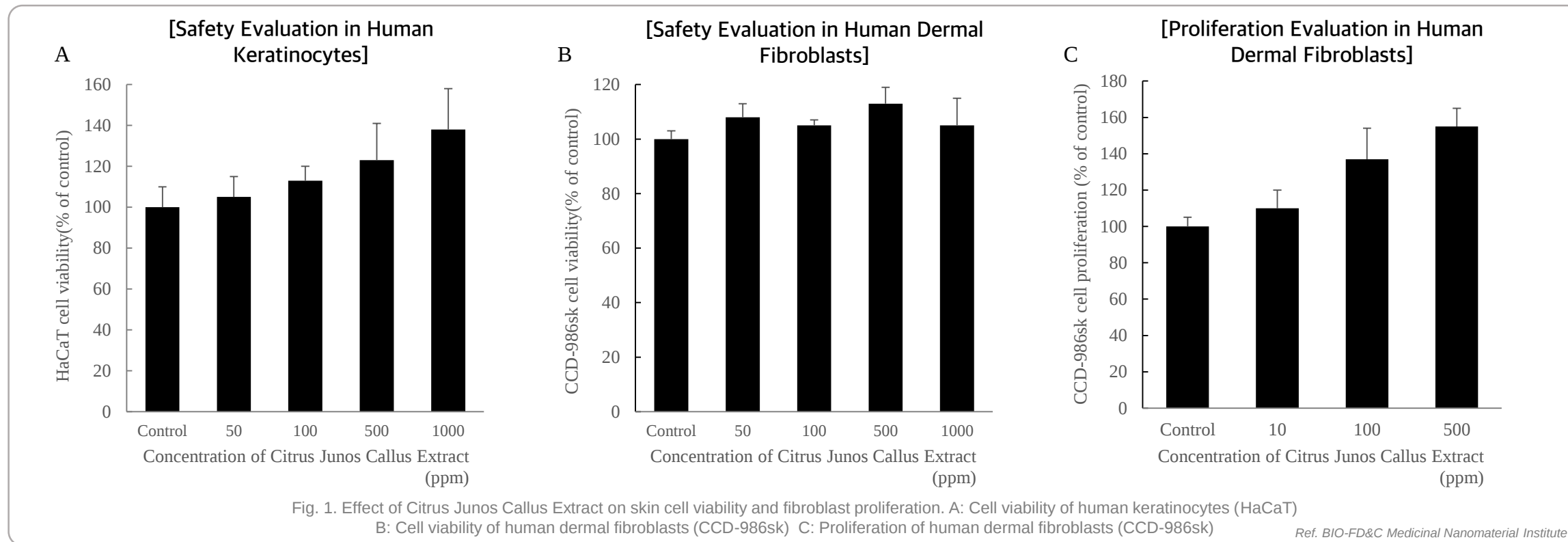


Firming Care

A firming care concept designed for a resilient and smooth-looking skin condition. Inspired by the golden vitality of yuzu and plant cell culture technology, it is proposed as an ingredient for skin vitality and elasticity care.



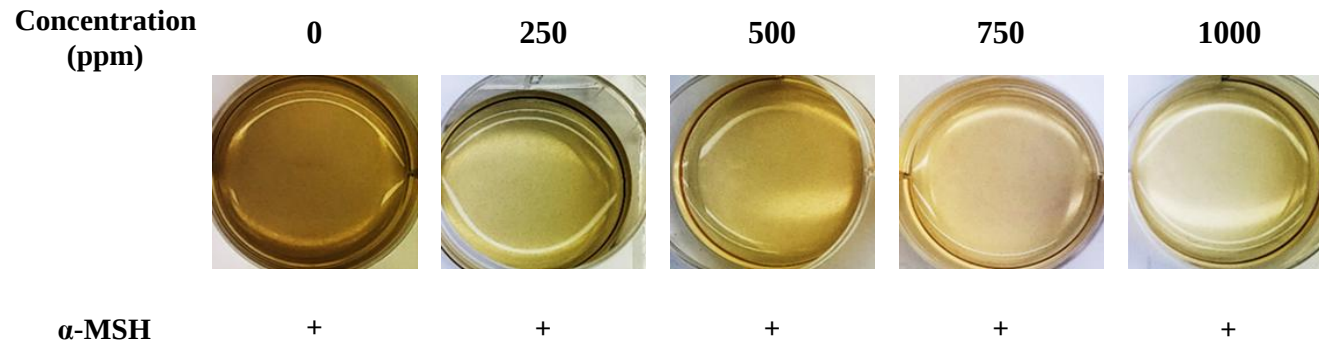
Evaluation of Cellular Safety and Skin Cell Activity of Citrus Junos Callus Extract



Citrus Junos Callus Extract maintained stable cell viability in HaCaT keratinocytes and CCD-986sk dermal fibroblasts within the tested concentration ranges. In addition, the proliferation assay using CCD-986sk dermal fibroblasts showed an increasing trend in cell proliferation with increasing treatment concentration, suggesting its potential as an ingredient associated with skin cell activity.

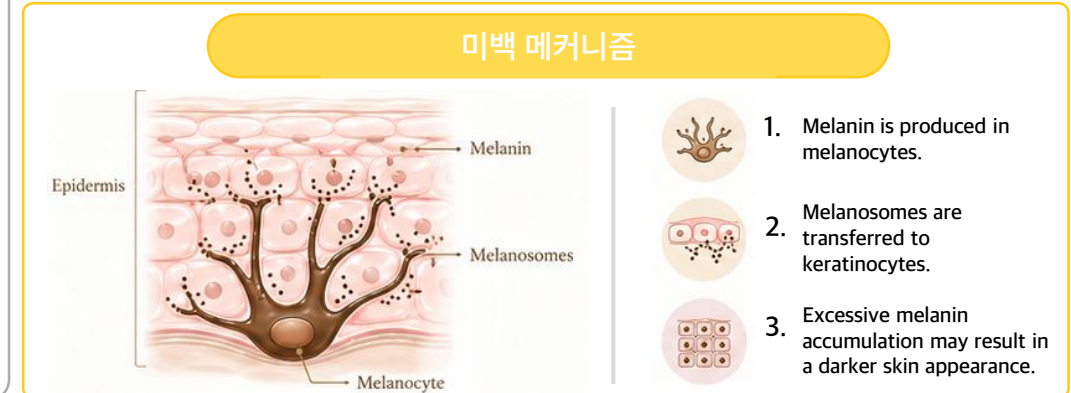
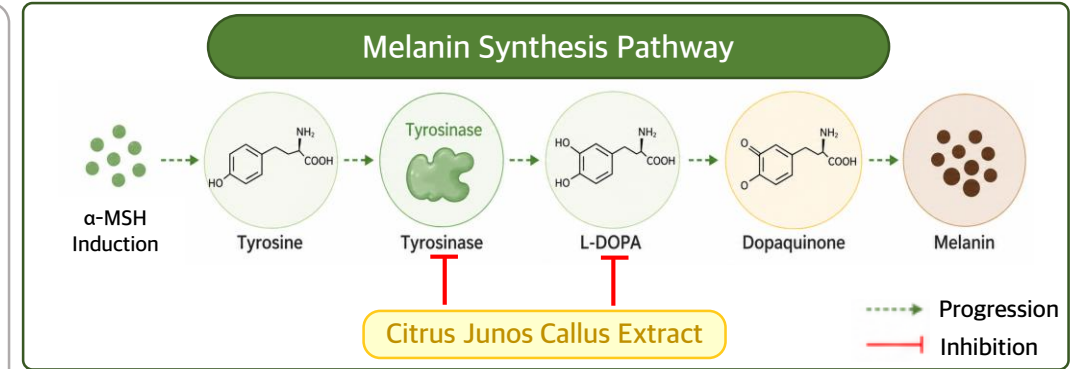
Inhibitory Effect of Citrus Junos Callus Extract on Melanin Synthesis

Representative images of melanin synthesis inhibition by Citrus Junos Callus Extract



Ref. BIO-FD&C Medicinal Nanomaterial Institute

Fig. 2. Citrus Junos Callus Extract inhibits melanin synthesis in α -MSH-stimulated melanocytes



Citrus Junos Callus Extract showed a decreasing trend in melanin production with increasing treatment concentration under α -MSH-induced conditions. A lighter color change was observed particularly at higher concentrations, suggesting that the extract may be associated with the regulation of melanin production.

Evaluation of Melanin Synthesis-Related Inhibitory Activity of Citrus Junos Callus Extract

[Evaluation of Inhibitory Activity Using L-Tyrosine and L-DOPA]

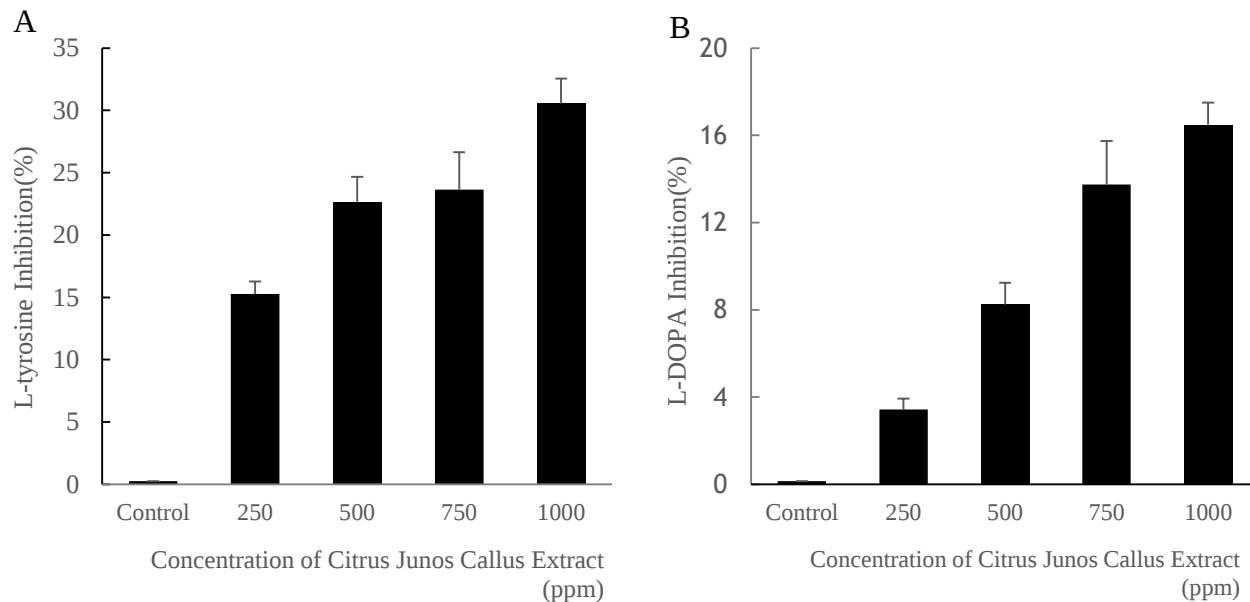
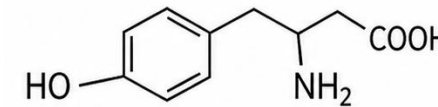


Fig. 3. Inhibitory effect of Citrus Junos Callus Extract on L-Tyrosine and L-DOPA activity related to melanin synthesis.
A: L-Tyrosine activity inhibition; B: L-DOPA activity inhibition.

Ref. BIO-FD&C Medicinal Nanomaterial Institute

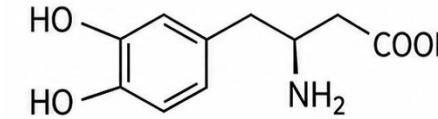
L-Tyrosine



Starting substrate

- A major substrate involved in the initial stage of melanin synthesis
- Converted to L-DOPA through the action of tyrosinase
- Related inhibitory activity suggests possible regulation of the early reaction step in melanin synthesis

L-DOPA

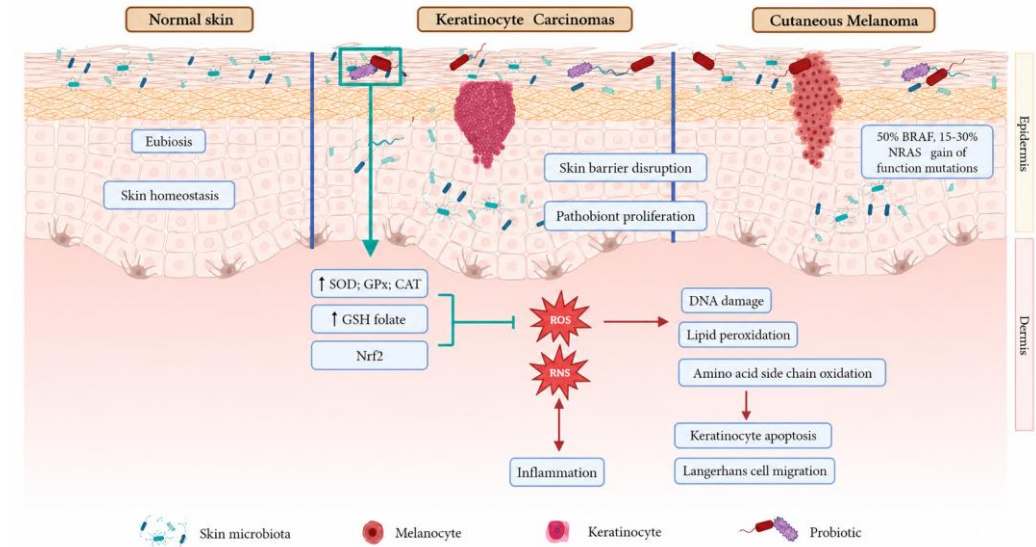
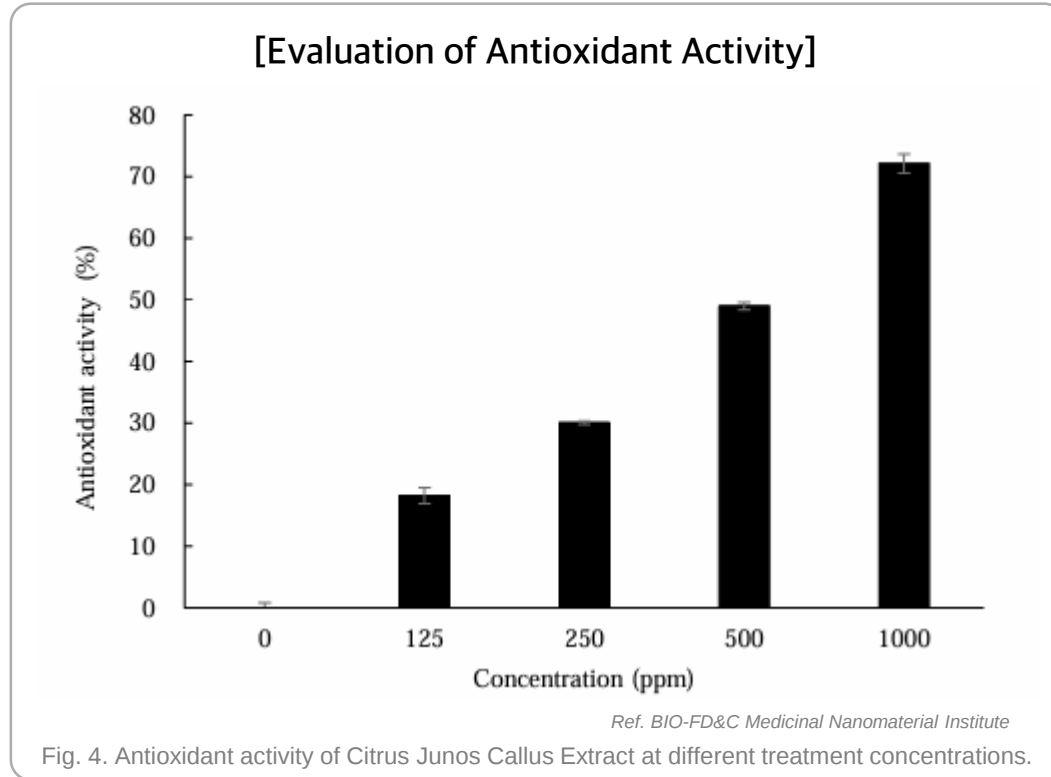


Intermediate substrate

- An intermediate substrate formed from L-Tyrosine
- A key intermediate involved in the melanin synthesis pathway
- Related inhibitory activity suggests possible regulation of the intermediate reaction step in melanin synthesis

Citrus Junos Callus Extract showed an increasing trend in inhibitory activity with increasing treatment concentration in evaluations using L-Tyrosine and L-DOPA. Higher inhibitory activity was observed particularly at high concentrations, suggesting that the extract may be associated with the regulation of melanin synthesis-related reactions.

Antioxidant Activity of Citrus Junos Callus Extract(Anti-Aging Care)

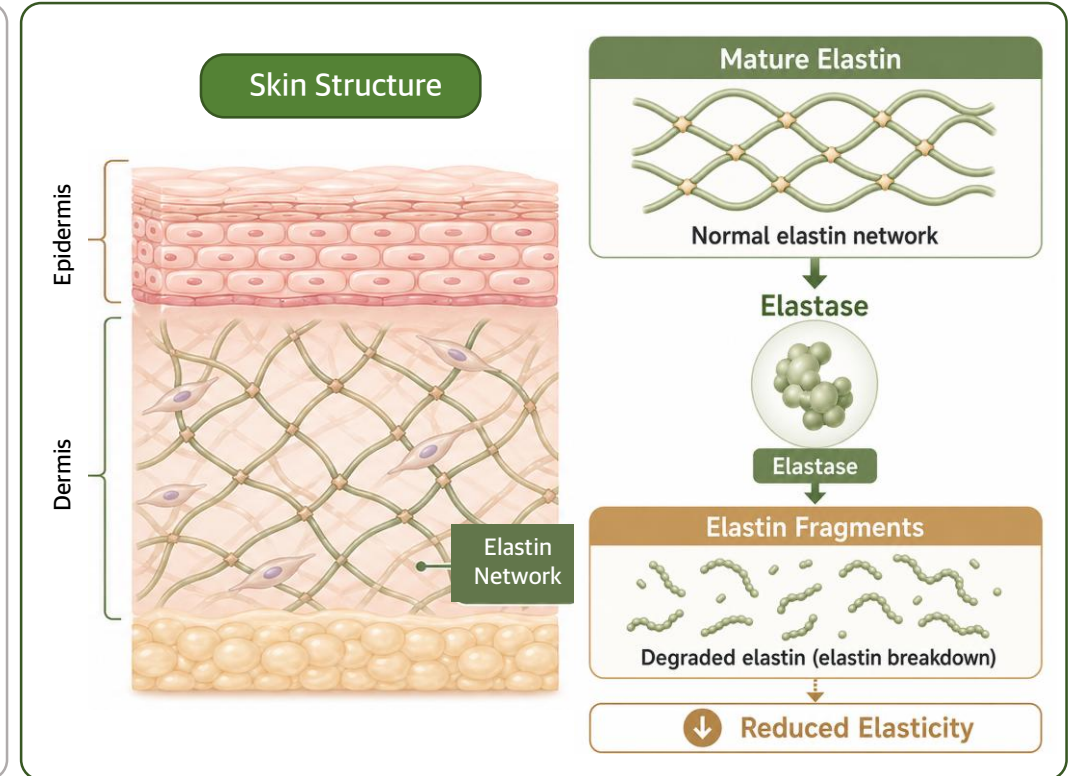
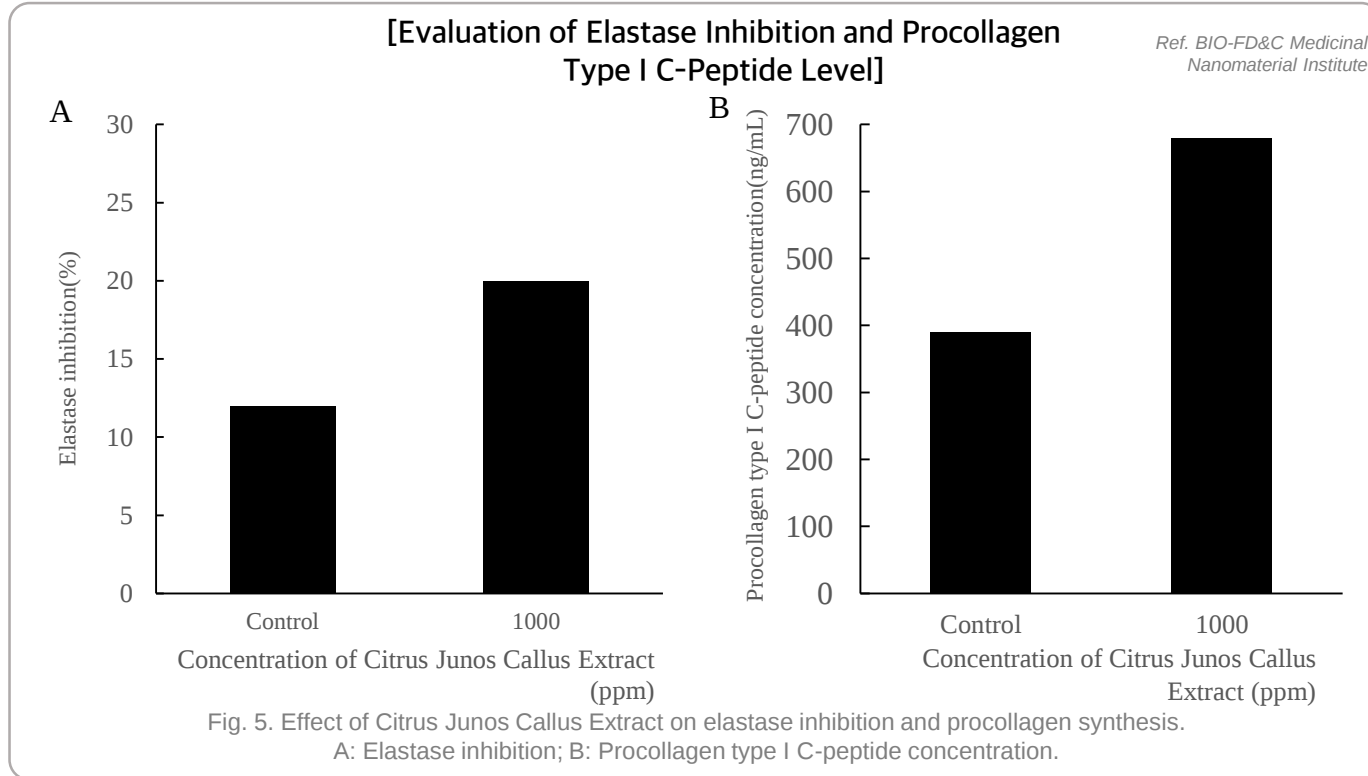


[Oxidative stress on skin]

Free radical scavenging activity evaluates the ability of a test material to neutralize reactive radicals. Citrus Junos Callus Extract showed an increasing trend in scavenging activity with increasing treatment concentration.

Citrus Junos Callus Extract showed a gradual increase in free radical scavenging activity with increasing treatment concentration. The highest antioxidant activity was observed in the 1,000ppm treatment group, suggesting that the extract may possess antioxidant properties associated with free radical scavenging. These results indicate its potential as an ingredient for oxidative stress care.

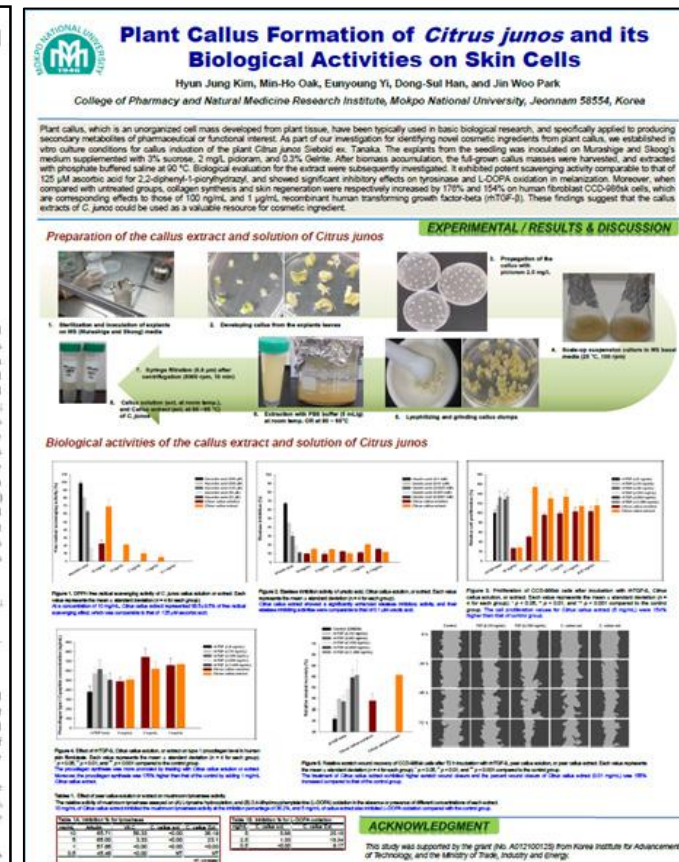
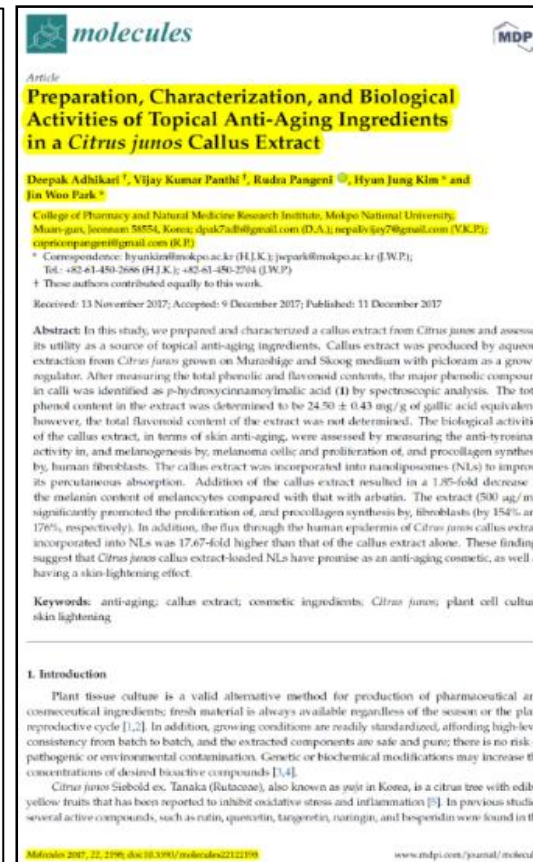
Evaluation of Skin Elasticity-Related Activity of Citrus Junos Callus Extract



Citrus Junos Callus Extract showed an increasing trend in elastase inhibitory activity with increasing treatment concentration. In addition, the Procollagen Type I C-peptide concentration was increased in the 1,000ppm treatment group compared with the untreated control, suggesting that the extract may be associated with the regulation of skin elasticity-related indicators.

Research Achievements of Citrus Junos Callus Extract

Citrus Junos Callus Extract is a research-based ingredient supported by accumulated findings from registered patents, a scientific publication, and an academic poster presentation. These research materials support its scientific foundation as a yuzu-derived plant cell culture ingredient and its potential application as a skincare material.



Human Skin Irritation Evaluation of Citrus Junos Callus Extract (Clinically Non-Irritating)

Citrus Junos Callus Extract was evaluated for its irritation potential under actual human skin application conditions. Based on the test results, the extract was classified as clinically non-irritating, supporting its low irritation potential for topical application.

EL-1612077358261-02

인체적용 시험 보고서

㈜바이오프디엘씨

유자 callus 추출물 외 1종의 피부접촉에 의한
안전성 평가 인체적용 시험에 관한 연구

2016년 12월 30일

㈜엘리드



본 문서는 ㈜엘리드의 보편특허로서 ㈜엘리드에 그 소유권이 있으며, 제3자에게 무단으로 양도, 모방, 공개 및 복사를 금합니다.

연구결과 요약서

연구제목	㈜바이오프디엘씨 유자 callus 추출물 외 1종의 피부접촉에 의한 안전성 평가 인체적용 시험에 관한 연구
보고번호	EL-1612077358261-02
의뢰기관	㈜바이오프디엘씨 결과담당: 최순균 화승읍 산단길 106
연구기관	㈜엘리드 성기도 성남시 분당구 황새울로 325 7층 및 8층
연구기간	2016년 12월 15일 ~ 2016년 12월 30일
시험대상	유자 callus 추출물 외 1종
연구방법	48시간 패치검토 시험 1. 신체 건강한 성인 남녀 31명을 선정 2. 원부자료: 연구 대상자의 등 부위에 시험물 적용하여 48시간 주 제거 3. 시험부위 관찰: 철폐 제거 후 30분, 24시간, 120시간 경과 후 관찰 4. 자극유무 판정: PCPC Safety Evaluation Guidelines 및 ICDRG의 기준에 준하여 평가
연구결과	1. 연구 대상자: 여성 31명으로 38세 ~ 55세의 연령분포를 가졌다 (평균 47.6세). 2. 시험결과 ㈜바이오프디엘씨에서 의뢰한 유자 callus 추출물 외 1종 (시료 #1, #2)은 모두 무자극 제품군에 속하는 것으로 판단된다.
보고서 작성일	2016년 12월 30일
원부자료	원부 1. 평가원서에 따른 세부자료
연구 책임자	리부과 전문의 문태기
신뢰성보증 책임자	공백박사 김보라
연구자	이원희 / 김유진 / 김희주

5



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결론 및 요약

㈜엘리드에서는 유자 callus 추출물 외 1 종을 의뢰받아 연구 대상자 31 명에 대한 피부접촉 시험 (patch test)을 시행하였다. 시행한 결과, ㈜바이오프디엘씨에서 의뢰한 유자 callus 추출물 외 1 종 (시료 #1, #2)은 모두 무자극 제품군에 속하는 것으로 판단된다.

본 연구는 ㈜엘리드 3&R 작업 지침서에 따라 수행되었으며, 그 결과와 최종 보고서의 내용은 전파에 따라 감사 완료되었다.

17



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Distinctive Features of BIO-FD&C Plant Cells



Sustainable
Ingredient



Non-GMO
Ingredient



Aseptic
Production System



Activation of Bioactive
Components

- BIO-FD&C's plant cell technology enables reproducible production of plant materials, making it sustainable with a low environmental burden.
- BIO-FD&C's plant cell technology does not use GMO plants during the cultivation process.
- BIO-FD&C plant cells are cultured in a controlled sterile environment, ensuring safety from contamination or infection caused by external factors.
- BIO-FD&C plant cells utilize proprietary in-house R&D technology, resulting in a high expression level of bioactive compounds.

BIO-FD&C Plant Cell Manufacturing Process

Seed Germination



After selecting the target plant, the seeds are germinated on a culture plate.

Plant Callus Induction



Using appropriate cultivation technology, callus is induced from the germinated seeds.

Solid Culture (Plate)



The induced callus is cultured and grown under solid culture conditions.

Suspension Culture (Bioreactor)



Once sufficient growth is achieved, the callus is transferred to a bioreactor for large-scale mass culture.

Harvesting & Freeze-Drying



The mass-cultured callus is harvested and then freeze-dried.

Extraction / Formulation



Only the active components are extracted and formulated according to customer specifications.

Quality Control / Shipment



After quality inspection, the final product is released for shipment.

Summary

Trade Name	Citrus Junos Callus Extract
INCI Name	Citrus Junos Callus Extract
Source	Citrus Junos Callus
Product type	Solution
Effect	Anti-Oxidant
Storage	Keep it in a cool temperature (4°C ~ 15°C) and avoid direct sunlight.
Patents	• Patent No. 10-2016062 : Pear callus and yuzu callus materials with skin-brightening and wrinkle-improving effects • Patent No. 10-1949937 : Anti-aging topical skin composition containing pear or yuzu callus culture extract and xanthan gum

- Citrus Junos Callus Extract is a skincare ingredient developed based on yuzu-derived plant cell culture technology.
- Cellular safety and human skin irritation evaluations confirmed its low irritation potential for topical application.
- Evaluations related to melanin production and melanin synthesis-associated reactions suggested its potential as an ingredient for brightening-care concepts.
- Free radical scavenging activity evaluation showed a concentration-dependent antioxidant trend.
- Elastase inhibition and Procollagen Type I C-peptide evaluations suggested its potential as an ingredient associated with skin elasticity-related activity.

BIO-FD&C provides bio-based ingredients through a research-driven approach and development grounded in scientific evidence.

The efficacy and safety of our ingredients are validated by scientific data and managed under consistent standards throughout the entire process, from planning and research to manufacturing and quality control.

Based on the latest research and validated data on skin and human application technologies, we continue to strengthen our technological competitiveness. With accumulated expertise and a responsible research system, we strive to be a reliable partner our customers can trust.

BIO-FD&C Co., Ltd.

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[Notice]

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※ If special certifications such as Organic, Vegan, or Halal are planned, issuance of certain requested documents may be difficult. Please confirm the availability of the required documents before placing an order.

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