

# Distinctive® Phytostem Marrubium

INCI: Glycerin, Marrubium vulgare Meristem Cell Culture, Xanthan Gum

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DC 3730

## Plant Tissue Culturing

In recent years, researchers have successfully developed active ingredients through *plant tissue culturing*. Many medicinal, nutritional and cosmetic active ingredients have been enhanced through this technology.

**Resources of Nature**, in partnership with global leaders in this field, can now selectively harvest cells from a plant, allowing the utilization of even the most rare plant species without harm. These cells are specially cultivated to generate cultures rich in plant stem cells and complex compounds. These specifically designed plant cell cultures act as nature-made liposomes and are fully compliant with the skin, perfect for delivering their contents of powerful antioxidants and cell regenerating molecules.

Up until recently, harvesting these highly active cells had been extremely difficult and expensive. Through advances in the most specialized processing technologies, they are now available in quantities feasible for commercialization for cosmetic applications as "**Distinctive® Phytostem Cell Ingredients**".

Compared to standard botanical extraction methods, this highly sustainable, eco-friendly technology provides higher purity products with up to 1000 times the active molecule concentrations, and because of their highly controlled production techniques, Distinctive® Phytostem Cell Ingredients meet and exceed Certified Organic and Bio-Eco Cosmesi guidelines.



**Marrubium vulgare**, also known as White Horehound or Marrubio, is an edible herbaceous plant with origins in temperate areas of Europe, Africa, America and Asia. Since the Middle Ages, horehound has been praised for its medicinal activity and has been used to help respiratory conditions, aid digestion, as a tonic and as a soothing agent. It also has been applied topically to speed healing and remedy various skin problems and inflammation.

**Distinctive® Phytostem Marrubium** is a unique third generation antioxidant derived from *Marrubium vulgare*. This new ingredient is rich in phenylpropanoids, especially Forsythoside B and Verbascoside, highly active defense molecules that provide effective multi-phase protection for the skin: Protects skin against environmental aggressors. Provides immediate antioxidant activity and long-term protection. Maximizes skin's self-defense systems. Enhances the capacity of the skin to resist oxidative and UV induced stress.

By pre-activating the skin's defense mechanisms, and further providing antioxidant/free radical scavenging properties, Distinctive® Phytostem Marrubium provides maximum relief from environmental stressors.

- ◆ Anti-Oxidant
- ◆ Anti-Pollution
- ◆ Anti-Aging
- ◆ Soothing
- ◆ Anti-Stress
- ◆ Detoxifying
- ◆ Self Defense for Skin
- ◆ Free Radical Scavenging

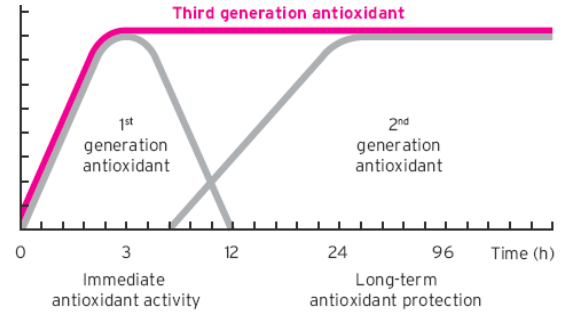
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## THIRD GENERATION ANTIOXIDANT

Distinctive® Phytostem Marrubium is able to provide skin a multi-phase protection against a wide range of oxidative and environmental stresses.

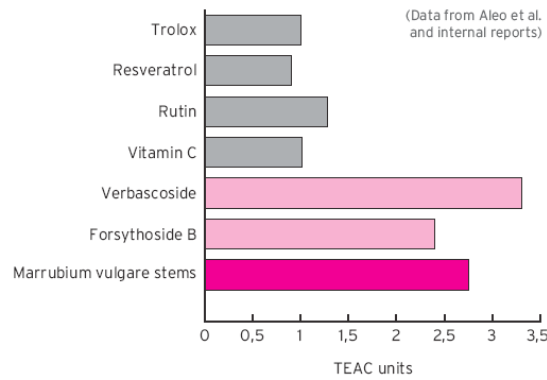
	Properties	1 <sup>st</sup> generation antioxidant	2 <sup>nd</sup> generation antioxidant
FORSYTHOSIDE B	antioxidant	✓	
	activator of Nrf2		✓
	inducer of Phase II enzymes		✓
VERBASCOSIDE	antioxidant	✓	
	inducer of Phase II enzymes		✓



Immediate protection through strong radical scavenging and long-term protection through maximization of skin's own defense systems.

## ANTIOXIDANT ACTIVITY

TEAC (Trolox Equivalent Antioxidant Capacity)

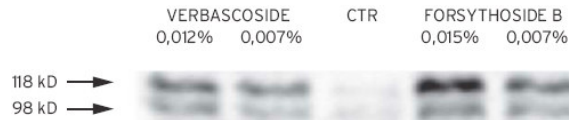


Distinctive® Phytostem Marrubium\* has strong antioxidant activity (approx. 2 times that of Resveratrol and Vitamin C).

(\* ) Test performed on the powder form of Marrubium vulgare cell cultures in order to avoid experimental interferences.

## ACTIVATION OF Nrf2

Human keratinocytes (HaCat) were incubated for 24 hours with forsythoside B and verbascoside at increasing concentrations (0.006-0.015%). Nuclear level of transcription factor Nrf2 was assessed by Western blotting.

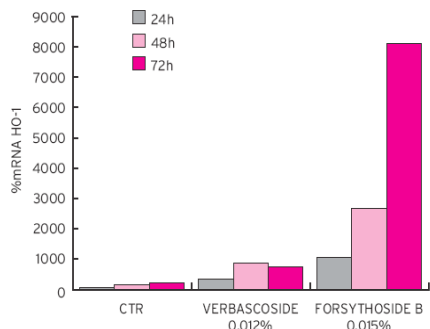


Forsythoside B and verbascoside dose dependently increase the levels of Nrf2 protein thus activating the physiological detoxification system of the human keratinocytes and hence the synthesis of Phase II enzymes.

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## INDUCTION OF PHASE II ENZYMES



Human keratinocytes (HaCat) were incubated at different times with forsythoside B (0.015%) and verbascoside (0.012%). Expression levels (mRNA) of heme oxygenase were assessed by quantitative PCR analysis. Results: mRNA level of the protective enzyme heme oxygenase was strongly increased by forsythoside B and verbascoside in a time-dependent (and dose-dependent) manner.

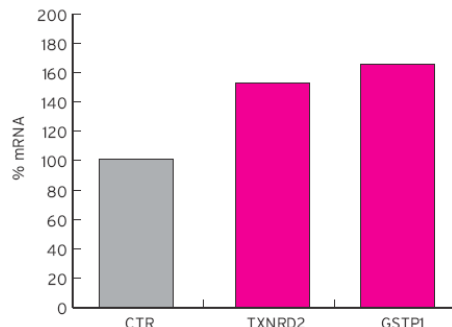
Consequent to the gene expression induction, Western Blot Analysis confirmed that the protein level of heme oxygenase in HaCat was also increased.



Forsythoside B and verbascoside significantly induce the expression and the synthesis of the Phase II enzyme heme oxygenase 1 in human keratinocytes thus improving their physiological self defensive system.

(\*) Test performed on the powder form of Marrubium vulgare cell cultures in order to avoid experimental interferences.

## STIMULATING EFFECT ON PHASE II ENZYMES IN 3D HUMAN EPIDERMIS



Transcriptional effects were evaluated on reconstructed human epidermis in order to assess effects on Phase II enzymes. After 24 hours of incubation with the ingredient\* (0.125%) the mRNA expression level of typical Phase II enzymes was evaluated by quantitative PCR. Results: Increased expression levels of the enzymes thioredoxin reductase 2 (TXNRD2) and glutathione S-transferase 1 (GSTP1). These Phase II enzymes are directly involved in the response to xenobiotics mediated by Nrf2 activation.

Distinctive® Phytostem Marrubium is able to potentiate the enzymes belonging to the endogenous cytoprotective system by activation of the Nrf2 transcription pathway.

## TYPICAL PROPERTIES

Composition  
Appearance  
Aflatoxins  
GMO  
Pesticides  
Microbiology  
Packaging  
Storage  
Shelf Life

## DISTINCTIVE® PHYTOSTEM MARRUBIUM

Marrubium vulgare Cell Cultures 20%, Glycerin 80%, Xanthan gum 0.3%  
Amber to light brown liquid  
Absent  
Absent  
Absent  
Total microbial count: Bacteria < 100 UFC/g  
1 kg  
Store the product in the original, well closed container, in a cool, dry area and protected from light  
12 months

## FORMULATION GUIDELINES

Use Level: 1.0 – 3.0 %  
Compatible with O/W emulsions, serums, etc... Introduce during the cooling phase (<50°C).  
pH ≤ 6

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