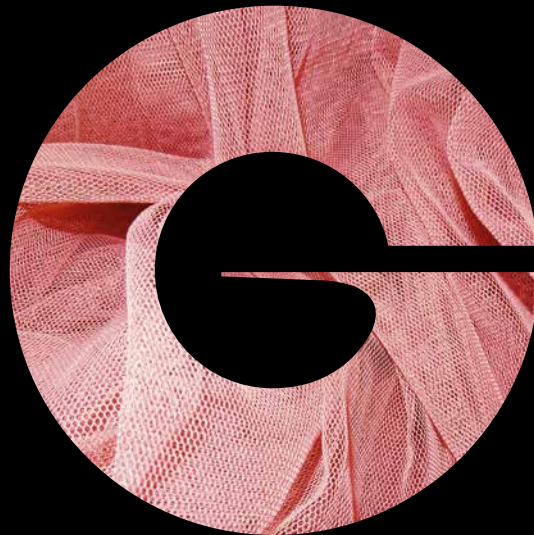


Active Beauty
Unicontrolzon™ C-49
The Overall prOtectOr against O₃

Crafted by green technology and synthesis



Focus on the product

Pollution: our global killer

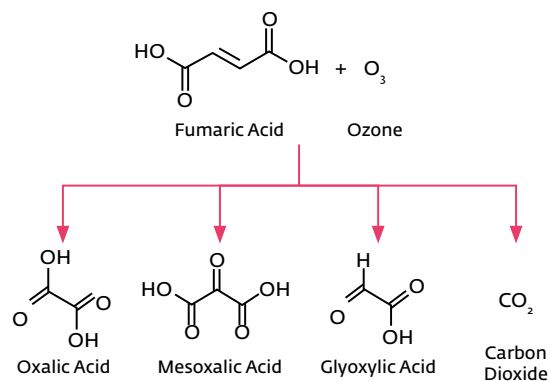
Over 90% of the world's population lives in areas that exceed pollution safety limits set by the World Health Organization¹. Air pollution is a major environmental risk to health. One of the main components of photochemical smog is Ozone (O₃). This air pollutant is formed by the photochemical reaction between Volatile Organic Compounds (VOC) coming from vehicles, solvents or industry and Nitrogen Oxides (NOx) emitted by vehicles or industry². As a result, the highest levels of Ozone pollution occur during periods of sunny weather. The World Health Organization has set up the maximum Ozone air pollution threshold at 120 µg/m³ for a period of 8 hours. Values over this limit can lead to acute harm to the health¹.

Impact of Ozone on skin

As it is directly in contact with our environment, the *Stratum corneum* is the first target of ozone damages. Ozone can permanently damage the antioxidant content in the *Stratum corneum* leading to a cascade of effects resulting in an active cellular response in the deeper layers of the skin³. The exposition of skin to Ozone results in depletion of antioxidant vitamins, permanent damages on proteins and disruption of lipidic cell membranes. Those damages will lead to a pro-inflammatory response which will damage the Extra Cellular Matrix (ECM) and destroy natural lipophilic skin barrier.

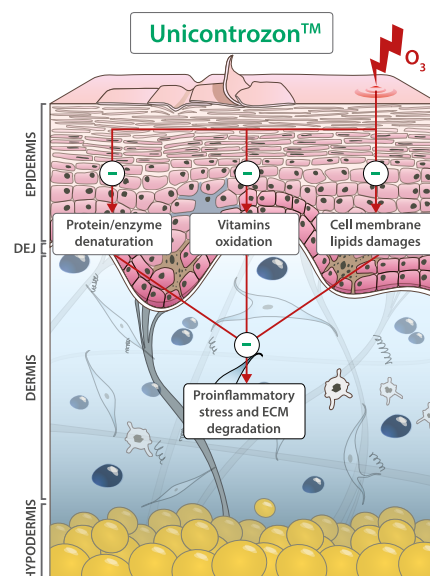
Unicontrolron™ C-49 the Overall protectOr against O₃

Unicontrolron™ C-49 is a natural combination of fumitory and lemon fruit extracts with fumaric acid for an efficient protection against Ozone. Fumitory was used in ayurvedic tradition to soothe various skin diseases⁴. The fumaric acid is an endogenous substance which is produced biogenically within the citric acid cycle and is present in nearly all the body cells⁵. It has a high specific reactivity with Ozone yet is very stable towards atmospheric oxygen and other oxidising agents⁶. In combination with the fumitory extract, the constituents of the lemon extract develop an additional protective action. The environmental Ozone is going to oxidize Fumaric Acid to form mainly three reaction products, Oxalic Acid, Mesoxalic Acid, Glyoxylic Acid together with Carbon Dioxide. These three carboxylic acids are formed in a very low concentration with no toxicological impact.



Bringing an overall protection of the skin against Ozone:

- ▶ Avoid denaturation of proteins
- ▶ Maintain enzyme activity
- ▶ Protect lipophilic and hydrophilic vitamins (B2, E)
- ▶ Protect extra cellular matrix (hyaluronic acid)
- ▶ Reduce cell membrane damages
- ▶ Protect hair dyes from fading
- ▶ Protect sebum composition



¹ World Health Organization.

² United States Environmental Protection Agency.

³ The dual action of ozone on the skin. Valacchi G, Fortino V, Bocchi V. Br J Dermatol. 2005 Dec;153(6):1096-100.

⁴ A review on ethnobotany, phytochemistry and pharmacology of Fumaria indica (Fumitory). Prakash Chandra Gupta, Nisha Sharma, and Ch V Rao.

⁵ Grieve, M. Modern Herbal, pp. 329-331. Penguin Books (1980).

⁶ Stryer, L. Biochemie, pp. 389-409. Spektrum Akademischer Verlag, Heidelberg (1994).

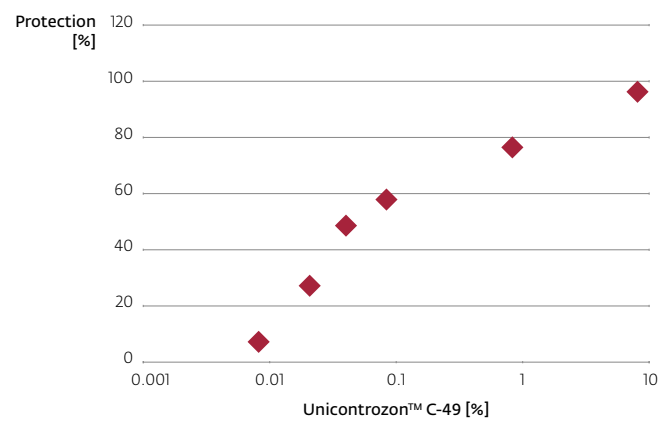
Biological activity

Protection of enzymes against Ozone damages (*in tubo*)

The protective effect of Unicontrozon™ C-49 on enzymes has been evaluated using the β -glucosidase as model enzyme. β -glucosidase was mixed with increasing concentrations of Unicontrozon™ C-49 and Ozone solution (58mg/L). The Ozone was inactivated using sodium sulphite. The enzyme activity was then measured by adding the enzyme substrate to the solution (o-NP glucoside) and evaluating the absorbance with a spectrophotometer at 430nm.

Results: Unicontrozon™ C-49 shows strong Ozone scavenging properties. At 1%, Unicontrozon™ C-49 demonstrates a **protection of enzymes** which catalyse all cellular metabolic processes of more than **75%**.

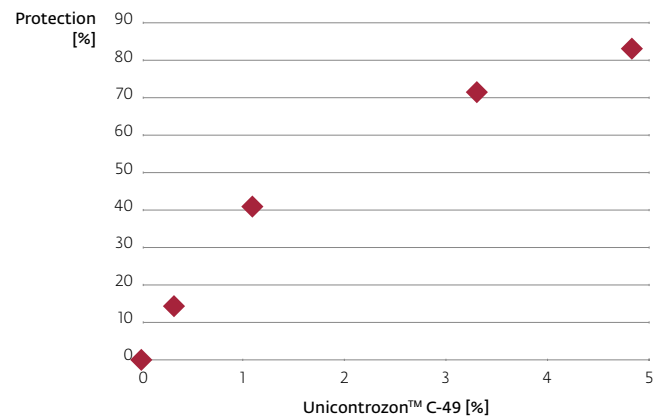
A protection index of **almost 60%** is reached with a concentration as low as 0.1%.



Protection of proteins against Ozone damages (*in tubo*)

The protective effect of Unicontrozon™ C-49 on proteins has been evaluated using myoglobin, which is an oxygen carrier. Myoglobin was mixed with increasing concentrations of Unicontrozon™ C-49 and Ozone solution (58mg/L) for 5 minutes. The denaturation of myoglobin was measured with a spectrophotometer at 410nm.

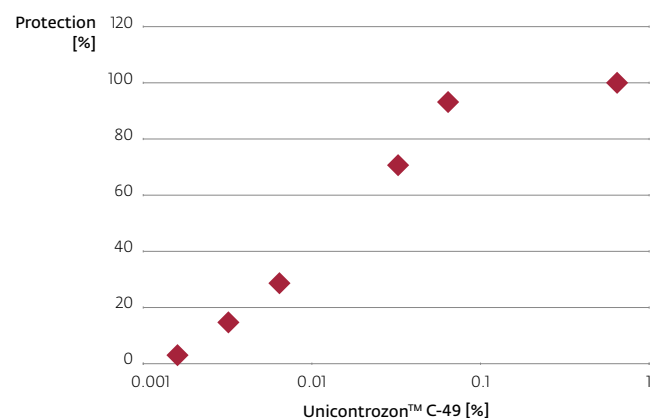
Results: At 3%, Unicontrozon™ C-49 demonstrates a **protection of proteins** of approximately **70%**. The protection is not total because Ozone has a strong affinity with the iron within the heme part of the myoglobin which will not only be oxidised but also expelled from the heme.



Protection of hydrophilic vitamins against Ozone damages (*in tubo*)

The protective effect of Unicontrozon™ C-49 on hydrophilic vitamins has been evaluated using the riboflavin (Vitamin B2) as model. The vitamin was mixed with increasing concentrations of Unicontrozon™ C-49 and Ozone solution (58mg/L) for 2 minutes. The protection against denaturation of vitamin was then evaluated by measuring the absorbance of the solution at 445nm.

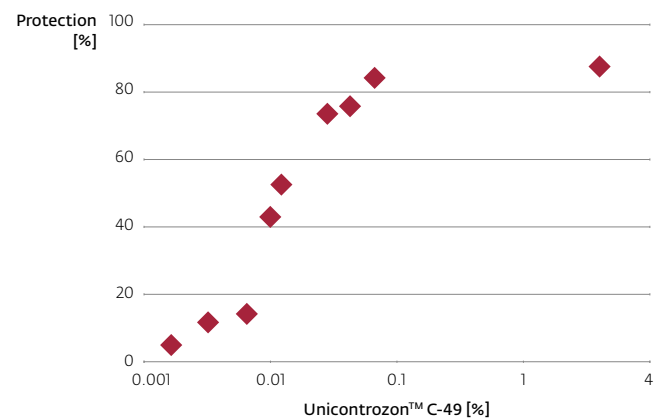
Results: At the very low concentration of 0.5%, Unicontrozon™ C-49 demonstrates a **protection of hydrophilic vitamins** from denaturation by Ozone of approximately **99%**.



Protection of lipophilic vitamins against Ozone damages (*in tubo*)

The protective effect of Unicontrolzon™ C-49 on lipophilic vitamins has been evaluated using the tocopherol (Vitamin E) as reference. Tocopherol and Ozone reacts very quickly together, so it is usually really difficult to protect Tocopherol against Ozone. The vitamin was mixed with increasing concentrations of Unicontrolzon™ C-49 and Ozone solution (58mg/L) for 1 minute. The protection against denaturation of vitamin was evaluated by measuring the absorbance of the solution at 293nm.

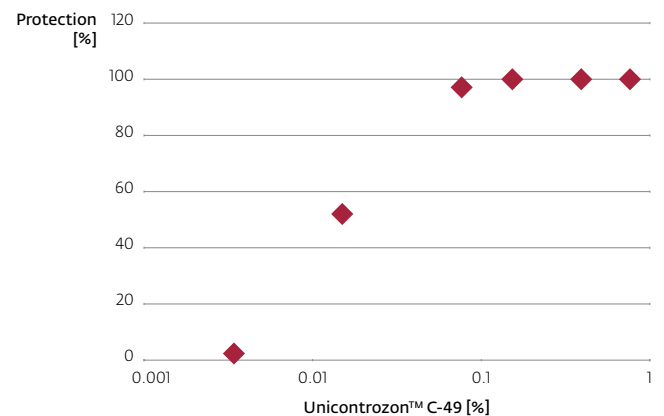
Results: At only 0.1%, Unicontrolzon™ C-49 demonstrates a **protection of lipophilic vitamins of more than 80%**.



Protection of ECM against Ozone damages (*in tubo*)

The protective effect of Unicontrolzon™ C-49 on extra cellular matrix has been evaluated using one of the main component of the ECM, hyaluronic acid, as model. Hyaluronic acid was mixed with increasing concentrations of Unicontrolzon™ C-49 and Ozone solution (58mg/L) for 3 minutes. The protection of hyaluronic acid against degradation by Ozone was evaluated by measuring the viscosity of the solution, as hyaluronic acid in solution brings viscosity to the medium.

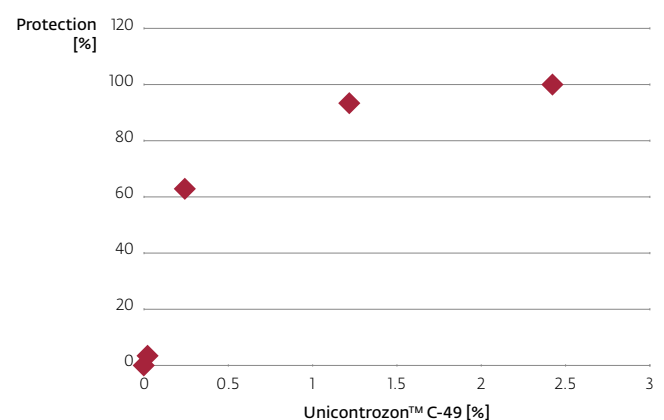
Results: At only 0.2%, Unicontrolzon™ C-49 demonstrates a complete **protection of ECM** by completely avoiding the degradation of hyaluronic acid (Protection Index 100%).



Protection of cell membranes against Ozone damages (*in tubo*)

The protective effect of Unicontrolzon™ C-49 on cell membranes has been evaluated using erythrocytes, which are red blood corpuscles with a common cell membrane in which ozone damages can be easily evaluated (due to red pigment spread in the solution). Erythrocytes were mixed with increasing concentrations of Unicontrolzon™ C-49 and Ozone solution (58mg/L) for 2 minutes. The intact erythrocytes are centrifuged. The absorbance of the supernatant is measured at 415nm by a spectrophotometer.

Results: At 1%, Unicontrolzon™ C-49 protects **cell membranes at more than 80%**.



Biological activity

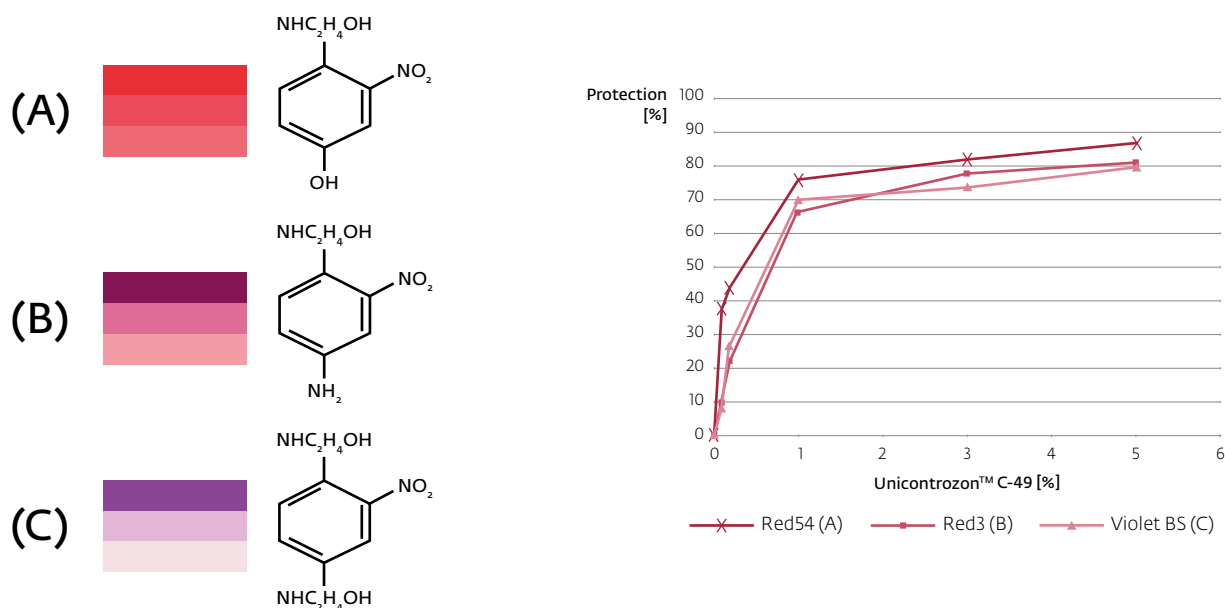
Summary of *in tubo* results

Skin molecule	Category	Unicontrozon™ C-49	Protection index
β-glucosidase	Enzyme	1%	>75%
Myoglobin	Protein (oxygen carrier)	3%	70%
Riboflavin	Hydrophilic vitamin	0.5%	99%
Tocopherol	Lipophilic vitamin	0.1%	> 80%
Hyaluronic acid	Polysaccharide of the ECM	0.2%	100%
Erythrocyte	Cell membrane	1%	> 80%

Results: Unicontrozon™ C-49 provides an overall protection against Ozone aggressions on the different essential molecules of the skin.

Protection of hair dyes against Ozone damages (*in tubo*)

Unicontrozon™ C-49 was tested for its ability to protect hair dyes. A first absorption measurement (at their λ_{\max} , which is different depending on the dye solution) was done on a mix of a solution of the particular dye with the product. Then, the Ozone solution was added for 2 minutes before a second measurement.



Results: At 1%, Unicontrozon™ C-49 provides a protection of hair dyes of +67% to +76%. At 5% of Unicontrozon™ C-49, it is possible to protect dyes with up to +87% protection index.

Biological activity

Detoxifying activity of Unicontrozon™ C-49 on sebum lipids (*in tubo*)

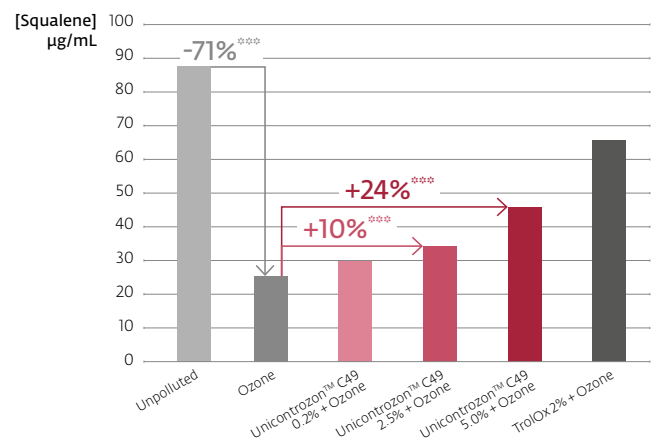
The aim of this study was to evaluate the capacity of Unicontrozon™ C-49 to protect the natural skin sebum (protection of skin) from Ozone damages. Ozone induces a cleavage of the sebum lipids, giving birth to free unsaturated fatty acids, thus fostering skin inflammation¹. Skin sebum was incubated with increasing concentrations of Unicontrozon™ C-49 and then exposed to Ozone pollutant bubbling for 30 seconds (99% O₂/1% O₃ v/v). The sebum was extracted through a liquid/liquid extraction and analysed with a Gas Chromatography linked to a Mass Spectroscopy. Three conditions were tested:

- ▶ Unpolluted (no exposure to Ozone - Negative control)
- ▶ Increasing concentrations of Unicontrozon™ C-49 and exposition to Ozone.
- ▶ Trolox at 2% (as positive antioxidant reference) and exposition to Ozone.

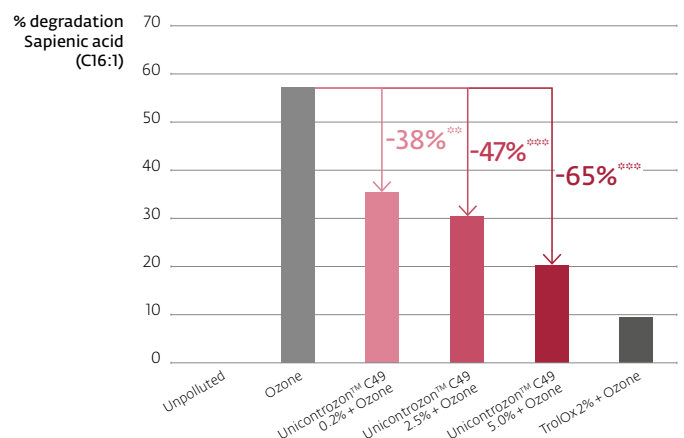
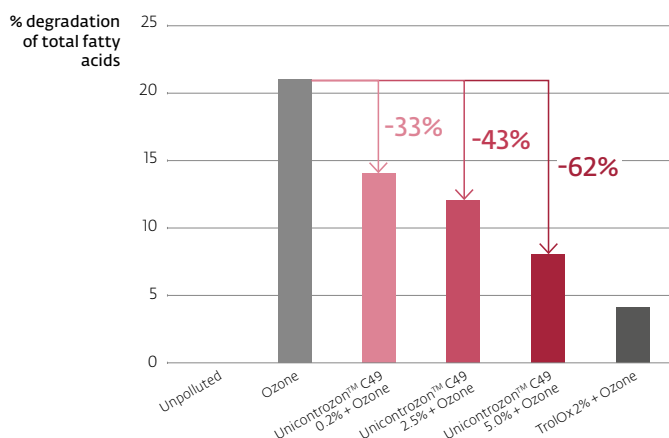
1. Evaluation of squalene content after Ozone exposure

Results: Ozone exposure induces a significant degradation of squalene contained in sebum. Unicontrozon™ C-49 induces a dose dependent protection of squalene (main component of sebum) against Ozone pollution with **+10% and +24%** increase of squalene concentration vs untreated, at respectively 2.5% and 5% Unicontrozon™ C-49.

***p<0.001 (Bonferroni's Multiple Comparison test)



2. Evaluation of free unsaturated fatty acid content after Ozone exposure



Results: Ozone exposure induces a significant degradation of free unsaturated fatty acids contained in sebum. Unicontrozon™ C-49 induces a significant dose dependent protection of sapienic acid (most predominant fatty acid in sebum) against Ozone pollution with **-38%, -47% and -65% degradation vs untreated** at respectively 0.2%, 2.5% and 5% Unicontrozon™ C-49.

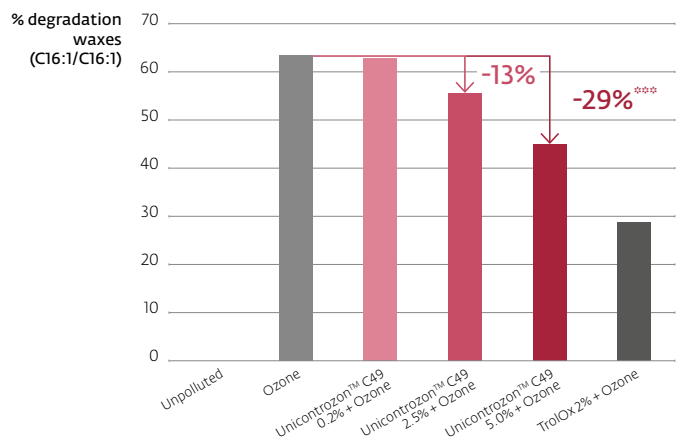
p<0.01 (Bonferroni's Multiple Comparison test) / *p<0.001 (Bonferroni's Multiple Comparison test)

Biological activity

3. Evaluation of bound fatty acid content after Ozone exposure

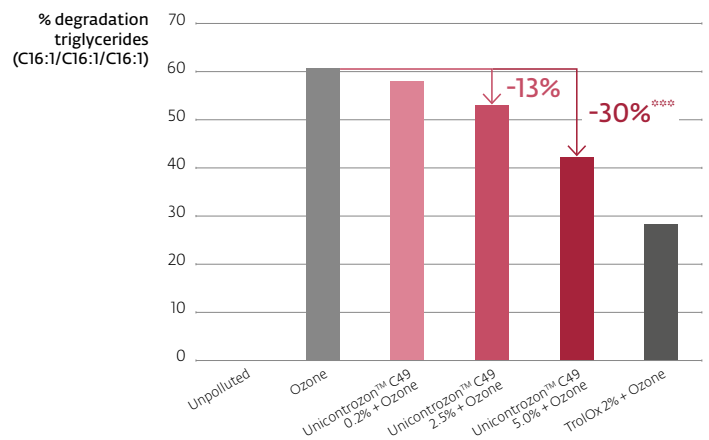
Results: Unicontrozon™ C-49 induces a dose dependent protection of waxes C16:1 against Ozone pollution with **-13%, and -29% degradation vs untreated** at respectively 2.5% and 5% Unicontrozon™ C-49.

***p<0.001 (Bonferroni's Multiple Comparison test)



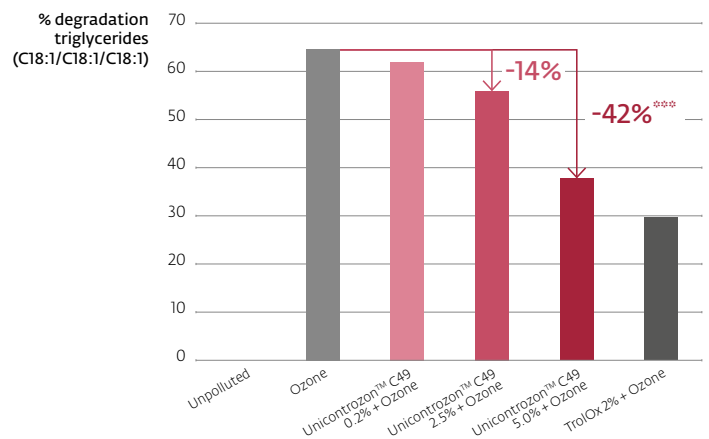
Results: Unicontrozon™ C-49 induces a dose dependent protection of triglycerides C16:1 against Ozone pollution with **-13%, and -30% degradation vs untreated** at respectively 2.5% and 5% Unicontrozon™ C-49.

***p<0.001 (Bonferroni's Multiple Comparison test)



Results: Unicontrozon™ C-49 induces a dose dependent protection of triglycerides C18:1 against Ozone pollution with **-14%, and -42% degradation vs untreated** at respectively 2.5% and 5% Unicontrozon™ C-49.

***p<0.001 (Bonferroni's Multiple Comparison test)



A dose effect is observed for the Unicontrozon™ C-49 with a better protection at 5%. An interesting and significant protection effect mediated by the active ingredient was observed on free and bound fatty acids degradation when put in presence of Ozone, with down to -65% degradation of free fatty acids, and down to -42% degradation of bound fatty acids.

Summary



Technical information

INCI:	Unicontrolon™ C-49: Water (and) Propylene Glycol (and) Citrus Lemon (Lemon) Extract (and) Fumaria Officinalis Flower/Leaf/Stem Extract (and) Fumaric Acid
	Unicontrolon™ BG-49: Water (and) Butylene Glycol (and) Citrus Lemon (Lemon) Extract (and) Fumaria Officinalis Flower/Leaf/Stem Extract (and) Fumaric Acid
Origin:	Natural and organic synthesis
Preservation:	Preservative free
Appearance:	Clear to slightly opalescent, brown liquid
Solubility:	Water soluble
Dosage:	2.5-5%
Processing:	Can be added at the end of the formulation process, under gentle stirring. Can be added to the water phase. Formulate at pH between 5.0 and 8.0 and temperature below 50°C.

Claims

Claims:	Antipollution, ozone protection, overall protector against ozone, sebum protection, vitamin protection, hair dye protection, hair shield.
Applications:	Day cream, night cream, serum, body lotion, shampoo, conditioner, hair spray, antipollution mist.

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