

# **UTILIZATION OF PLANT OILS WITH INTRODUCED OZONE IN VARIOUS COSMETIC FORMULATIONS**

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## ABSTRACT

Technologists are seeking innovative or new ingredients that better meet consumer expectations. One solution is the use of a new raw material - ozonated rapeseed oil. Due to its rich and valuable nutritional composition, rapeseed oil is used in the food industry as it plays a significant role in the daily human diet. Furthermore, it serves as a base for creating lines of cosmetic products.

The increasing number of people experiencing allergies and skin intolerances to fragrances and preservatives found in products is a significant technological challenge. In response to this growing demand, scientists are seeking innovative solutions.

Ozone, a strong oxidizer, is used in medicine, dentistry, the food, and pharmaceutical industries. Additionally, it is used for the decontamination of water, air, and even waste recycling. Applications in medicine include treating infections, wounds, burns, and even as a part of cancer therapy. At low concentrations, ozone exhibits biostimulating effects, enhancing regenerative processes and improving microcirculation. The introduction of ozone into plant oils changes their chemical profile and functional properties.

The main objective of the research was to assess the possibility of using ozonated rapeseed oil in cosmetic products. The study determined the chemical composition and functional properties of refined and cold-pressed oil, before and after the ozonation process. Additionally, cosmetic formulations for facial care based on modified rapeseed oil were developed. Gas chromatography coupled with mass spectrometry (GC-MS) was used to determine the fatty acid composition in oil samples before and after the introduction of ozone at concentrations of 0.04 mol O<sub>3</sub> or 0.09 mol O<sub>3</sub> per 100 g of oil. Headspace solid-phase microextraction (HS-SPME) coupled with GC-MS was used for the analysis of volatile compounds. Additionally, cytotoxicity was assessed using HaCaT cells. Rapeseed oils with and without ozonation were used as bases for cosmetic emulsions. Selected organoleptic properties, preservative effectiveness, and stability of the formulations were evaluated over twelve months.

The ozonation process reduced the level of unsaturated fatty acids present in the oils. Despite this, a positive impact on the physicochemical and sensory properties of cosmetic emulsions was observed due to the formation of new compounds, such as hexanal, nonanal, butan-2-one, and methyl undecanoate. The use of products containing ozonated rapeseed oil effectively increased skin hydration, which is a clear advantage compared to products based on non-ozonated oil.

Emulsions containing ozonated rapeseed oil demonstrated longer retention of their properties compared to formulations without ozone. By introducing concentrations of 0.04 or 0.09 mol O<sub>3</sub>/100 g of oil, the shelf life of the formulation can be extended to twelve months without the need for additional preservation. Emulsions containing ozonated oil are distinguished by their unique fruity aroma, which is an additional attraction.

An important aspect is also the fact that rapeseed oil is a readily available and economical raw material, especially in the case of Polish rapeseed oil. Poland is one of the main producers of low-erucic acid rapeseed in Europe, which provides an opportunity to utilize local resources in the cosmetic industry