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Doktoranckie Koło Naukowe „Zielona Chemia”
Opiekun: dr hab. inż. Robert Pełech
Zachodniopomorski Uniwersytet Technologiczny w Szczecinie
Wydział Technologii I Inżynierii Chemicznej

The esters of curcumin- synthesis and properties

Monika Retajczyk

Curcumin [(1E,6E) -1,7-bis (4-hydroxy-3-methoxyphenyl) -1,6-hepien-3,5-dione] is a compound which belongs to the group of polyphenols. It is also known as diferuloylmethane. Curcumin is a bright yellow chemical, which can be produced by some plants. It is obtained from the rhizome of turmeric (*Curcuma longa L.*), plants from the ginger family, otherwise known as long-nephron or saffron of India.

Curcumin is produced by a plant most likely to protect against fungi. Its properties were used for centuries for treatment in many health problems. Both this compound and its derivatives show interesting biological activity. Numerous studies have shown that curcumin and its derivatives have antibacterial, antiviral (including anti-HIV), anti-inflammatory, antioxidant and anti-cancer activity. Moreover, there are works in which curcumin and its derivatives are used in diseases such as Alzheimer's disease or Parkinson's disease.

Curcumin derivatives are obtained by modifying its structure, which can be classified in three types. The first includes modification within the alkyl link located between the aromatic rings. Another type of modification is the introduction of substituents into the aromatic ring. The last type of changes in the structure of curcumin is the formation of its complexes with metal ions. Experiment: Synthesis of curcumin acetate.

Curcumin was dissolved in methylene chloride. Acetic anhydride and pyridine were added. The mixture was heated for 2 hours under reflux. Methanol was added to the residue to give yellow solid. The product was analyzed by FTIR spectroscopy.

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The study of climate change in the lab

Barbara Hanna Roman

The atmosphere has a significant effect on Earth conditions. It is a barrier against excessive electromagnetic radiation from space, but it is mainly responsible for maintaining appropriate temperature through the greenhouse effect. This is due to the composition of the gases forming it, nitrogen (78.08%), oxygen (20.95%), argon (0.93%) and other gases such as carbon dioxide, neon, helium, krypton, xenon, hydrogen and ozone. (0.04%) in terms of dry air. Depend on the location and conditions of the atmosphere may contain from 0.1 to 3% by volume of water. Along with the height, the chemical composition changes. In the upper part of the atmosphere are lighter gases such as hydrogen and helium, while in the lower part are heavier gases namely nitrogen and oxygen.

The greenhouse effect of the atmosphere is caused by the presence of gases that have absorption bands in the infrared area, such as water and carbon dioxide. The greenhouse effect of water is clearly perceptible. In the dry climate there is a large differentiation of day-night temperatures, while in the sea climate the differences between day and night temperatures are flattened.

In the common belief, the climate of the Earth shaped by the media is getting warmer. Blamed for this human been, which increases the natural greenhouse effect, emitting into the atmosphere each year, growing amounts of carbon dioxide. At least, say scientists from the IPCC (Intergovernmental Panel on Climate Change), the team appointed by the UN to investigate the impact of human activity on climate.

Experiment: The rate of change in temperature in 4 types of environment like desert, desert with additional CO_2, ocean and ocean with additional amount of CO_2 in the laboratory scale was investigated.

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Separation of curcuminoids from Turmeric (*Curcuma longa L.*)

Łukasz Sałaciński

In recent years, modern science and medicine have become interested in curcumin, a substance isolated from the rhizomes of Turmeric (*Curcuma longa* L.) due to its properties. It is distinguished by multidirectional biological activity and potential use in the treatment of many diseases, such as: atherosclerosis, cancer and Alzheimer's disease. Unfortunately, effective use of curcumin is difficult. The biggest problem is the low bioavailability of this polyphenol, which forces scientists to synthesize new curcumin derivatives that could be used in medicine.

Curcuminoids are obtained mainly as a result of Knoevenagel's synthetic condensation or by extractions of Curcuma plants. Both methods do not give satisfactory results: isolation and separation of curcuminoids poses a lot of difficulties due to their similar polarity, while synthesis is inefficient. The content of curcuminoids in the raw material is from 5 to 10% of dry matter and the extract contains a mixture of curcumin derivatives - 77% curcumin, 17% demethoxycurmarin and 3% bis-thymoxycurmarin.

Fig. 1. Curcumin and its derivatives

Experiment: Chopped Turmeric rhizomes (*Curuma longa* L.) were extracted with methanol and obtained extract was subjected to separation by known analytical methods: thin layer chromatography TLC, column chromatography CC and high performance liquid chromatography HPLC.