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THE POTENTIAL OF FLAVONOID OXIMES IN COUNTERACTING OXIDATIVE STRESS

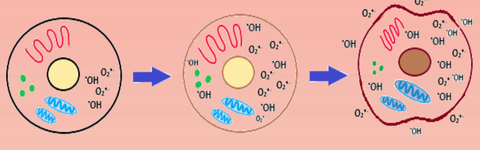
A. Vrantza[1,*], S. Matsia[1], A. Hatzidimitriou[2], A. Salifoglou[1]

[1] *Laboratory of Inorganic Chemistry and Advanced Materials, School of Chemical Engineering, Aristotle University of Thessaloniki, Thessaloniki 54124, Greece*

[2] *Laboratory of Inorganic Chemistry, School of Chemistry, Aristotle University of Thessaloniki, Thessaloniki 54124, Greece*

E-mail: ***andrianav@cheng.auth.gr***

Oxidative stress in human health



INTRODUCTION

Oxidative stress is a phenomenon that results in cell and tissue damage in the human body.[1] In oxidative stress, formation of reactive oxygen and nitrogen species (ROS and RNS) increases and weakens body antioxidant defence and protection, subsequently causing DNA damage, lipid peroxidation, protein modification and other effects, all responsible for a number of diseases, including cancer, cardiovascular disease, diabetes, atherosclerosis, neurological disorders (Alzheimer's, Parkinson's disease), and chronic inflammation. The antioxidant activity of flavonoids and their derivatives, has shown great research interest in recent years, further envisioning to gain strength through metal ion complexation. In fact, it has been proven that certain metal ions have a positive impact on the human body's immune defence, due to metal-regulatory mechanisms operating in cells.[2] In that respect, the oxime functional group is considered to strengthen the biological efficiency of a flavonoid molecule, thereby potentially enhancing cell protection and antioxidant activity.[3] Concurrently, metal complexes of flavonoids appear to exhibit intensified antioxidant properties compared to the nascent form of flavonoid.

Goals

Materials and Methods

Chemical modification of Flavonoids

Design

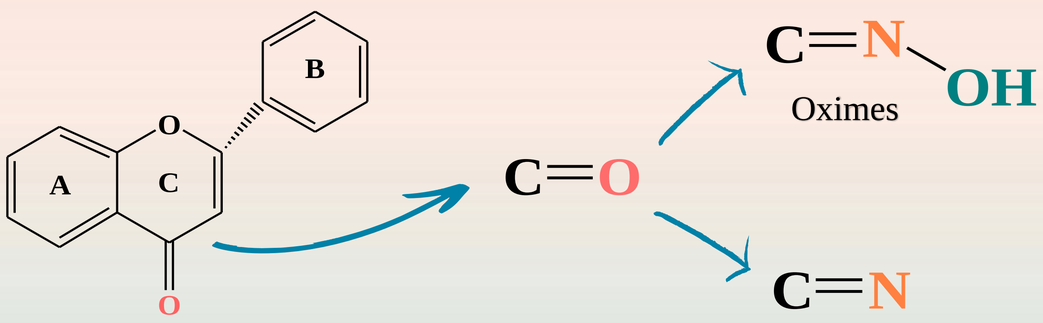
Synthesis and new materials

- Chemical reactivity
- Isolation
- Crystallization

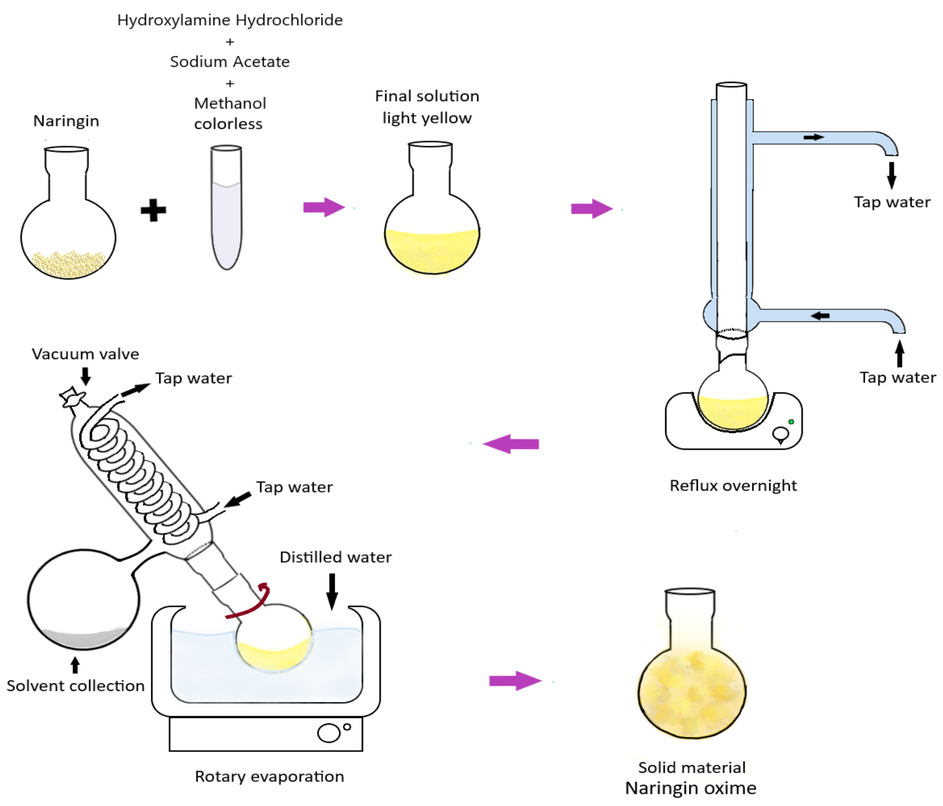
- Enhanced physicochemical properties
- Enhanced biological activity

Sample analysis

Chemical modification of flavonoids

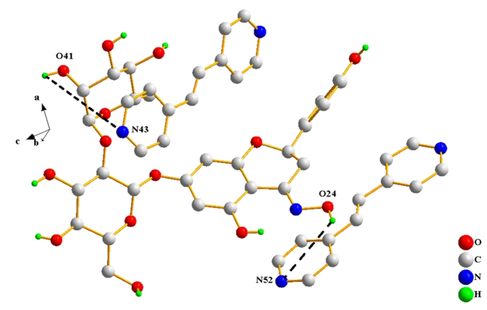


Naringin oxime synthesis

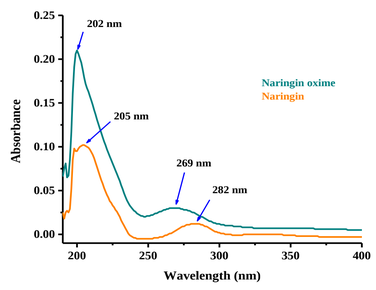


Results

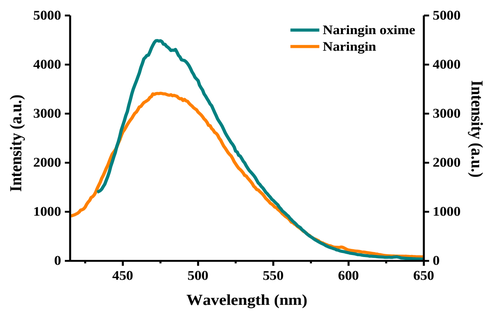
Physicochemical Properties



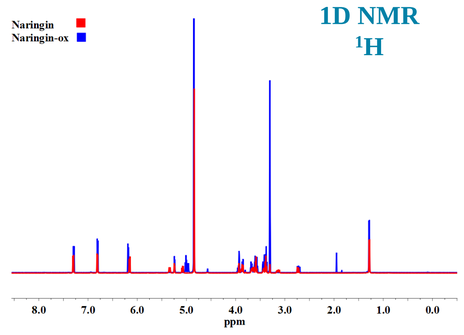
UV-Visible electronic pattern



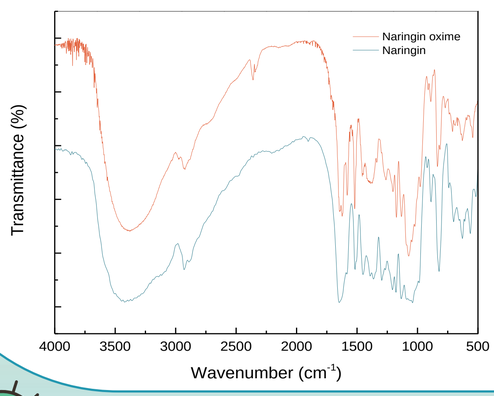
Luminescence properties



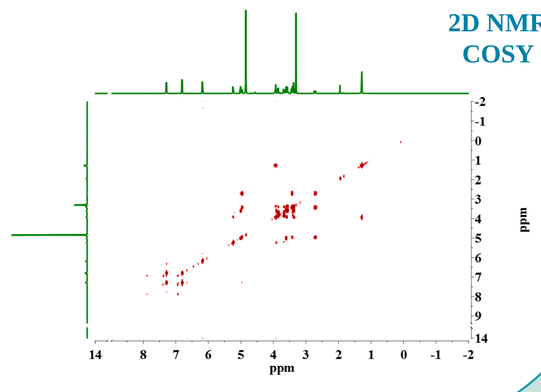
1D NMR ^{1}H



FT – IR



2D NMR COSY



Antibacterial tests

The antibacterial effect of Naringin oxime has tested in solid cultures of the bacteria: *E. coli*, *X. campestris*, and *S. aureus*. The liquid sample was placed in patches. The appearance of zone of inhibition (ZOI) around the sample patches constitutes proof of antibacterial effect of the sample.

E. coli *S. aureus* *X. campestris*

Zone of Inhibition (ZOI) (mm)	Bacteria												
	E. coli				*S. aureus*						*X. campestris*		
	Pen/Strep concentration (%)		Naringin-ox (M)		Pen/Strep concentration (%)			Sample concentration (M)			Pen/Strep concentration (%)	Sample concentration (M)	
	0.1	1	0.1	0.08	0.1	2	5	0.1	0.08	0.04	2	0.1	0.08
Mean	No Zone	15.5±1.6	21.5±1.1	21.0±0.7	37.0±1.0	>4.00	>4.00	25.0±0.1	19.5±0.7	12.5±0.7	26.3±1.03	22.3±0.3	19.0±0.7

Conclusions – Future goals

- Modified flavonoids (oximes, Schiff bases) were synthesized, isolated and characterized (Elemental analysis, FT-IR, ESI-MS, ^{1}H, ^{13}C-NMR, UV-Visible, and X Ray Crystallography)
- All of the production and isolation processes have been optimized
- The crystal structure of the oxime derivative of naringin is the most important achievement in an effort to unravel new properties of flavonoid derivatives.
- Luminescence of organic materials reveals enhancement of modified flavonoid activity
- Investigation of their potential as metal-inducer drugs in adipogenesis (Diabetes mellitus II)

References

1. Pizzino G, Irrera N, Cucinotta M, Pallio G, Mannino F, Arcoraci V, Squadrito F, Altavilla D, Bitto A. (2017). Oxidative Stress: Harms and Benefits for Human Health. Oxidative Medicine and Cellular Longevity, 8416763, 1–13.

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