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European Network on Understanding Gastrointestinal Absorption-related Processes

Screening for nutraceutical - drug interactions toward the non-covalent interactions of their solid binary systems (Case study on Piperine)

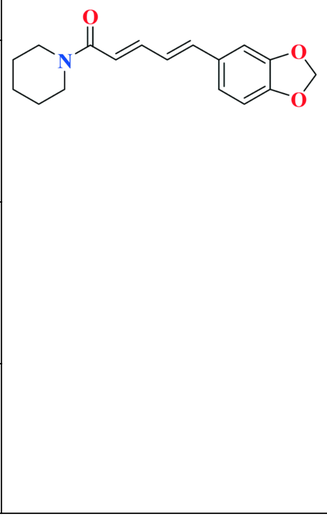
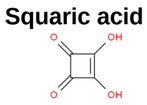
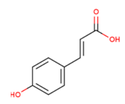
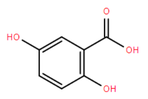
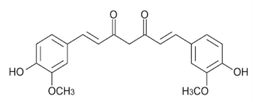
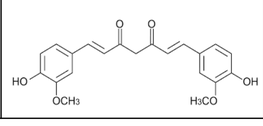
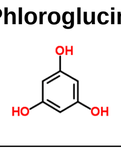
Aleksandar Cvetkovski[1], Darinka Gjorgieva Ackova[1], Katarina Smilkov[1], Petre Makreski [2]

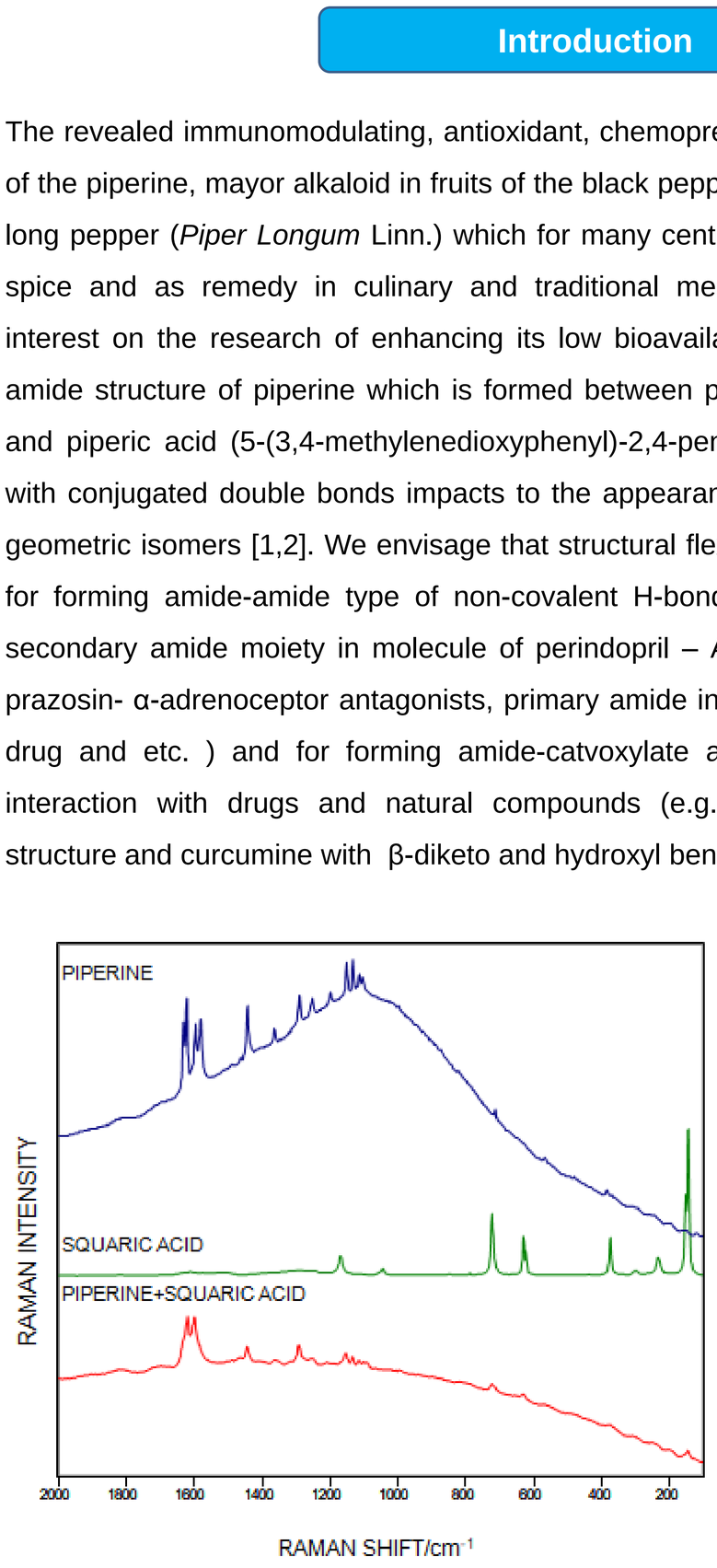
[1] Department of Pharmacy, Faculty of Medical Sciences, University Goce Delcev, Stip, Macedonia FYR,
[2]Institute of Chemistry, Faculty of Natural Sciences and Mathematics, SS. Cyril and Methodius University, Skopje, R. Macedonia
aleksandar.cvetkovski@ugd.edu.mk

Introduction

The revealed immunomodulating, antioxidant, chemopreventive and anticancer activity of the piperine, mayor alkaloid in fruits of the black pepper (*Piper nigrum* Linn.) and the long pepper (*Piper Longum* Linn.) which for many centuries are broadly used both as spice and as remedy in culinary and traditional medicine, respectively spurs our interest on the research of enhancing its low bioavailability. Referring to the ternary amide structure of piperine which is formed between piperidine in chair conformation and piperic acid (5-(3,4-methylenedioxyphenyl)-2,4-pentadienoic acid), its side chain with conjugated double bonds impacts to the appearance of piperine in four possible geometric isomers [1,2]. We envisage that structural flexibility of piperine is favourable for forming amide-amide type of non-covalent H-bond interactions with drugs (e.g. secondary amide moiety in molecule of perindopril – ACE inhibitor, tertiary amide in prazosin- α-adrenoceptor antagonists, primary amide in carbamazepine – antiepileptic drug and etc.) and for forming amide-catvoxylate and amide-hydroxyl H-bonding interaction with drugs and natural compounds (e.g. ascorbic acid with enediole structure and curcumine with β-diketo and hydroxyl benzoic moieties in its structure).

Compounds Studied

Sample No	Model/ nutraceuticals	Coformer	Coformer	Mol ratio
S1		Squaric acid 		1/1
S2		*p*- Coumaric acid 		1/1
S3		Gentisic acid 		1/1
S4		Curcumine 	Squaric acid 	1/1/1
S5		Curcumin 	Phloroglucinol 	1/1/1



Sample preparation

Growing crystalline phases by solvent evaporation method

Characterization

Micro-*Raman spectrometer*
(Horiba Jobin-Yvon LabRam. 300)

Conclusion

Assigned Raman spectra reveal that there is not any interactions between piperine and coformeds

References

Grynpas M, Lindley FP. (1975) *Acta Crystallogr* B Struct Sci Cryst Eng Mater; 31: 2663–67.
Gorgani L., et al., (2017) *Compr Rev Food Sci Food Saf*; 16: 124-40

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