PhD Thesis proposal[1]

General Information		
PhD Thesis Title	***Screening and encapsulation of plant antimicrobial compounds for food preservation: Potential application on food matrices.***	
School	***Agricultural and Food Sciences***	
Research Unit	NA	
Laboratory	NA	
Axis		
PhD Supervisor	Name & Title : Alain Abi Rizk / Associate professor Email : alainabirizk@usek.edu.lb	University Address : Holy Spirit University of Kaslik- USEK
Co-supervisor (if applicable)	Name & Title : Youssef El Rayess / Assistant Professor Email : youssefrayess@usek.edu.lb	University Address :
Location (s)	Location 1: USEK	Work shift calendar /per year (%): 100%
	Location 2:	Work shift calendar /per year (%):
Funding and scholarship		

Applicant Profile and/or Special Requirements	Agricultural Engineer, Food Engineer, master's in chemistry

Subject's national or worldwide Context, Objectives & Research lines
Foodborne diseases represent a substantial public health concern in the Mediterranean Basin even in industrialized countries. New risks are being encountered because of changing characteristics of the relevant micro-organisms, changing production methodologies, changes in the environment and the ecology, and an increase of the global trade of foodstuffs. With the growing consumer demand for natural preservatives to replace chemical compounds, plant and spices antimicrobial compounds must be thoroughly investigated for their potential to serve as biopreservatives. Also, the emerge of multi-drug resistance strains of some bacteria due to the intensive use of antibiotics is a major concern. To retain their biological activity and minimize at the same time the impact on the organoleptic properties of foods where incorporated, bioactive compounds need to be encapsulated in delivery systems, which are compatible with food applications. For all these reasons, the aim of this study is to screen the antimicrobial activity essential oils and extracts of some plants and spices against Lebanese multi-drug resistance bacteria strains (*Salmonella, Listeria* and *E-coli*) and against some spoilage yeasts (*Candida, Saccharomyces* and *Brettanomyces*). In parallel, the chemical composition of

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essential oils and extracts will be studied; thus, the antimicrobial activity can be correlated with the chemical composition. Also, to extend the shelf-life of the identified compounds, three encapsulations methods (coacervation, spray drying and freeze drying) and polymers will be tested on the products with the highest antimicrobial activity.

Outcomes (OCs) : What do we wish to achieve?	
OC1:	Assess the antimicrobial activity of Lebanese plants essential oils and extracts
OC2:	Correlate the chemical composition and the antimicrobial activity
OC3 :	Choose the best technique and polymers for the encapsulation of essential oils and extracts
OC4 :	Validate the obtained results on real food matrices

References (R) (5 most recent peer-reviewed publications)	
R1:	Hintz, T., Matthews, K. K., & Di, R. (2015). The use of plant antimicrobial compounds for food preservation. BioMed research international, 2015.
R2:	Pandey, A. K., Kumar, P., Singh, P., Tripathi, N. N., & Bajpai, V. K. (2017). Essential oils: sources of antimicrobials and food preservatives. Frontiers in microbiology, 7, 2161.
R3 :	Saikia, S., Mahnot, N. K., & Mahanta, C. L. (2015). Optimisation of phenolic extraction from Averrhoa carambola pomace by response surface methodology and its microencapsulation by spray and freeze drying. Food Chemistry, 171, 144-152.
R4 :	Ghayempour, S., Montazer, M., & Rad, M. M. (2015). Tragacanth gum as a natural polymeric wall for producing antimicrobial nanocapsules loaded with plant extract. International journal of biological macromolecules, 81, 514-520.
R5 :	Ballesteros, L. F., Ramirez, M. J., Orrego, C. E., Teixeira, J. A., & Mussatto, S. I. (2017). Encapsulation of antioxidant phenolic compounds extracted from spent coffee grounds by freeze-drying and spray-drying using different coating materials. Food chemistry, 237, 623-631.