



Enrichment of Extra Virgin Olive Oil for the Development of Functional Oil to Special Consumers

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State of the Art

In the Mediterranean diet (MD), there is a high consumption of fruits, vegetables, whole grain cereals, potatoes, legumes, nuts, and spices. One of the most important product is the extra virgin olive oil (EVOO) that represent the main source of fat. Several published studies documented that most of the health effects of MD can be ascribed to EVOO. According to the definition of the European Union Commission, EVOO must be extracted 'only from olives with a superior quality, cannot undergo any treatment other than washing the fruits, and decanting, centrifuging and filtering the extracted olive oil. It excludes oils obtained from seeds by chemical or mechanical methods or the use of solvent extraction or re-esterification methods, and those mixed with oils from other sources'. Thus, the addition of herbs, spices, to an EVOO generates a product that cannot be called as 'extra virgin olive oil', but can be defined as flavoured olive oil (FVOO). These FVOOs are characterized by improved nutritional values, enriched sensory characteristics and increased shelf-life. For a long time, it was believed that EVOO healthy properties were ascribable to its high monounsaturated fatty acid (MUFA) content however an increasing number of scientific evidences have revealed that phenolic compounds that represent only ~2% of EVOO may also contribute to the healthy features of EVOO (Jimenez-Lopez et al., 2020). In fact, the European Food Safety Authority (EFSA) with the Directive n. 432/2012 approved the health claim on olive oil polyphenols (OJEC, 2012). The addition of herbs and spices, including chilli pepper to EVOO has become more popular in recent years, due to consumer demand of 'gourmet oils' or 'functional oils'. A perusal analysis of the literature revealed that there is a great variability in the aromatization process of an EVOO. Clodoveo et al. (2016) compared the impact of different FVOO production techniques (infusion of herbs into the oil, addition of herbs to the crushed olives before the malaxation step, and application of ultrasound before the olive paste malaxation) on the quality (as chemical parameters and sensorial note) of the derived FVOO. Results clearly evidenced that the addition of the selected extract in the malaxation step seems to be not only a green technique without the use of solvents that is easier and faster to apply than others, such as infusion, but also in showing more effective results in extraction of phenolic compounds, with a significantly lower level of hydrolysis.

Phd Thesis Objectives and Milestones

This PhD research project aims to enhance the traditional foods typical of rural areas by identifying their compositional and healthy peculiarities. To achieve this goal, extra virgin olive oil (EVOO) from the Calabrian territory, derived from cultivars that have not been extensively investigated will be enriched with spices, vitamins and spirulina. In this way, a series of stable formulations or flavoured oils (FVOOs) will be obtained. These FVOOs will be stable, pleasant from a sensorial point of view and with marked health properties.



Selected References

- Clodoveo ML, Dipalmo T, Crupi P, Durante V, Pesce V, Maiellaro I, Lovece A, Mercurio A, Laghezza A, Corbo F, Franchini C (2016) Comparison between different flavored olive oil production techniques: healthy value and process efficiency. *Plant Food Hum Nutr* 71: 81-87.
- OJEC (2012) European Union Commission. Commission Regulation (EC) No 432/2012 of 16 May 2012 establishing a list of permitted health claims made on foods, other than those referring to the reduction of disease risk and to children's development and health. *Official Journal of the European Communities*, L 136/22.
- Jimenez-Lopez C, Carpena M, Lourenço-Lopes C, Gallardo-Gomez M, Lorenzo JM, Barba FJ, Prieto MA, Simal-Gandara J (2020) Bioactive compounds and quality of extra virgin olive oil. *Foods* 9: 1014.

Table 1 Gantt diagram for this PhD thesis project on a 3-year period (bimonthly).

Activity	Months	1	3	5	7	9	11	13	15	17	19	21	23	25	27	29	31	33	35
		2	4	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36
A1)	Bibliographic research and analytical method assessment																		
A2)	Identification of the best olive cultivars to be used as a matrix to be enriched and the spices to use for oil enrichment																		
A3)	Matrix chose for oil enrichment will be subjected to microwave and ultrasound assisted maceration process																		
A4*)	EVOOs enrichment with spices, herbs, vitamin A and D, lutein and spirulina by using different technological approaches																		
A5)	EVOOs and FVOOs physical-chemical and sensorial analysis																		
A6)	EVOOs UHPLC analysis																		
A7)	FVOOs UHPLC analysis																		
A8)	Determination of antioxidant activity by multi-target approaches and enzyme inhibitory properties related to health status																		
A9*)	FVOOs preparation for further aromatic profile analysis																		
A10**)	Characterization of the aromatic profile on spices, herbs, spirulina, EVOOs and a selection of FVOOs using SPME-GC-MS analysis;																		
A11)	Statistical data analysis, writing and editing of the PhD thesis;																		

*period spent at the 'Mediterranea Foods SRL', Via Lepre 67, 89016 Rizziconi RC, Italy.

**period spent abroad at the Instituto de Química Orgánica General (CSIC), Madrid, Spain, under the Supervision of Prof A.C. Soria

Table 2 Risks analysis.

RISKS		LEVEL OF RISK	SOLUTION
Project's member	Little experience of the Phd Student	Reduce	Presence of a team with consolidated experience in the sector
	Lacks of funding	Moderate	Request a loan from University Rector
Purchasing	Lacks of raw materials	Moderate	Re-planning the activities from the project plan
	Delays in delivery of products	Moderate	Re-planning the activities from the project plan

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