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Editorial

Adding Value to Agricultural Products and Agrifood Byproducts by Highlighting Functional Ingredients

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Functional ingredients (FIs) serve to introduce and improve quality attributes of food products such as sensory appreciations, nutritional properties, health benefits, and microbiological stability. Furthermore, they serve as the basis for formulation of functional foods and technofunctionality. They encompass a wide array of phytochemicals (such as polyphenols, terpenes, and alkaloids), fibers, proteins, peptides, polysaccharides, minerals, vitamins, and so forth. They have the intrinsic ability to impact taste, flavor, appearance, color, texture, water and fat binding, counteracting fat separation, foaming and emulsifying properties, preservation, antioxidant activity, metabolite disorder, hypertension, heart disease, glycemia, and cancer. Low cost agricultural agroresources and agrifood byproducts are rich in these ingredients, and indeed they add value to the production of FIs.

FIs have been the subject of several research works and industrial developments in the last decade because of their high-tech wide applications. This special issue presents a collection of ten research papers concerning the extraction and recovery of FIs of plant and animal origin.

We sincerely hope that this collection will be of great interest to researchers and industrials and participates in the development and promotion of new ideas in the field of functional ingredients.

In this special issue, three works were focused on the use of agave as source of functional ingredients, especially soluble and insoluble fibres. A. Bouaziz et al. determined optimum conditions leading to the highest yield of soluble and insoluble fibres from Tunisian *Agave americana* L. using surface response methodology. Insoluble fibres concentrate showed a high WHC and OHC (8.66 g water/g sample and 5.6 g oil/g sample, resp.). They suggested that this material could be used as a functional ingredient in food to avoid syneresis for formulated products and to stabilize foods with high fat content. They conclude that it is promising to focus on the possibility to incorporate these fibres concentrates in food applications.

M. A. Bouaziz et al. studied chemical composition and some functional properties (water holding capacity, oil holding capacity, swelling power, and emulsifying capacity and gelling properties) of leaves powder and water extracted inulin from Tunisian *Agave americana* L. leaves. Results showed that agave leaves powder and inulin could be used as functional ingredients in food formulations. This promotes the value addition potential *of Agave americana* L. leaves. And, as an application, textural properties of *Agave* inulin-pectin mixed gels were examined using instrumental Texture Profile Analysis (TPA).

A. Chávez-Rodríguez et al. showed that the Agave *tequilana* powder may be considered as an interesting source of dietary fiber used as food ingredients in food and nutraceutical industries. And, as food application, they employed the response surface methodology to optimize the microencapsulation conditions of *Agave tequilana* Weber var. azul juice

using whey protein isolate by a spray drying technique. They optimized the process to obtain maximum powder yield but they also search the maximum solubility and bulk density and the minimum hygroscopicity and water activity to warrant functionality and preservation of the final product.

In this special issue, five work articles cover the topic of extraction and characterization of antioxidant from vegetable and animal origin. Antioxidants, which can link reactive free radicals, are supposed to play an important role in human health and prevent the rancidity and lipid oxidation in food systems. A. Sila et al. reported that the barbel muscle protein hydrolysate displayed a high angiotensin-I-converting enzyme (ACE) inhibitory activity and it exhibited an important radical scavenging effect and reducing power. Barbel muscle protein hydrolysate can be used in food systems such as meat products as a natural ingredient with high antioxidative properties. Furthermore, these bioactive substances can be used into functional foods or nutraceuticals.

F. Mraihi et al. compared phenolic contents and antioxidant activities of methanol extracts of *Crataegus azarolus* and *Crataegus monogyna* fruits cultivated in Tunisia. The richest composition in antioxidant compounds (phenolics, proanthocyanidins, and flavonoids and anthocyanins) and the higher antioxidant capacity activity of *Crataegus* can promote the use of these fruits in various fields such as functional food formulation and pharmaceutical industry.

W. Kchaou et al. analysed antioxidant activities, using several methods, of extracts from three selected Tunisian cultivars of date's by-products (*Phoenix dactylifera L.*). Results showed that the best antioxidant activity was obtained for Allig extract, followed by Bejo and Deglet Nour. Total phenolics, total flavonoids, carotenoids, and tannins were determined spectrophotometrically in these three date extracts. This study demonstrates the potential antioxidant activity with Tunisian date byproducts leading to the use these natural extracts as food additives as an alternative to synthetic compounds.

A. Romojaro et al. showed that the addition of fruits of *Rosa canina* and *Quercus ballota* and leaves of *Sanguisorba minor* to vegetable oils increased their oxidative stability. These underused edible plants could be considered as natural source of antioxidants and encourage their use by enriching vegetable oils with low content of natural antioxidant, such as sunflower oil, in order to avoid or decrease the use of synthetic antioxidant.

A review article by D. Ackar et al. discusses if we can consider cocoa and chocolate as potential functional food. They reported that these contain some components such as polyphenols and methylxanthines which could contribute to the health impact of these foods. They suggest that additional researches must be undertaken to elucidate the extent of polyphenols and methylxanthines health impact and their possible synergy in chocolate, with respect to energy contribution.

I. Felfoul et al. studied the effect of milk fat substitution by a (W1/O/W2) multiple emulsions, based on olive oil, on milk behavior during rennet coagulation. The substitution of milk fat by emulsified olive oils in milk could be considered as an option to obtain cheese with healthier saturated/unsaturated fat balance.

A. Chikhoun et al. investigated the effect of sugar cane molasses in chemical composition sensory characteristics of madeleines, minicroissants, and buns incorporated with interesterified oil. Results showed the possibility to give value addition to this sugar manufactory byproduct by its use in formulation of highly appreciated pastry products.

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