

THE ECOLOGICAL AGRICULTURAL PRODUCTS – SOURCES OF RAW MATERIALS FOR QUALITY FOOD PRODUCTS

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Abstract

Organic agricultural products are the best raw materials for food products with high nutritional density (food supplements, functional foods, and nutraceuticals). The applied technologies in the organic farming system use inputs free of hormones, GMOs, pesticides, antibiotics and other synthetic substances - and all of these allow both the preservation of the bio-availability of the active compounds during processing and the elimination of toxicological risks in final food products.

The authors present an innovative approach to the production technology specific to a food product with high nutritional density that is developed from raw materials from Romania.

The production of quality foods with high nutritional density can be supported both by Romania's huge potential within the production system specific to ecological agriculture and by the increased demand for such products with added value.

The use of special techniques of Atomic Absorption Spectrometry (AAS), extraction of active bio-compounds with the help of supercritical agents (SFE), molecular absorption spectrometry (MAS) facilitates the monitoring of food safety for both raw materials and final foods.

Key words: *organic, innovative technology, food supplements*

INTRODUCTION

The modern man, limited by time resources is often attracted to fast food, regardless of the side effects generated by this diet(3). Consumer education, directing their attention to natural and high energy diets, personalizing diets according to genetic characteristics, personal, acquired and developed throughout life are the main goals of any nutritionist. A special role in the development of a safe, sanogenic diet is associated with the food industry specialist able to study and improve both the quality of raw materials entered in the manufacturing process and all stages of this process. The role of functional foods and dietary supplements in supporting and regulating metabolic functions in conditions of a daily life affected by stress and pollution, is well known (3). The research

objectives were according the rules of designed Healthy Food – using Innovative Technologies (4).

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MATERIALS AND METHODS

An important problem arises in the case of preserving the active properties, in the conditions of an advanced processing and therefore, it is extremely important to study the application of new protective technologies in the construction of such foods [3]

The proof of raw materials was conducted in respect of specific queries of consolidated EU Regulation for organic agriculture (848:2018) and SR EN ISO IEC 17025:2018 (for used methods in certificated testing laboratories). The raw materials were carried out of pesticides, hormones, antibiotics, OMGs.

To control the quality of final food supplements, to establish the best food additives –able to use in design the nutraceuticals, a “multi-sensor mobile analytical IoT devices” system was used, composed by:

- Optical sensors which were used to record the molecular absorption curves in the UV (190-400 nm) and VIS (400-700nm) ranges of processed final products.
- Lot of Protective membranes inner Supercritical Fluid Extraction System, for develop one of strongest plasmatic field in to mass of extracted bio-compounds, with best proved efficiency [1]
- The modular and mobile sensor systems are coupled to a digital interface that communicates with a Smartphone equipped with an Octa Core processor. This Smartphone can have access to a Cloud or a lap top - where exists the recorded databases with the molecular absorption spectra, which the obtained results are compared. At the laboratory scale, such mobile sensory systems have been tested.

For starting technology, it used a personal basic concept of new technology for innovative food supplements (built with valued antioxidant natural bio-compounds from plants) [2,3].

All used Technologies were choice in respect of the environmental condition, bioethical requests, and prevent of any risk [4,5].

RESULTS AND DISCUSSIONS

The best strategies for designing and producing a food product with high nutritional density take into account a number of important factors (Figure 1) and the techniques used (Figure 2). A very important example of a flow chart for the production of a hemp-based food supplement is shown in figure 3.

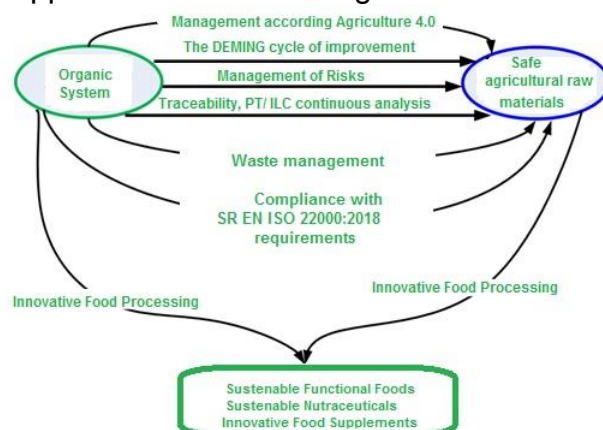


Figure 1- Relationships that matter in developing a strategy for foods with high nutritional density

As can be seen in Figure 1, in order to obtain Innovative Food Supplements, Sustainable Functional Foods, and Nutraceuticals it is mandatory to process the safe raw materials, apply the requirements of Food Safety Management Standards, the latest type of Agriculture Management 4.0, Waste Management and prevention and mitigating of risks [5].

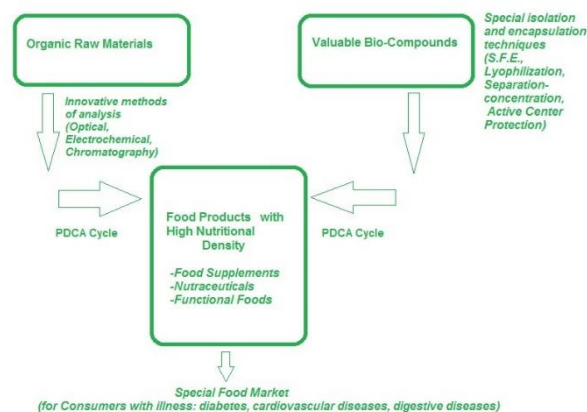


Figure 2- Techniques and Technologies used in this Work Research

The Organic Raw Materials go through a series of operations and innovative methods of analysis (optical, electrochemical and special chromatography tests). Also, the valuable bio-active compounds go through several work series - characterized by Mild Food Processing Techniques (Lyophilization, Supercritical Fluid Extraction, Separation-Concentration under the action of different fields, preservation of Active Centers and Cores). All these analyzes and operating techniques lead to obtaining food products with high nutritional density, highly demanded by the Market of Educated Consumers, a Location where "premium products" circulate (food products that maintain and/or improve the health status of consumers (Figure 2).

In this way, inoculating and perfectly balanced product lines were designed and developed for certain categories of consumers - affected by certain diseases (diabetes, digestive diseases, cardiovascular diseases, endocrine diseases), but also consumers who needed a personalized nutrition (people who needed to restore the body after accidents, operations, during top sports competitions, people with a deficient immune system as a result of microorganism attacks, etc.).

At first glance, everything seems beautiful, it seems easy. It is not easy; in order to design and develop a food with high nutritional density (food supplement, functional food, innovative nutraceutical) a series of rules, techniques, technologies must be respected. The harvesting of plants and plant parts is done according to a certain time schedule, under certain conditions and only from certain places. The selection of processing preparation, conditioning and preservation techniques increases the importance of the Work

Strategy, ensures the achievement of high qualitative and quantitative yields. Processing technologies must be applied with utmost care and discernment. The less monitored concentration of certain valuable bio-compounds can favor the formation of dangerous macro-compounds for the health of consumers. The lack of homogeneity, poor rheology, the use of synthetic, "identically natural" compounds are causes that could depreciate the final product and develop a certain risk of its contamination. Incorrect storage of raw materials, by-products, final products may constitute a chemical or microbiological risk and may also cause problems for the final product.

The lack of professional experience, the lack of engineering and transversal skills can lead to the appearance of unsatisfactory, qualitatively depreciated products and, therefore, to some rejections on the market. Just as "premium" products reach the Market of Educated Connoisseurs, they are also made only by Professionals who have reached a high level of technological maturity and creativity.

Today, both in Europe and on other continents, countries face a series of major shortages of raw materials and materials. Also, the resources of organic raw materials suffered a slight decrease in the final volumes due to the reduction of the number of production operators in the organic farming system and the increase in the costs of these technologies - especially in the conditions where the organic products are made on small areas, very divided.

The European Union has shown increased interest in the conservation of natural resources, the preservation of environmental conditions, the development

of innovative eco-systems in the field, the promotion of specific policies for the development of products with quality policies, products such as Guaranteed Traditional Specialties, Named Products of Protected Origin, Products with Protected Geographical Indications.

Recently, in the European Union, a series of support and financial resources have been allocated to support the development of the Bio-economy, "cascade" Processing, innovative technologies that improve protective processing techniques and use under-utilized resources to their maximum potential present.

The technological scheme in Figure 3 (for obtaining a food supplement, using depreciated resources or residues from other processing) is one of the final results of a PCCDI-III project.

The general project was called "COMPLEX SYSTEM FOR COMPREHENSIVE VALUATION OF SOME AGRICULTURAL SPECIES WITH ENERGY AND FOOD POTENTIAL (VALINTEGR)", and within Project 4 "Valorization of the food potential of selected agricultural crops (artichoke, sorghum seeds, cakes resulting from obtaining oil from cold-pressed hemp seeds)" a very valuable food supplement was obtained at the University of Craiova, which was subjected to OSIM patenting procedures.

Bio-economy, circular economy and "cascade" processing techniques were used in the Project. Thus, a series of by-products that were not exploited (normally, in conventional technologies) became raw materials for the creation of new food supplements. A food supplement was

made from unused Jerusalem artichoke leaves, residues from the pressing of hemp seeds from the specialized Agricultural Station in Secuieni, Neamț County (Coordinating Partner in the Project) and other vitamin sources (in this case, from sea buckthorn residues) particularly important for feeding consumers with certain cardiovascular and digestive diseases.

As is known, both Regulation (EC) 834:2007 and Regulation (EC) 889:2008 - which established the necessary working conditions in the organic farming system, underwent a series of changes. In 2018, the new Regulation (EC) 848:2018 of the European Parliament and of the Council appeared (officially published on May 30, 2018) - on organic production and labeling of organic products and repealing the consolidated Regulation (EC) number 834:2007 of the Council.

More recently, from 11 November 2020, REGULATION (EU) 2020/1693 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL amending Regulation (EU) 2018/848 on organic production and labeling of organic products as regards its date of application and certain other dates referred to in that Regulation.

Regulation (EU) 2018/848 of the European Parliament and of the Council, which entered into force on 17 June 2018, establishes a new regulatory framework for organic production. In order to ensure a smooth transition from the old regulatory framework to the new one, that regulation set the application date as January 1, 2021.

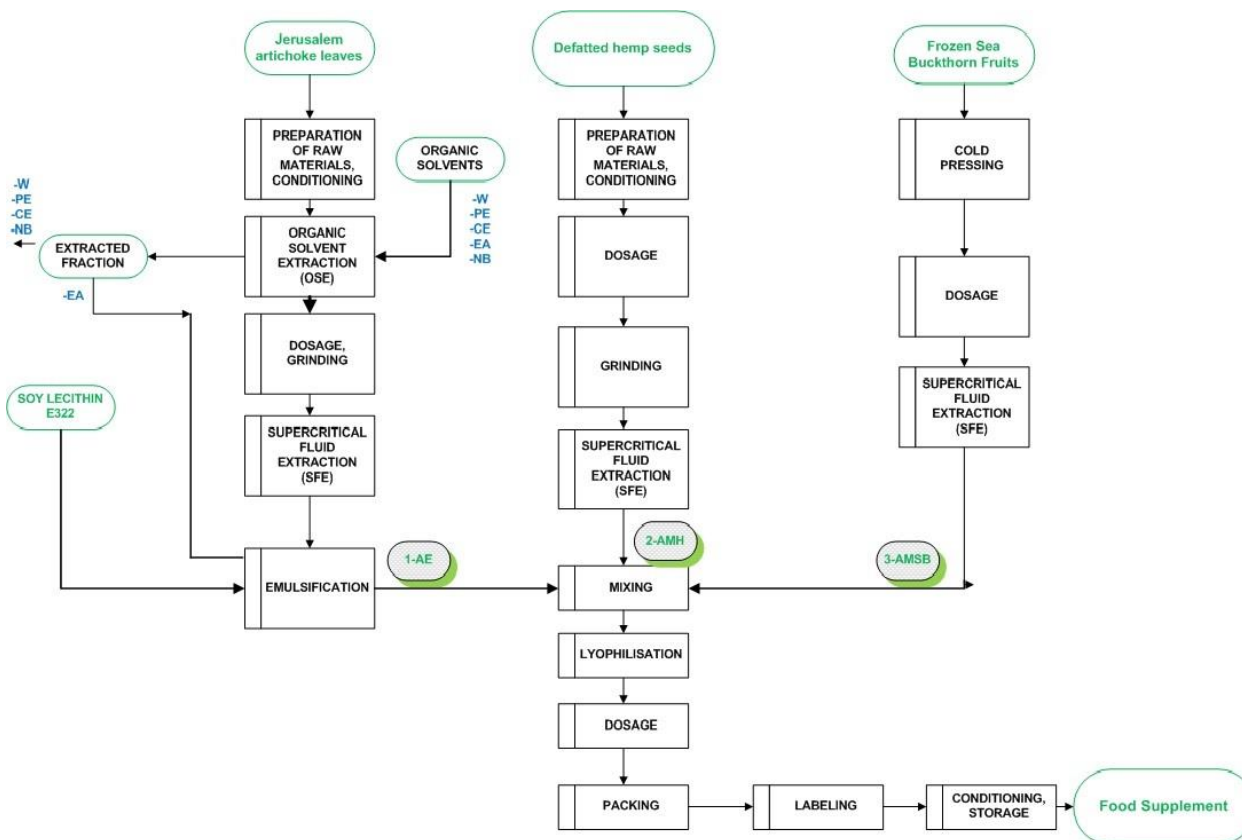


Figure 3 - Flow chart used for the development of an innovative food supplement (OSIM Patent: A 2020-00745)(2)

CONCLUSIONS

The production of quality foods with high nutritional density can be supported both by Romania's huge potential within the production system specific to ecological agriculture and by the increased demand for such products with added value.

The use of special techniques of Atomic Absorption Spectrometry (AAS), extraction of active bio-compounds with the help of supercritical agents (SFE), molecular absorption spectrometry (MAS) facilitates the monitoring of food safety for both raw materials and final foods.

Even though organic raw materials are the best sources for food products with high nutritional density, they must be controlled chemically, physically, microbiologically

A mobile system of specialized sensors can greatly assist the processor in establishing technological indicators, process values - in a very short time and at very low capital costs.

The demand for food products with high nutritional density - is increasing (consumers realizing the importance of these foods in personal nutrition), and Romania can become an important resource of food with added value for the European Union.

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