

IMPORTANT ASPECTS REGARDING THE DEVELOPMENT OF AN INNOVATIVE TECHNOLOGY OF OBTAINING A FOOD SUPPLEMENTS FROM DEGREASED SEEDS OF CANNABIS SATIVA AND LEAVES OF HELIANTHUS TUBEROSUS

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ABSTRACT

Modern man is subjected to prolonged physical and intellectual efforts; these continuous efforts together with the accumulated daily stress consume a lot of the nutrients that man feeds on. Therefore, it is very important for today's man to consume a number of food supplements - able to maintain the balance of nutrients (minerals, vitamins, proteins) in the body.

The scientific paper highlights important aspects of the technology of obtaining such a food supplement, a technology developed in a specific research project in the field of dietary supplements from defatted seeds of Cannabis Sativa and healthy leaves of Helianthus Tuberosus.

INTRODUCTION

Food supplements, functional foods, foods with high nutritional density, organic foods - are just as many foods of the future. They can "fill" certain nutritional deficiencies caused by the stress of the pandemic, restrictions, deprivation of liberty (thinking, action, movement), the continuous and constant over-effort in which the activities of modern man are included.

On the national and international market today there are also a series of functional foods, nutraceuticals, food supplements with modest functions, made by amateurs in the field. These food fakes are the main reason why some consumers refuse to take these food and nutraceutical supplements.

Thus, it can be written, knowingly, that the design and construction of food supplements are the prerogative of well-trained experts.

In order to design and build a functional food, the food specialist must have in-depth knowledge of food chemistry, innovative technologies, mass

transfer phenomena, heat and impulse transfer.

When starting to design an innovative food supplement, the following must be taken into account: the end goal, potential users (customers), the ability to solve a metabolic problem, the ease with which optimal and sanogenic raw materials can be found and their cost, the possibility of occurrence of undesirable reactions by combining biocompounds with antagonistic functions. Also, both the influences of technological treatments on the stability of valuable food biocompounds and the optimal process conditions are taken into account.

The raw materials used must be natural, ecological (without traces of pesticides, plant hormones), in order to avoid the concentration of unwanted compounds in the final product.

By complying with these minimum conditions, through strategically developed analyzes and tests, a very valuable food supplement can be developed, in the "premium" quality category.

MATERIAL AND METHOD

The product “food supplement made from defatted Cannabis Sativa seeds and healthy leaves of Helianthus Tuberosus” was made within the PNCCDI 9/2018 / Pr4 project at the University of Craiova, in a team coordinated by Petre Săvescu.

Cannabis Sativa seeds from two varieties obtained at the Secuieni Agricultural Research and Development Station, Neamț County were used (SCDA). These seeds were mechanically pressed to extract the oil. In general, for food supplements that use Cannabis Sativa as a raw material, hemp oil is used, which is very rich in active ingredients. An innovative, very active supplement was tested and made from the remains of defatted hemp seeds and healthy leaves of Helianthus Tuberosus, a local variety from Dăbuleni. Very important were also the conditions in which the cultivation technologies were realized, without chemical treatments (Dobre M., 2015; Tabăra V.2005).

The physico-chemical analyzes for the raw materials used in this project corresponded to the following Method Standards:

- humidity (SR ISO 712: 2009);
- acidity (SR 90: 2007);
- total fat, Soxhlet (SR 90: 2007);
- proteins (SR ISO 20483: 2007);
- total ash (SR ISO 2171: 2009);
- fiber (AOAC 991.43 (1995);
- inulin - UV-Vis and FT-IR spectrophotometry using MRC standards and the Single Addition Method;
- mineral substances with AAS atomic absorption spectrometer: AAnalyst 800 with flame and graphite furnace, with change and automatic alignment of graphite furnace flame and ZEEMAN background correction.

For microbiological analyzes were used:

- total number of mesophilic aerobic germs (NTG) (SR ISO 4833: 2003);
- number of yeasts and molds SR ISO 21527-1: 2009.

RESULTS AND DISCUSSIONS

The results of the measurements for the raw material indicators are presented in tables 1-3. Measurements for pesticide residue analysis were performed in an accredited laboratory from Romania. No traces of pesticides were recorded - which could have been used in conventional cultivation technologies. It was observed that the raw materials meet the necessary conditions of use in the construction of a food supplement (Belitz and coll., 2009).

All the processing stages are very important: preparation of the raw material, conditioning, dosing, grinding, preparation for extraction with the help of supercritical agents (with carbon dioxide at supercritical temperature and pressure) - in the case of hemp seeds.

As for the healthy leaves of Helianthus tuberosus, they are prepared, conditioned, extracted with organic polar solvents (which results in certain EF Extraction Fractions). The material is then followed by appropriate dosing, grinding and a Supercritical Fluid Extraction with supercritical carbon dioxide (Angela M., Meireles A., 2008)

In order to increase the extraction efficiency, a system of biomembranes is applied inside the supercritical extraction system that have been immersed in a cold plasma field for a long time - generated by a high-performance psychoplasmic equipment (the method is described in Săvescu P, BIONAM 2019). The extraction product is emulsified (using natural emulsifier) and mixed with EF and the extraction product from the skimmed hemp seed cakes. The product thus formed is dosed, lyophilized and packaged in aseptic conditions.

The result is a food supplement that has an optimal ω -6 / ω -3 fatty acid ratio of 3.3, a total fatty acid content of 77%, polyunsaturated fatty acids of 13%, monounsaturated fatty acids of 10%, a high content of total fiber, protein and essential amino acids.

Very important were the technological calculations, the obtaining

efficiency, the regulation of the price / quality ratio, the calculation of the losses on pipes, fittings, for manual or semi-automatic operations.

Also, a food supplement can only be made under conditions of sustainable development, without affecting the environment (Savescu P. and coll., 2005) Special filters and membranes with a graphene field effect are used to preserve the original matrix - both for wash water, technological water and for those that are discharged into the sewer. These wash waters undergo a well-developed system to avoid any loading of biocomposites that could consume dissolved oxygen and cause eutrophication of the environment.

In order to know which is the best purification / treatment for these washing and technological waters, the data obtained in another project financed in 2008 by Phare CBC Romania-Bulgaria were used, in which Petre Savescu – such assistant manager - contributed to the realization the best station of its kind (Savescu P., 2008). All things and a few other manufacturing secrets highlight the complexity of an innovative technology used in obtaining the food supplement and the need for multidisciplinary training of food supplement makers (Savescu P., 2018).

It is very important to ensure traceability (for feedback and continuous improvement), to ensure metrological routes for all equipment used, the use of mathematical statistics in accordance with the requirements of ISO 13528: 2015.

CONCLUSIONS

As a result of these exhaustive and complex analyzes, certain conclusions can be drawn:

- the design and construction of valuable food supplements is an area of the future, as they are needed by an increasing

number of consumers affected by stress and nutritional deficiencies

- development of valuable food supplements is the prerogative of top specialists able to take into account all the requirements

- a very clear distinction must be made in empirical and well-dosed, balanced, developed recipes

- following this project stage, a valuable food supplement with antiviral, immunomodulatory, invigorating tonic effect was developed.

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Table 1

The main minerals in the samples of Helianthus Tuberosus, analyzes from 2020 [mg / 100g]

Number of sample 2020	N 2020 [mg/100g]	P2020 [mg/100g]	K2020 [mg/100g]	Ca2020 [mg/100g]	Mg2020 [mg/100g]
V1	1,9688	3,6512	33,9226	4,399	2,0882
V2	2,0631	3,3712	27,5268	4,1976	2,1518
V3	2,1413	4,1216	33,6062	4,611	2,2684
V4	2,231	3,9984	35,4142	5,7982	2,5016
V5	1,45245	3,304	27,4929	1,537	1,007

Table 2

The trace elements in the samples of Helianthus Tuberosus, analyzes from 2020 [ppm]

Number of sample 2020	Ca 2020 [ppm]	Zn 2020 [ppm]	Fe 2020 [ppm]	Mn 2020 [ppm]	Mo 2020 [ppm]
V1	6,99	23,47	146,53	34,32	4,33
V2	5,79	22,59	126,74	27,18	4,12
V3	8,11	26,95	144,85	34,53	4,39
V4	8,42	29,85	154,20	34,76	4,46
V5	5,69	21,05	99,86	26,58	4,05

Table 3

Average values of the main physico-chemical indicators of defatted hemp seeds

The main physico-chemical indicators	Units of measurement	Value
Moisture	%	8,50
Raw ash	% s.u.	7,18
Raw protein	% s.u.	28,64
Crude fat	(% s.u.)	10,65
Total sugar	(% s.u.)	5,79
Total fiber	(% s.u.)	47,71
Ca	mg/100 g	286,42
Mg	mg/100 g	612,40
Na	mg/100 g	44,70
K	mg/100 g	1300,00
Cu	mg/100 g	1,93
Zn	mg/100 g	6,90