ELABORATION THE TECHNOLOGY OF HIGH CONCENTRATION SUPERCRITICAL CO2 -EXTRACTS USING WHEAT GERMS, AND OTHER RAW PLANT MATERIALS

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Abstract. We study the technology of extraction from vegetable raw materials biologically active substances with a clean and safe solvent, supercritical (SC) carbon dioxide (CO_2).
The study of the extraction process performed on a laboratory pilot plant CO_2supercritical fluid extraction. The experimental work carried out by using raw materials wheat germ and Milk thistle (grown in the country Moldova and Romania).
It is established that the technology allows to obtain highly concentrated extracts of biologically active agents in their native proportions, free from residues of solvent
Key words. CO_2 extraction supercritical, wheat germs, vitamin E, fatty acids, pilot installation.

The supercritical (SC) carbon dioxide (CO_2) extraction of bioactive compounds from vegetal material assures a high ecological level of the process because the use of pure and inoffensive carbon dioxide as a solvent and excludes the possibility of environment and final product pollution. The SC-CO_2 technology permits to obtain highly concentrated biologically active extracts with preservation of their natural ratio or individual fractions, even target biologically active components for the pharmaceutical, cosmetic or food industry.

In collaboration with pharmacologists we anticipated the possibility of isolation by SC-CO_2 technique and comparative analysis of quality characteristics of extracts from small samples of endemic plants. The study included also pharmacokinetics and bioequivalence of individual natural biologically active compounds or extracts and their suitability for food and pharmaceutical products making.

In the present communication we like to report the results of wheat germs grown in Republic of Moldova and Romania and Milk thistle (*Silybum mariuanum* L.) seeds extractions which were done on a laboratory pilot installation for SC-CO_2 extraction equipped with a 1000 cm^3 extraction vessel, two connected in series separators of 600 cm^3 each, a supply line, a tank for co-solvent and a plunger pump which permits the use of pure or mixed fluids within 4±10% of co-solvent and a computer setup software of the process (Fig.1). The extraction of mentioned raw materials was carried out during 1h at 37-42ºC and a pressure of 35-40 MPa, with extract separation in the first separator at 45ºC and 14-17 MPa and at 35ºC and 6,5-7,0 MPa in second using 35 kg of extracting agent per 0.5 kg of the raw material.

The continent of fat oil in according with SC-CO_2 extraction was (8- 9) % for wheat germs and (26-28) % for *S.mariuanum.* The chemical compositions of both species of oil were analyzed by gas-chromatography coupled with mass-spectrometry (GC-MS) and high

resolution liquid chromatography (HPLC), also their physical, chemical and quality parameters were measured.

In correspondence with GC data (see table 1) both species have a high content of unsaturated fatty acids (including polyunsaturated) – 81,67% for wheat germs and 82,15% for *S. mariuanum*, respectively.

Table 1 Content of unsaturated fatty acids

						Ome-ga 6	Ome-ga 3					
Acids	C14:0	C16:0	C16:1	C18:0	C18:1	C18:2	C18:3 alfa	C20:0	C20:1	C22:1	C22:0	C24:0
M/mas	242.4	270.4	268.4	298.4	296.4	294.48	292.4	326.5	324.5	346.5	348.5	376.5
Wheat Germs	0,10	16,89	0,18	0,73	15,05	57,21	7,60	0,08	1,33	0.30	0.09	0,08
Milk Thistle	0,09	7,61	0,07	4,31	31,94	48,88	0,19	2,63	0,99	0,08	2,30	0,74

The content of vitamin E (α-, γ-,δ-tocoferol, mg/100 g of extract) depends of the used regime of extraction and has quite large limits (see table 2).

Table 2 The content of vitamin E

	α-tocoferol	γ–tocoferol	Σtocoferols
Wheat germs	123,6	67,55	191,15
Milk thistle	23,45	5,60	29,05

Extracts contain mainly dietary essential fatty acids that make up 64.74% of the total extract. (Linolenic 18:2 (Omega -6), alfa - Linolenic 18:3(Omega -3), which allows the use of the extract as a dietary supplement for a healthy food, and perhaps to create a natural pharmaceuticals kind “Aevit”.

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We are open to cooperation with interested partners, for approval of the use of supercritical fluid CO2 extracts. Supposed to create a database on CO2 supercritical extract of endemic flora of the Black Sea region. (production, biochemical and clinical evaluation, as applicable).

Fig. 1. Pilot supercritical CO_2-extractor HA120-50-01C (China)

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