

DEVELOPMENT OF TECHNOLOGY FOR THE PRODUCTION OF SUPERCRITICAL CO₂ EXTRACT OF BLACK PEPPER

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Various spice extracts are used in the production of meat products: oleoresins, which are obtained using organic solvents; essential oils, which are extracted with hot water vapour; extracts obtained with carbon dioxide in subcritical (liquid extraction) and supercritical (fluid extraction) conditions. CO₂ extracts can be used in natural products produced according to the «clean label» concept and can replace oleoresins and synthetic flavours. The recent increase in the use of carbon dioxide extracts is due to the growing demand for products with a natural composition, therefore, Ukrainian producers follow this trend, and domestic scientists take part in the corresponding developments.

The work deals with the issue of obtaining a natural and environmentally friendly CO₂ extract of black pepper using supercritical carbon dioxide with a yield that will ensure the economic feasibility of processing raw materials. Black pepper (*Piper nigrum*), originating in Vietnam, whole, processed, germ reduced, was selected for the study. The raw materials were ground using a roller grinder R6-VS.185x170 (Mogilev-Podolsk Machine-Building Plant, Mogilev-Podolsk, Ukraine). The extraction was carried out on a pilot supercritical extraction unit UE 12.12.400-2 (Tekharm LLC, Lviv, Ukraine) for 3 hours. Based on [1], it was assumed that the following factors have the greatest influence on the extract yield: pressure (P), temperature (T), and particle size of the raw material after grinding (D_p). The corresponding intervals of variation of technological factors of CO₂ extraction were selected for planning experiments, the results of which are shown in Table 1.

Table 1 - Influence of technological parameters of CO₂ extraction on the extent of extraction of black pepper extractive substances.

№	1	2	3	4	5	6	7	8
P, MPa	12	18	12	18	12	18	12	18
T, °C	35	35	45	45	35	35	45	45
D _p , mm	0,5-0,7	0,5-0,7	0,5-0,7	0,5-0,7	0,2-0,5	0,2-0,5	0,2-0,5	0,2-0,5
Yield, %	3,0	4,3	2,2	3,5	4,5	6,5	3,3	5,3

According to the results obtained, the highest yield of black pepper extractive substances is provided by the combination of parameters in experiment №6. In the future, it is planned to conduct a detailed chemical analysis of all the samples obtained.

References:

1. LUCA, Simon Vlad; KITTL, Thomas; MINCEVA, Mirjana. Supercritical CO₂ extraction of spices: A systematic study with focus on terpenes and piperamides from black pepper (*Piper nigrum* L.). *Food Chemistry*, 2023, 406: 135090. <https://doi.org/10.1016/j.foodchem.2022.135090>.