УДК 664.3:602
DOI

EXPERIMENTAL DETERMINATION OF THE QUALITATIVE COMPOSITION OF CHLADONE EXTRACTS OF BAY LEAF

Potapov V., Professor, Doctor of Technical Sciences

Biliy D., PhD student

Kharkiv State University of Food Technology and Trade, Kharkiv, Ukraine

Abstract. The features of the use of laurel leaf extracts in food production are considered. The characteristics of the main substances contained in the leaves of the Noble laurel are listed. The chemical composition of Noble laurel proves the prospect of using extracts in food production. The extraction and environmental advantages of extraction with liquefied gases were analyzed, traditional methods of extracting vegetable oil, as well as their comparative characteristics were given. The stages of the technological process of extraction of laurel oil using liquefied chladone are shown, the organoleptic characteristics of the final product are evaluated. In the process of chemical analysis of the refrigerant extract, it was determined that the use of the modern method of chladone extraction with liquefied gases allows extracting the extract with a significantly larger amount of aroma-forming substances. The obtained values of the number of aroma are compared with the indicators of aqueous-alcoholic extract, which exceed the latter several times. Studies of extracts by gas chromatography have been described, as a result of which more than 50 components have been identified, among which fatty acids and ether derivatives are of particular interest. It was revealed that the chladone extract of laurel leaves retains the color, smell and taste of the original plant materials. The results of gas chromatography were compared with literature data on the qualitative composition of bay leaf extracts obtained by microwave extraction and supercritical fluid extraction, as a result of which it was established that chladone extract of bay leaf has the same dominant compound 1,8-cineole. Of particular value are eugenol derivatives, which can act as antioxidant supplements in the treatment of cancer.

Keywords: bay leaf, additive, gas chromatography, flavor number, liquified chladoni, extract.

ЭКСПЕРИМЕНТАЛЬНОЕ ОПРЕДЕЛЕНИЕ КАЧЕСТВЕННОГО СОСТАВА ХЛАДОНОВЫХ ЭКСТРАКТОВ ЛАВРОВОГО ЛИСТА

Потапов В.А., профессор, доктор технических наук,

Белый Д.В., аспирант

Харьковский государственный университет питания и торговли, г. Харьков

Анотация. Рассмотрены особенности применения экстрактов листьев лавра в пищевых производствах. Проанализированы экстракционные и экологические преимущества экстракции сжиженными газами, приведены традиционные методы извлечения растительного масла, а также их сравнительные характеристики. Показаны стадии технологического процесса экстрагирования лаврового масла с помощью сжиженных хладон, оценены органолептические показатели конечного продукта. Определено, что использование современного метода хладонной экстракции сжиженными газами позволяет выделить экстракт с значительно большим количеством ароматообразующих веществ. Сопоставлены полученные значения числа аромата с показателями для водно-спиртовой экстракции, которые превышают последние в несколько раз. Описаны исследования экстрактов методом газовой хроматографии, в результате которого выявлено более 50 компонентов, среди которых особый интерес представляют жирные кислоты и эфирные производные.

Ключевые слова: лавровый лист, добавка, газовая хроматография, число аромата, сжиженные хладоны, экстракт.

Introduction. The main methods for producing oil of noble laurel are steam distillation and extraction with organic solvents. In the process of parodytillation a significant disadvantage is the partial or complete destruction of thermolabile components at high temperature. The disadvantage of extraction with organic solvents is the chemical aggressiveness of solvents. In addition, the question arises of removing residual solvents from the final product, leading to additional costs and an increase in the complexity of the technology. Therefore, it is relevant to search for alternative methods of obtaining essential oils, free from undesirable impurities, which retain their composition as close as possible to the native one [1].

Analysis of recent research and publications. Liquefied gases, as solvents, are increasingly being used to produce high-quality lipid extracts from various biological raw materials. This is due to the technological advantages of this method and the fact that the extracts fully preserve the native structure of the molecules, taste and

aromatic quality indicators of the raw materials. Chladone extraction technologies with high extraction properties allow extracting a wide range of biologically active substances and changing the composition of the fractions obtained, which is especially important in food production [2-3].

Hydrofluorocarbons based liquefied chladone with viscosity less than in traditional solvents are characterized as extractants with better diffusion properties. Chemically, they are indifferent to the lipid fractions that are released. They are non-toxic, fire and explosion proof. Low values of heat of evaporation and boiling point of liquefied gases allow you to quickly remove the gas from the extracts at low temperatures, which ensures the preservation of thermolabile molecular complexes in the final product [2].

The purpose of the work was to quantitatively determine the substances that determine the aroma of the cold-extract extract of the bay leaf.

Materials and methods. Noble laurel is a subtropical tree or shrub, all parts of which contain essential oil, tannins, resins, bitterness, which give them a typical aromatic smell and pleasantly bitter taste. The composition of the bay leaf contains vegetable proteins, saturated fatty acids, vitamin C, macronutrients (calcium, magnesium, potassium, phosphorus) and trace elements (iron, zinc, copper, manganese). The content of essential oil in the leaves reaches 5.5% [4].

The valuable chemical composition of the bay leaf determines its use in various feed technologies. For example, the promising use of water extract of bay leaf in the technology of bakery products as a nutrient fortifier for the development and fermentation activity of yeast cells has been proven. The possibility of using hydroalcoholic extract of bay leaf as a natural antioxidant for the stabilization of carotenoids in the development of the technology of carotenoid additives in the form of fine powders was studied [5]. It was shown that extractions of bay leaves with unrefined sunflower oil make it possible to obtain a spicy-oil mixture with antibiotic activity [6]. The use of this mixture in food technology will stabilize microbiological processes during storage of products.

Essential oil of laurel is used in the manufacture of sausages, which allows not only to give them a pleasant aroma, but also to reduce the total number of extraneous microorganisms and restrain lipid oxidation during storage [7].

For the manufacture of the extract used dried leaves of laurel, which grow in Georgia. Hydrofluorocarbon liquefied chladone R22 was used as an extractant. Technological stages of the process of chladone extraction included: grinding bay leaves to 250 microns, mixing with a refrigerant solvent, extracting the extract during diffusion, draining the miscelas of the dissolved extract, evaporating the solvent from the miscelas, draining the bay oil into the receiving tank and sedimentation of the final product. The final product is a homogeneous green viscous substance with a pronounced taste and smell inherent in the bay leaf, without foreign smell and taste.

One of the quantitative characteristics of the content of substances that determine the aroma of raw materials and food products is the number of aroma, which is conventionally expressed in milliliters of sodium trioxothiosulfate per 100 g of product. In order to determine the total content of substances that contribute to the aroma of chladone extracts of bay leaf, the method for determining the aroma number, which is given in GOST 8756.7-70, was adapted. The basis for determining the number of aroma is the reaction of the interaction of essential oils with a chromic mixture, during which they are oxidized.

Research results. According to the results of the analysis performed, it was established that the number of aroma of chladone extract of bay leaf is 1122 ± 20 ml and 833 ± 17 ml of $\text{Na}_2\text{S}_2\text{O}_3$ / 100 g, respectively. The obtained values exceed 3.6 ... 4.8 times the value of this indicator in the aqueous-alcoholic extract [5].

Studies of the composition of laurel extract by gas chromatography were carried out. The research method was as follows. A portion of the sample weighing 24 mg was dissolved in 1 ml of dichloromethane. The sample was analyzed on an Agilent 7890A GC System gas chromatograph with an Agilent 5975C mass selective detector and an Agilent 7697A Headspace sampler. For the separation of components, an HP-5MS column with a diameter of 0.25 mm, a length of 30 m, a stationary phase thickness of 0.25 μm was used. The introduction of the sample volume of 1 μl was carried out at a temperature of 300 ° C, the flow distribution was 20: 1. The gas flow at the inlet to the column was 1 ml / min. The carrier gas is helium. The following temperature gradient was used: initial temperature 40 ° C, heating up to 270 ° C at a rate of 5 ° C / min. Detection was carried out by mass spectrometry in the scanning range (from 35 to 500 m / z). To identify the results obtained, NIST-08 mass spectra libraries were used. Results were selected with a minimum similarity index of 80%. For quantitative calculations, the internal standard method was used. As a result of the research in the refrigerant extract of bay leaf, the presence of at least 94 components was found, among which are saturated and unsaturated hydrocarbons, aldehydes, alcohols, ketones (fig. 1).

Fig. 1. Chromatogram of chladone extract of bay leaf

50 components were identified. The main components, the structure of which has been established, are α -pinene, sabinen, β -pinene, β -myrcene 1,8-cyneol, linalool, α -terpineol, limonene, eugenol, palmitic acid, linolenic acid, etc.

Conclusions. Thus, during the chladone extraction of laurel leaves, the color, smell and taste of the original plant materials are preserved. It has been shown that carrying out the extraction of bay leaf with the help of chladones makes it possible to obtain an extract with a high content of aromatherapeutic substances in comparison with a water-alcohol extraction.

The results of gas chromatography were compared with literature data on the qualitative composition of laurel leaf extracts obtained by microwave extraction and supercritical fluid extraction. It has been established that the freon extract of laurel leaf has the same dominant compound 1,8-cyneol. From a practical point of view, of interest is the presence in the composition of the chladone extract of eugenol derivatives, which can act as antioxidants in the treatment of cancer.

References

1. Prokopchuk, D.I., Pokrovskij, O. I., Parenago, O. O., Bagateliya, S. A., Markoliya, A. A., Pokryshkin, S. A., Lunin, V. V. (2018). Sravnenie kachestvennogo sostava ekstraktov listev lavra, poluchennyh metodami sverhkriticheskoj flyuidnoj ekstrakcii i SVCh-ekstrakcii. *Himiya rastitelnogo syrya*, 3, 169-177.
2. Osec'kij, O.I. (2017). Eksperimental'ne vivchennya optimal'nih parametriv procesu ekstrakcii zridzhenimi hladonami i analiz osoblivostej jogo realizacii pri molekulyarnomu frakcionuvanni biologichnoi sirovini roslinnogo i tvarinnogo pohodzhennya. *Zvit pro naukovu-doslidnu robotu*, 1-39.
3. Kasyanov, G. I. (2008). Analiz sovremennyh tehnologiy pischevoy bioindustrii. *Vestnik biotekhnologii i fiziko-himicheskoy biologii im. Yu.A. Ovchinnikova*, 4(1), 48-56.
4. AL-Hashimi, A. G., Mahmood, S. A. (2016). The nutritional value and antioxidant activity of bay leaves (*Laurusnobilis*L.). *Bas.J.Vet.Res.*, 15(2), 246-259.
5. Poharska, V. V, Pavliuk, R. Yu, Maksymova, N. P., Savchenko, O. O. (2011). Stabilizatsiia karotynoidiv u poroshkopodibnykh dobavkakh z vykorystanniam naturalnykh antyoksydantiv. *Progresivni tekhnika ta tekhnologii harchovyh virobnictv restorannogo gospodarstva i torgivli*, 2 (14), 71-79.
6. Yehorov, B. V., Mohylianska, N. O. (2014). Otsinka sanitarnykh pokaznykiv priano-aromatychnoi syrovynyta priano-oliynykh sumishei. *Kharchova nauka i tekhnolohiia*, 2(27). 34-38.
7. Nepomniashcha, N. O., Shtonda, O. A. (2012). Vykorystannia ekstraktiv spetsii ta prianoschchiv u tekhnolohii subproduktovykh kovbasnykh vyrobiv. *Naukovyi visnyk LNUVMBT imeni S.Z. Hzhyskoho*, 2(52), 257-260.

Отримано в редакцію 04.04.2019
Прийнято до друку 16.06.2019

Received 04.04.2019
Approved 16.06.2019