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THE STUDY OF THE FATTY ACID COMPOSITION OF COMMON LILAC FLOWERS OF "MADAME LEMOINE" VARIETY

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An important place in human nutrition is occupied by omega-3, omega-6 and omega-9 fatty acids (FA). They have different effects on the human body and play a significant role in the appearance and the course of some diseases (for example, cardiovascular system, gastrointestinal tract, cancer, obesity, etc.).
The aim. *To study the qualitative composition and the quantitative content of fatty acids in Common Lilac (Syringa vulgaris) flowers of "Madame Lemoine" variety.*
Materials and methods. *The fatty acid composition was studied by gas chromatography based on the formation of methyl esters of fatty acids and their subsequent determination.*
Results and discussion. *The presence and the quantitative content of 15 fatty acids have been determined. Among them, 13 FA have been identified, namely 6 saturated fatty acids and 7 unsaturated fatty acids. The total amount of saturated fatty acids (54.65 %) significantly predominates over unsaturated fatty acids (34.81 %). Palmitic acid dominates among saturated FA (39.83 %). Linoleic acid has the highest percent among unsaturated FA (13.75 %).*
Conclusions. *For the first time the composition of fatty acids in Common Lilac flowers of "Madame Lemoine" variety has been studied. The raw material accumulates saturated fatty acids in a significant number. Palmitic acid (C 16 : 0) – 39.83 % and linoleic acid (C 18 : 2) – 13.75 % are the dominant acids*
Keywords: *Common Lilac (Syringa vulgaris), fatty acids, gas chromatography, palmitic acid*

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1. Introduction

The current task of the pharmaceutical industry is to find new sources of biologically active substances (BAS), promising for the study of pharmacological activity and the creation of new domestic herbal medicines. Such BAS include fatty acids (FA), primarily polyunsaturated fatty acids (PUFA) [1–3].

Omega-3, omega-6 and omega-9 FA are especially important in human nutrition. They got their names from the location of the first double bond from the methyl group in the chain. In omega-3 FA, the double bond is located at the third carbon atom, and in omega-6 and omega-9 – at the sixth and ninth carbon atoms, respectively [2, 4].

The name omega-3 combines docosahexaenoic (C 22:6) and eicosapentaenoic (C 20:5) acids, which are contained in fish oil of various fish species and in some seafood, as well as α-linolenic acid (C 18:3), which is synthesized by plants from linoleic acid (C 18:2). The importance of α-linolenic acid is that it is a precursor for the synthesis of other omega-3 FAs. Flax seeds and walnuts, as well as their oils are plant sources of α-linolenic acid [1–5].

Omega-6 FA includes linoleic (C 18:2) and arachidonic (C 20:4) FA, which are contained in various fatty oils (sunflower, corn, soybean, etc.). Linoleic acid is converted to γ-linolenic acid (C 18:3), which is a precursor of prostaglandins. Oleic (C 18:1) and erucic (C 22:1) acids represent Omega-9 FAs, which are found in significant amounts in olive oil. Among the above FA linoleic (omega-6) and α-linolenic acid (omega-3) are not synthesized in the human body, and come only with food. That is why they are called essential FA, or vitamin F [1, 2, 4, 5].

The importance of FA for human health is undeniable. They have different effects on the body and are significant for the appearance and course of some diseases (e.g., cardiovascular system, gastrointestinal tract, oncology, obesity and related pathologies) [2, 3, 5–7].

It is necessary to maintain an appropriate balance between the amounts of FA consumed with food. The literature highlights how changes in the omega-6 / omega-3 FA ratio increase the incidence of pathological conditions [2, 6].

FA is characterized by antioxidant, hypotensive, hypocholesterolemic, hypolipidemic, anticoagulant, antiarrhythmic, antitumor and anti-inflammatory properties [1, 2, 4, 6, 7].

Awareness of the need for daily consumption of FA for the normal functioning of the body is the basis for studying the fatty acid composition of new types of MPRM.

The aim of the work was to determine the qualitative composition and quantitative content of FA in the

flowers of lilac ordinary "Madame Lemoine" variety.

2. Materials and methods

The object of the study was selected flowers of the common lilac "Madame Lemoine" variety, harvested in 2020 in the Kharkiv region. These studies are a continuation of a comprehensive pharmacognostic study of members of the genus Lilac (Syringa L.) [8–10].

Lipophilic fractions obtained by exhaustive extraction with hexane followed by hydrolysis were used for analysis. The study of fatty acid composition was performed by gas chromatography. The method is based on the determination of methyl esters of FA. The experiment was performed on a gas chromatograph "Selmichrom-1" (Sumy, Ukraine), which has a flame ionization detector. Experimental parameters: length of stainless steel column – 2.5 m, its inner diameter – 4 mm, stationary phase – inert, treated with 10 % diethylene glycol succinate, temperature (t) of the thermostat – 180 °C, t detector – 220 °C, t evaporator – 230 °C, carrier gas flow rate (nitrogen) – 30 cm^3 / min, sample volume 2 mm^3 of a solution of methyl esters of acids in hexane. Identified FA methyl esters by peak retention time, compared with the standard mixture. The calculation of the composition of methyl esters was carried out by the method of internal normalization. Reference samples (standards of saturated and unsaturated methyl esters FA) were used by Sigma-Aldrich. To obtain FA methyl esters, a modified Peisker method was used, using a mixture of methanol, chloroform and sulfuric acid (100: 100: 1). In glass ampoules were measured 30-50 µl of lipophilic fraction of lilac flowers, added 2.5 ml of methylating mixture, after which the ampoules were sealed and placed for 3 hours in a thermostat (t 105 °C). After methylation, the ampoules were opened, their contents were transferred to a test tube, and zinc sulfate powder was added to the tip of a scalpel, 2 ml of purified water and 2 ml of hexane (for extraction of methyl esters). After thorough shaking and settling, the hexane fraction was filtered and used for chromatographic analysis [11].

3. Results and their discussion

The gas chromatogram FA of common lilac flowers «Madame Lemoine» variety is shown in Fig. 1.

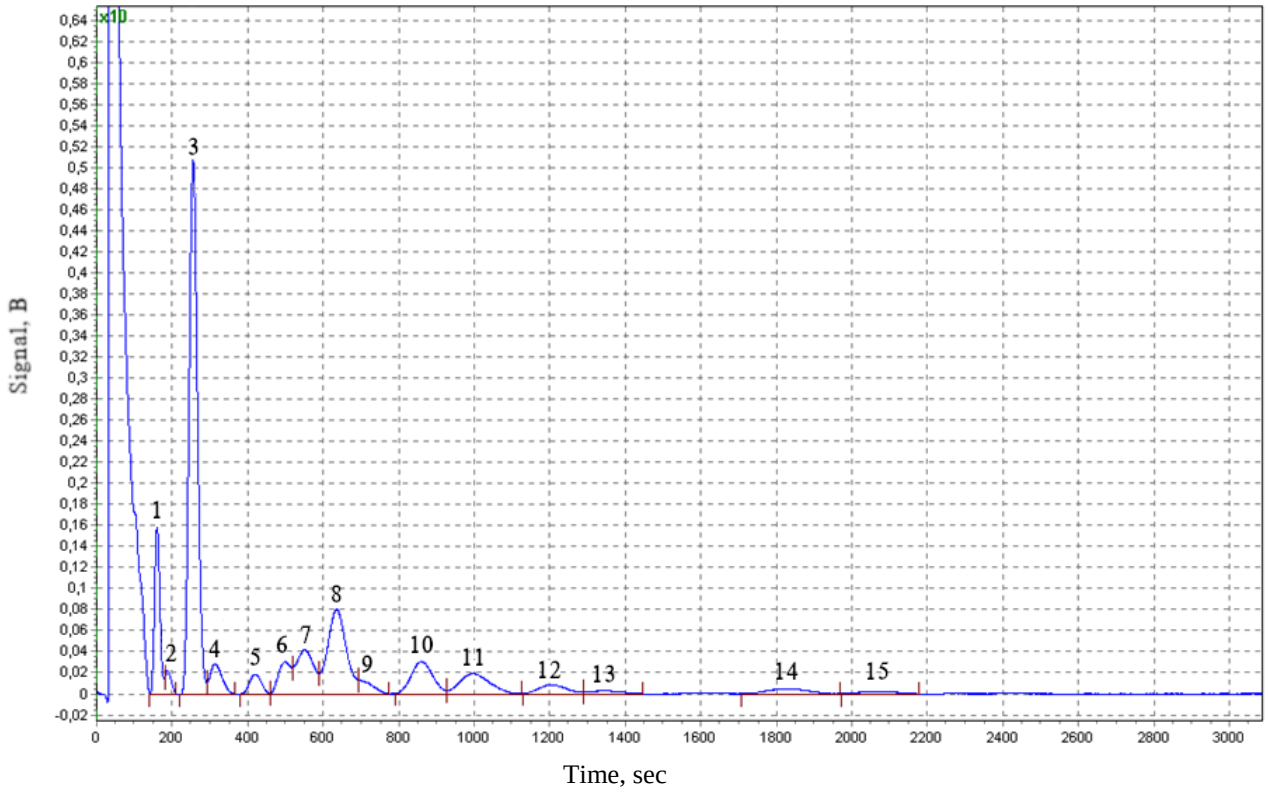

Fig. 1. Gas chromatogram of methyl esters of FA of flowers of a common lilac «Madame Lemoine» variety: 1 – myristic FA (C 14 : 0), 2 – myristoleic (C 14 : 1), 3 – palmitic (C 16 : 0), 4 – palmitoleic (C 16 : 1), 5 – stearic (C 18: 0), 6 – oleic (C 18 : 1), 7 and 14 – unidentified FAs, 8 – linoleic (C 18 : 2), 9 – arachidic (C 20 : 0), 10 – linolenic (C 18 : 3), 11 – gadoleic (C 20 : 1), 12 – behenic (C 22 : 0), 13 – erucic (C 22 : 1), 15 – lignoceric (C 24 : 0).

Qualitative composition and quantitative content of detected FA in percent are given in Table 1.

As a result of the study, 15 FAs were found in the common lilac flowers «Madame Lemoine» variety, of which 13 were identified. Among the identified 6 belong to saturated and 7 to unsaturated FA. It should be noted that the total content of saturated FA (54.65 %) significantly exceeds the unsaturated one (34.81 %). Palmitic acid (C 16:0) dominates among saturated FA (39.83 %), which is almost 73 % of the total saturated FA. The content of other saturated FA is significantly lower and decreases in the following sequence: myristic (7.96 %) > behenic (2.24 %) > stearic (2.12 %) > arachidic (1.74 %) > lignoceric (0.76 %).

Table 1

Qualitative composition and quantitative content of fatty

acids of common lilac flowers «Madame Lemoine» variety

No.	FA name	Abbreviated designation of FA	Content, % of the total
Saturated fatty acids			
1	Myristic	C 14 : 0	7,96
2	Palmitic	C 16 : 0	39,83
3	Stearic	C 18 : 0	2,12
4	Arachidic	C 20 : 0	1,74
5	Behenic	C 22 : 0	2,24
6	Lignoceric	C 24 : 0	0,76
Total content of saturated FA, %			54,65
Unsaturated fatty acids			
7	Myristoleic	C 14 : 1	1,25
8	Palmitoleic	C 16 : 1	3,30
9	Oleic	C 18 : 1	3,92
10	Linoleic	C 18 : 2	13,75
11	Linolenic	C 18 : 3	6,20
12	Gadoleic	C 20 : 1	5,42
13	Erucic	C 22 : 1	0,97
Total content of unsaturated FA, %			34,81
Unidentified fatty acids			
Total content of unidentified FA, %			10,54

The highest content among unsaturated FAs are polyene acids: linoleic (C 18:2) and linolenic (C 18:3). The dominant is omega-6 linoleic acid, its content is 13.75 %, which is 39.50 % of the total unsaturated FA. The content of omega-3 linolenic acid is much lower (6.20 %), which is 17.81 % of the total unsaturated FA.

Gadoleic, oleic, palmitoleic, myristoleic and erucic acids were found in smaller quantities - their content is 5.42 %, 3.92 %, 3.30 %, 1.25 % and 0.97 %, respectively.

4. Discussion of research results

For the first time the fatty acid composition of common lilac flowers “Madame Lemoine” variety was studied. Compared with previous studies [8], this variety has a high content of palmitic acid.

For example, in obesity, high concentrations of palmitic acid cause insulin resistance, which leads to diabetes [12]. That is why the quantitative content of FA should be determined and, if necessary, indicated in the reservations in medicines for certain categories of the population.

Study limitations. The obtained results cannot fully characterize the composition of FA in the studied raw material. Therefore, the qualitative composition and quantitative content of only those FAs whose standard samples were available were established. That is why additional pharmacognostic studies are needed for in-depth study of the chemical composition of lilac flowers of the usual variety “Madame Lemoine”.

Prospects for further research. The obtained results encourage in-depth study of lilac flowers by varieties for the purpose of comparative research and identification of the most promising varieties of lilac to create a new drug.

5. Conclusions

Gas chromatography was the first to study FA in “Madame Lemoine” lilac flowers.

In the investigated raw material, the presence and quantitative content of 15 FA were detected and 13 were identified: 6 saturated and 7 unsaturated FA.

Quantitatively dominated saturated FA over unsaturated (54.65 % vs. 34.81 %), in particular palmitic (39.83 %).

Among unsaturated FAs, omega-6 linoleic acid has the highest content (13.75 %).

The obtained data can be further used to create new herbal remedies from lilac flowers of the usual variety "Madame Lemoine".

Conflict of interests

The authors declare that they have no conflicts of interest.

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