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## ANALYSIS OF THE FATTY ACIDS COMPOSITION OF *GERBERA HYBRIDA*

***Actuality.*** *Compared to conventional pharmaceuticals, herbal medicines are generally more affordable and, in some cases, perceived as more effective for treating specific ailments. Consequently, the search for new medicinal plants remains highly relevant. Members of the Gerbera genus are known for their diverse biological activities, including anticancer, antiproliferative, antioxidant, anti-inflammatory, antiangiogenic, and cholesterol-lowering properties.*

*The aim of the study was to identify the qualitative composition and quantify the fatty acids present in Gerbera hybrida herb through GC/MS analysis.*

*Gerbera hybrida, belonging to the Asteraceae family, is a widely cultivated ornamental plant recognized for its vibrant and attractive flowers. The variety Gerbera "Queen Leen" is particularly appreciated in floristry and is often used as a cut flower for vase arrangements and decorative compositions. Despite its ornamental and potential medicinal value, research on this species remains limited.*

*Therefore, conducting a comprehensive phytochemical investigation of Gerbera hybrida is both relevant and timely.*

*The present study aimed to analyze the qualitative composition and quantitative content of fatty acids present in the raw plant material.*

***Material and methods.*** *The material for the research was the herb of Gerbera hybrida, harvested in the Ternopil region (Ukraine) in 2024.*

*Identification and quantitative content of fatty acids in the studied medicinal plant raw materials was carried out by gas-liquid chromatography-mass spectrometry of fatty acid methyl esters using the Agilent 6890N/5973inert gas chromatography-mass spectrometry system (Agilent technologies, USA). Fatty acid methyl esters were identified using the NIST 08 mass spectrum library. Quantitative analysis was performed by adding an internal standard solution (30 μg/sample) to the studied samples. Nonadecanoic acid was used as an internal standard.*

***Research results.*** *Some 11 fatty acids have been identified in Gerbera hybrida herb, and their quantitative content has been determined by gas chromatography. Accordingly, in the herb of Gerbera hybrida, unsaturated fatty acids dominated. Linoleic*

*(563,08±1,03 μg/g) and linolenic (681,06±1,37 μg/g) acids were the dominant unsaturated fatty acids in the raw material. The herb of Gerbera hybrida had the highest content of palmitic acid (567,99±1,98 μg/g) among saturated fatty acids.*

***Conclusion.*** *As a result of the conducted study, the presence of fatty acids in the raw material of Gerbera hybrida was confirmed. The qualitative composition and quantitative content of these acids were analyzed using the GC/MS method. Both saturated and unsaturated fatty acids were identified in the herb, with linolenic, linoleic, and palmitic acids being the dominant components. The findings suggest that the herb of Gerbera hybrida represents a valuable source of fatty acids and may serve as a promising raw material for the development of new pharmaceutical preparations in the future.*

***Key words:*** *Gerbera hybrida, herb, fatty acids, GC/MS.*

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## ДОСЛІДЖЕННЯ ЖИРНОКИСЛОТНОГО СКЛАДУ *GERBERA HYBRIDA*

***Актуальність.*** *Порівняно зі звичайними фармацевтичними препаратами рослинні ліки зазвичай є більш доступними, а в деяких випадках сприймаються як більш ефективні для лікування захворювань. Отже, пошук нових лікарських рослин залишається актуальним.*

*Представники роду гербер відомі своєю різноманітною біологічною активністю, зокрема й протираковими, антипроліферативними, антиоксидантними, протизапальними, антиангіогенними та гіпохолестеринемічними властивостями. Гербера гібридна належить до рослин родини айстрових та є культивованою декоративною рослиною, відомою своїми яскравими та привабливими квітками. Сорт гербери "Queen Leen" особливо цінується у флористиці та часто використовується для декоративних композицій. Незважаючи на їхню декоративну та потенційну лікарську цінність, дослідження цього виду залишаються обмеженими. Тому проведення комплексного фітохімічного дослідження гербери гібридної є актуальним і своєчасним.*

***Метою дослідження*** *– аналіз якісного складу та кількісного вмісту компонентів жирних кислот, які присутні в досліджуваній рослинній сировині гербери гібридної.*

***Матеріал і методи.*** *Матеріалом для дослідження була трава гербери гібридної, зібрана в Тернопільській області (Україна) у 2024 році.*

*Ідентифікацію та кількісний вміст компонентів жирних кислот у досліджуваній лікарській рослинній сировині проводили методом газорідинної хроматографії з мас-спектрометрією метилових естерів жирних кислот, з використанням інертної газової хромато-мас-спектрометрії Agilent 6890N/5973 (Agilent technologies, США). Метилові естери жирних кислот ідентифікували за допомогою бібліотеки мас-спектрів NIST 08. Кількісний аналіз проводили шляхом додавання розчину внутрішнього стандарту (30 мкг/зразок) до досліджуваних зразків. Як внутрішній стандарт використовували нонадеканову кислоту.*

***Результати дослідження.*** *У траві гербери гібридної було ідентифіковано 11 жирних кислот, установлено їх кількісний вміст за допомогою газової хроматографії. У траві гербери гібридної переважали ненасичені жирні кислоти. Лінолева (563,08±1,03 мкг/г) та ліноленова (681,06±1,37 мкг/г) кислоти були панівними ненасиченими жирними кислотами в досліджуваній сировині. Установлено, що найвищий вміст у траві гербери гібридної серед насичених жирних кислот становила пальмітинова кислота (567,99±1,98 мкг/г).*

***Висновок.*** *У результаті проведеного дослідження було підтверджено наявність жирних кислот у сировині гербери гібридної. Якісний склад і кількісний вміст цих кислот було проаналізовано методом газової хроматографії з мас-спектрометрією (ГХ/МС). У траві було ідентифіковано як насичені, так і ненасичені жирні кислоти, серед яких компонентами, що домінували, були ліноленова, лінолева та пальмітинова кислоти. Отримані результати свідчать про те, що трава гербери гібридної є цінним джерелом жирних кислот, може слугувати перспективною сировиною для розроблення нових фармацевтичних препаратів у майбутньому.*

***Ключові слова:*** *Gerbera hybrida, трава, жирні кислоти, ГХ/МС.*

**Introduction. Actuality.** Herbal medicines are plant-derived natural products that have long been used in traditional and regional healing practices for the management of different health conditions. These preparations are usually composed of complex mixtures of organic compounds, which may originate from any raw or processed part of the plant. Compared to conventional pharmaceuticals, herbal therapies are often considered more affordable and are sometimes regarded as more effective in addressing specific disorders (Feshchenko et al., 2021; Budniak et al., 2022).

The *Asteraceae* family, which includes nearly 1,600 genera and about 2,500 species across the globe, is considered one of the largest groups of flowering plants. Throughout history, members of this family have been extensively studied and documented for their valuable role in traditional medicine, largely due to their wide variety of therapeutic uses (Rolnik & Olas, 2021).

For example, it is known that *Gerbera jamesonii*, a member of the *Asteraceae* family, is known to possess a wide range of biological activities, including anticancer, antiproliferative, antioxidant, anti-inflammatory, antiangiogenic, and cholesterol-lowering effects (Negm El-Dein et al., 2023). *Gerbera anandria* is a perennial species belonging to the *Gerbera* genus, recognized as a traditional medicinal plant in China and extensively cultivated across the country. In Chinese folk medicine, it has been employed for the treatment of coughs, throat irritations, and as an anti-inflammatory and detoxifying agent. Additionally, it is traditionally used for managing rheumatic pain, joint disorders, bruises, sprains, and dysentery (He et al., 2014).

Gerbera (*Gerbera hybrida*), a member of the *Asteraceae* family, is a popular ornamental plant known for its striking blooms. These flowers come in a broad spectrum of colors, including yellow, orange, pink, crimson, red, purple, and white. The variety Gerbera "Queen Leen" is especially valued in floristry, frequently used as a cut flower for vases and decorative floral compositions (Dissanayake et al., 2009). However, limited research has been conducted on this species. Therefore, investigating the biological and phytochemical characteristics of *Gerbera hybrida* grown in Ukraine could provide valuable insights into its chemical composition and potential pharmacological applications.

**The aim of the study** was to identify the qualitative composition and quantify the fatty acids present in *Gerbera hybrida* herb through GC/MS analysis.

**Materials and methods of the study.** *Gerbera hybrida* herb was collected in the Ternopil region (Ukraine) in 2024. The identity of the plant was verified by Prof. Svitlana Marchyshyn Department of Pharmacognosy and Medical Botany (TNMU, Ternopil, Ukraine) (Budniak et al., 2021).

*GC/MS determination of fatty acids.* GC/MS analysis of fatty acids was performed using gas chromatograph Agilent 6890N with mass detector 5 973 inert (Agilent Technologies, USA). Samples were analyzed on a silica capillary column HP-5MS (30 m × 0,25 mm × 0,25 mkm, Agilent Technologies, USA). The interface was operated at 250 and 380 °C respectively. The initially set up oven temperature at 60 °C for 4 min, then at the rate of 4 °C/min raised to 250 °C and kept at this point for 6 min and maintained at a final temperature for 7 min. The carrier gas was used helium at a constant flow rate of 1, 0 ml/min. The sample with a volume of 1 μl was injected in a splitless mode using a 7683 series Agilent Technologies injector. Detection was performed in scan mode in the range (38–400 m/z) (Atolani et al., 2015).

*Sample preparation with pre-column derivatization.* Samples of herbal raw materials were ground into a powder by laboratory mill and about 0,5 g (accurately mass) were selected and placed into a glass vial. Then 3,3 ml of reacting mixture (methanol: toluene: sulfuric acid (44:20:2 v/v)) with 1,7 ml of internal standard solution (nonadecanoic acid in heptane solution) was added. The obtained samples were stood at 80 °C for 2 hours, refrigerated and centrifuged for 10 minutes at 5 000 rpm. It was taken 0,5 ml of the upper heptane phase, which contains methyl esters of fatty acids (Slobodianiuk et al., 2022; Khvorost et al., 2023; Olefirenko & Kyslychenko, 2024).

The compositions of the product obtained were identified by comparison of their mass-spectrums with data obtained from the NIST 2008 database. The quantitative content of fatty acids was done using the internal standard of nonadecanoic acid in heptane solution added to the sample.

**Research results and their discussion.** The findings on the fatty acid composition of *Gerbera hybrida* grass are summarized in table and illustrated in fig.

Chromatographic analysis of *Gerbera hybrida* raw material revealed the presence of 11 fatty acids in the plant's herb, including 9 saturated and 2 unsaturated types (fig., tab.).

In the analyzed *Gerbera hybrida* herb, saturated fatty acids were slightly predominant, accounting for 1 244,14 μg/g (53,09% of the total fatty acid content), while unsaturated fatty acids made up 1 099,32 μg/g (46,91% of the total fatty acid content) (tab.).

Among the saturated fatty acids identified in the analyzed herb, palmitic acid was the most abundant, with a concentration of (567,99±1,98) μg/g, accounting for 24,24% of the total amount of detected saturated fatty acids. Palmitic acid, a saturated fatty acid, is the main component of refined palm oil (Anushree et al., 2017). Over the past few decades, several studies have raised concerns regarding the potential adverse health effects of palm oil, primarily due to its high palmitic acid content. In animal models, diets enriched with palm oil have been shown to impair glucose tolerance by reducing insulin sensitivity (Fattore & Fanelli, 2013; Molfino et al., 2014; Mancini et al., 2015). Nevertheless, some reports in the literature indicate that palmitic acid may also exhibit anti-inflammatory and antitumor properties (Das, 2006; Xu et al., 2016).

Among the unsaturated fatty acids identified in the analyzed raw material of hybrid gerbera were linoleic (563,08±1,03 μg/g) and linolenic (681,06±1,37 μg/g) acids (tab.). These compounds are essential for maintaining the structural integrity and functional activity of cell membranes. Additionally, unsaturated fatty acids act as endogenous mediators in cellular signaling processes, play a key role in regulating gene expression, and serve as metabolic precursors for the synthesis of eicosanoids (Mercola & D'Adamo, 2023).

Linoleic acid is recognized as a key structural component of human tissues and is classified as an essential fatty acid. Moderate intake of this polyunsaturated compound has been linked to a decreased risk of developing

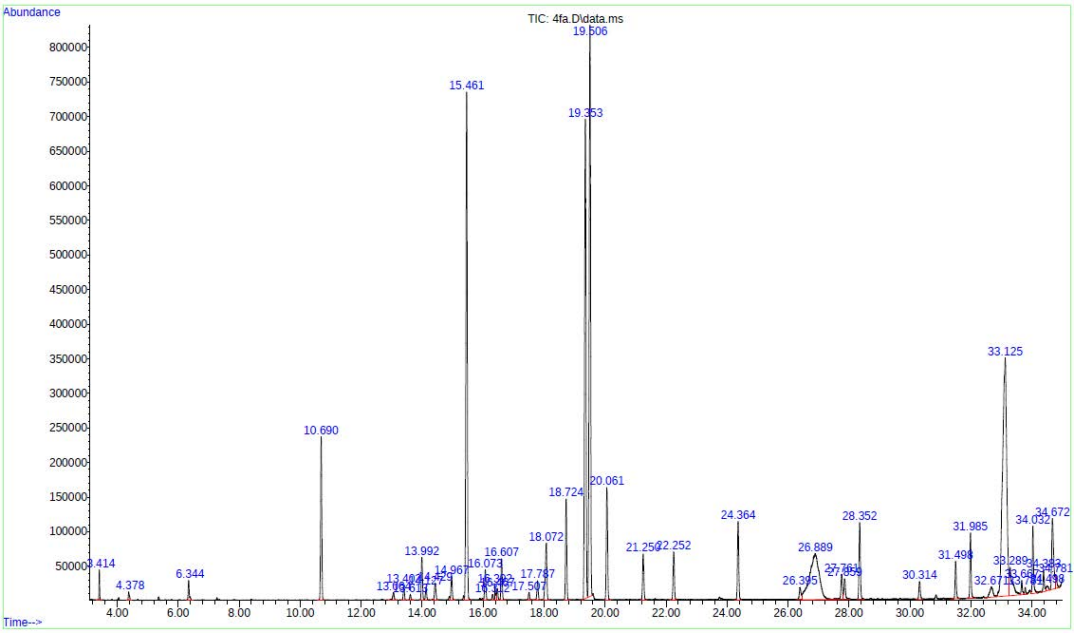


**Fig. Chromatographic profile of fatty acid methyl esters in *Gerbera hybrida* herb**

Table

**The qualitative composition and quantitative content of fatty acids of *Gerbera hybrida* raw material**

| № | Fatty acid name | RT, min | Fatty acid content, μg/g | Content (in %) of fatty acids from the total number of identified |
|---|---|---|---|---|
| Saturated fatty acids | | | | |
| 1. | Lauric acid | 6,35 | 17,59±0,21 | 0,75 |
| 2. | Myristic acid | 10,69 | 158,22±0,67 | 6,75 |
| 3. | Palmitic acid | 15,46 | 567,99±1,98 | 24,24 |
| 4. | Margaric acid | 17,79 | 19,34±0,34 | 0,82 |
| 5. | Stearic acid | 20,07 | 121,32±0,92 | 5,18 |
| 6. | Nonadecanoic acid | 22,26 | Internal standart | |
| 7. | Arachidic acid | 24,36 | 84,18±0,57 | 3,59 |
| 8. | Hexacosanoic acid | 27,76 | 32,78±0,42 | 1,40 |
| 9. | Behenic acid | 28,35 | 84,97±0,61 | 3,63 |
| 10. | Lignoceric acid | 31,98 | 12,93±0,43 | 0,55 |
| Unsaturated fatty acids | | | | |
| 11. | Linoleic acid | 19,36 | 563,08±1,03 | 24,03 |
| 12. | Linolenic acid | 19,52 | 681,06±1,37 | 29,06 |
| Total | | | 2 343,46 | 100 |
| The total amount of unsaturated fatty acids | | | 1 244,14 | 53,09 |
| The total amount of saturated fatty acids | | | 1 099,32 | 46,91 |

atherosclerosis, hypercholesterolemia, migraines, and various chronic disorders (Ramsden et al., 2021; Wang et al., 2023). Linoleic and linolenic acids are classified as essential fatty acids and serve as fundamental constituents of dietary oils. Among these, omega-3 and omega-6 fatty acids are of particular importance. In human nutrition, the composition and type of fatty acids consumed are often more significant than the overall quantity of fat intake (De Lorgeril et al., 2001; Czumaj & Śledziński, 2020).

The study results suggest that *Gerbera hybrida* holds significant potential as a valuable plant species, given the crucial role that fatty acids play in numerous biological and physiological processes.

**Conclusions. Using the GC/MS method, the qualitative composition and quantitative content of fatty acids in the herb of Gerbera hybrida were determined. A total of 11 fatty acids were identified in the raw material. Unsaturated fatty acids predominated, accounting for 53,09% of the total fatty acid content. The major unsaturated fatty acids were linolenic and linoleic acids, with concentrations of 681,06 μg/g (29,06% of total fatty acids) and 563,08 μg/g (24,03% of total fatty acids), respectively. Among the saturated fatty acids, palmitic acid had the highest content (567,99 μg/g).**

**These findings indicate that Gerbera hybrida is a promising plant species, given the essential role of fatty acids in various biological functions. Based on the obtained results, further pharmacological screening and the development of standardization parameters for Gerbera hybrida herb are planned.**

**BIBLIOGRAPHY**

Anushree S., André M., Guillaume D., Frédéric F. Stearic sunflower oil as a sustainable and healthy alternative to palm oil. A review. *Agronomy for Sustainable Development.* 2017. Vol. 37. P. 18. DOI: 10.1007/s13593-017-0426-x.

Atolani O., Adeniyi O., Kayode O. O., Adeosun C. B. Direct preparation of fatty acid methyl esters and determination of in vitro antioxidant potential of lipid from fresh Sebal causarium Seed. *Journal of Applied Pharmaceutical Science*. 2015. Vol. 5. P. 24–28. DOI: 10.7324/JAPS.2015.50305.

Budniak L., Slobodianiuk L., Marchyshyn S., Demydiak O., Dakhym I. Determination of amino acids of some plants from *Gentianaceae* family. *Pharmacia*. 2021. Vol. 68 (2). P. 441–448. DOI: 10.3897/pharmacia.68.e67052.

Budniak L., Slobodianiuk L., Marchyshyn S., Potishnyi I. Determination of amino acids of plants from *Angelica* L. genus by HPLC method. *Pharmacia.* 2022. Vol. 69 (2). P. 437–446. DOI: 10.3897/pharmacia.69.e83705.

Czumaj A., Śledziński T. Biological role of unsaturated fatty acid desaturases in health and disease. *Nutrients*. 2020. Vol. 12 (2). P. 356. DOI: 10.3390/nu12020356.

Das U. N. Biological significance of essential fatty acids. *The Journal of the Association of Physicians of India*. 2006. Vol. 54. P. 309–319.

De Lorgeril M., Salen P., Laporte F., De Leiris J. Alpha-linolenic acid in the prevention and treatment of coronary heart disease. *European Heart Journal.* 2001. Vol. 3. P. D26–D32. DOI: 10.1016/S1520-765X(01)90115-4.

Dissanayake G. K. G. S. D., Senevirathna C. N., Kirthisinghe J. P., Krishnarajah S. A. Study on extending vase life of Lotus using different vase solutions. *Proceedings of the National Symposium on Floriculture Research*. 2009. P. 30–38.

Fattore E., Fanelli R. Palm oil and palmitic acid: A review on cardiovascular effects and carcinogenicity. *International Journal of Food Sciences and Nutrition*. 2013. Vol. 64. P. 648–659.

Feshchenko H., Oleshchuk O., Slobodianiuk L., Milian I. *Study of Epilobium angustifolium L. amino acids content by HPLC method. ScienceRise: Pharmaceutical Science*. 2021. Vol. 6 (34). P. 85–90. DOI: 10.15587/2519-4852.2021.249836.

He F., Wang M., Gao M., Zhao M., Bai Y., Zhao C. Chemical composition and biological activities of *Gerbera anandria*. *Molecules*. 2014. Vol. 19 (4). P. 4046–4057. DOI: 10.3390/molecules19044046.

Khvorost O., Zudova Ye., Budniak L., Slobodianiuk L., Kramar H., Palamarchuk O., Ocheretniuk A. Analysis of carboxylic acids of *Astragalus dasyanthus* Pall. herb. *Pharmacia*. 2023. Vol. 70 (4). P. 1231–1238. DOI: 10.3897/pharmacia.70.e111279.

Mancini A., Imperlini E., Nigro E., Montagnese C., Daniele A., Orrù S., Buono P. Biological and Nutritional Properties of Palm Oil and Palmitic Acid: Effects on Health. *Molecules*. 2015. Vol. 20. P. 17339–17361. DOI: 10.3390/molecules200917339.

Mercola J., D'Adamo C. R. Linoleic Acid: A Narrative Review of the Effects of Increased Intake in the Standard American Diet and Associations with Chronic Disease. *Nutrients*. 2023. Vol. 15 (14). P. 3129. Doi 10.3390/nu15143129.

Molfino A., Gioia G., Fanelli F., Muscaritoli M. The role for dietary omega-3 fatty acids supplementation in older adults. *Nutrients*. 2014. Vol. 6 (10). P. 4058–4072. DOI: h10.3390/nu6104058.

Negm El-Dein S., Hussein A., Abu-Bakr M. S., Negm El-Dein A., Awad H. M., Ragab E. A. Phytochemical analysis and determination of antioxidant, anticholesterol, anti-inflammatory and anti-proliferative activities of *Gerbera jamesonii* flowers. *Advances in Traditional Medicine*. 2023. Vol. 23 (3). P. 863–875. DOI: 10.1007/s13596-022-00659-x.

Olefirenko A. O., Kyslychenko V. S. Research of the fatty acid composition of russell's lisianthus herb. *Odesa Medical Journal*. 2024. Vol. 6 (191). P. 92–95. DOI: 10.32782/2226-2008-2024-6-16.

Ramsden C. E., Zamora D., Faurot K. R., MacIntosh B., Horowitz M., Keyes G. S. Dietary alteration of n-3 and n-6 fatty acids for headache reduction in adults with migraine: Randomized controlled trial. *The British Medical Journal*. 2021. Vol. 374. P. n1448.

Rolnik A., Olas B. The plants of the *Asteraceae* family as agentsin the protection of human health. *International Journal of Molecular Sciences*. 2021. Vol. 22 (6). P. 3009. DOI: 10.3390/ijms22063009.

Slobodianiuk L., Budniak L., Feshchenko H., Sverstiuk A., Palaniza Y. Quantitative analysis of fatty acids and monosaccharides composition in *Chamerion angustifolium* L. by GC/MS method. *Pharmacia*. 2022. Vol. 69 (1). P. 167–174. DOI: 10.3897/pharmacia.69.e76687.

Wang Q., Zhang H., Jin Q., Wang X. Effects of dietary plant-derived low-ratio linoleic acid/alpha-linolenic acid on blood lipid profiles: a systematic review and meta-analysis. *Foods*. 2023. Vol. 12 (16). P. 3005.

Xu W., Guo Y. B., Li X., He M.-R., Liu S.-de. Palmitic acid induces hepatocellular oxidative stress and activation of inflammasomes. *Journal of Southern Medical University*. 2006. Vol. 36 (5). P. 655–659.

**REFERENCES**

Anushree, S., André, M., Guillaume, D., & Frédéric, F. (2017). Stearic sunflower oil as a sustainable and healthy alternative to palm oil. A review. *Agronomy for Sustainable Development*, 37, 18. https://doi.org/10.1007/s13593-017-0426-x.

Atolani, O., Adeniyi, O., Kayode, O.O., & Adeosun, C.B. (2015). Direct preparation of fatty acid methyl esters and determination of in vitro antioxidant potential of lipid from fresh Sebal causarium Seed. *Journal of Applied Pharmaceutical Science*, 5, 24–28. https://doi.org/10.7324/JAPS.2015.50305.

Budniak, L., Slobodianiuk, L., Marchyshyn, S., Demydiak, O., & Dakhym, I. (2021). Determination of amino acids of some plants from *Gentianaceae* family. *Pharmacia,* 68(2), 441–448. https://doi.org/10.3897/pharmacia.68.e67052.

Budniak, L., Slobodianiuk, L., Marchyshyn, S., & Potishnyi, I. (2022). Determination of amino acids of plants from *Angelica* L. genus by HPLC method. *Pharmacia,* 69 (2), 437–446. https://doi.org/10.3897/pharmacia.69.e83705.

Czumaj, A., & Śledziński, T. (2020). Biological role of unsaturated fatty acid desaturases. https://doi.org/10.3390/nu12020356.

Das, U.N. (2006). Biological significance of essential fatty acids. *The Journal of the Association of Physicians of India*, 54, 309–319.

De Lorgeril, M., Salen, P., Laporte, F., & De Leiris, J. (2001). Alpha-linolenic acid in the prevention and treatment of coronary heart disease. *European Heart Journal,* 3, D26 – D32. https://doi.org/10.1016/S1520-765X(01)90115-4.

Dissanayake, G.K.G.S.D., Senevirathna, C.N., Kirthisinghe, J.P., & Krishnarajah, S.A. (2009). Study on extending vase life of Lotus using different vase solutions. *Proceedings of the National Symposium on Floriculture Research*, 30–38.

Fattore, E., & Fanelli, R. (2013). Palm oil and palmitic acid: A review on cardiovascular effects and carcinogenicity. *International Journal of Food Sciences and Nutrition*, 64, 648–659.

Feshchenko, H., Oleshchuk, O., Slobodianiuk, L., & Milian, I. (2021). *Study of Epilobium angustifolium L. amino acids content by HPLC method. ScienceRise: Pharmaceutical Science, 6* (34), 85–90. https://doi.org/10.15587/2519-4852.2021.249836.

He, F., Wang, M., Gao, M., Zhao, M., Bai, Y., & Zhao, C. (2014). Chemical composition and biological activities of *Gerbera anandria*. *Molecules*, 19 (4), 4046–4057. https://doi.org/10.3390/molecules19044046.

Khvorost, O., Zudova, Ye., Budniak, L., Slobodianiuk, L., Kramar, H., Palamarchuk, O., & Ocheretniuk, A. (2023). Analysis of carboxylic acids of *Astragalus dasyanthus* Pall. herb. *Pharmacia*, 70 (4), 1231–1238. https://doi.org/10.3897/pharmacia.70.e111279.

Mancini, A., Imperlini, E., Nigro, E., Montagnese, C., Daniele, A., Orrù, S., & Buono, P. (2015). Biological and Nutritional Properties of Palm Oil and Palmitic Acid: Effects on Health. *Molecules*, 20, 17339–17361. https://doi.org/10.3390/molecules200917339.

Mercola, J., & D'Adamo, C.R. (2023). Linoleic Acid: A Narrative Review of the Effects of Increased Intake in the Standard American Diet and Associations with Chronic Disease. *Nutrients*, 15 (14), 3129. https://doi.org/10.3390/nu15143129.

Molfino, A., Gioia, G., Fanelli, F., & Muscaritoli, M. (2014). The role for dietary omega-3 fatty acids supplementation in older adults. *Nutrients,* 6 (10), 4058–4072. https://doi.org/10.3390/nu6104058.

Negm El-Dein, S., Hussein, A., Abu-Bakr, M.S., Negm El-Dein, A., Awad, H.M., & Ragab, E.A. (2023). Phytochemical analysis and determination of antioxidant, anticholesterol, anti-inflammatory and anti-proliferative activities of *Gerbera jamesonii* flowers. *Advances in Traditional Medicine,* 23 (3), 863–875. https://doi.org/10.1007/s13596-022-00659-x.

Olefirenko, A.O., & Kyslychenko, V.S. (2024). Research of the fatty acid composition of russell's lisianthus herb. *Odesa Medical Journal,* 6 (191), 92–95. https://doi.org/10.32782/2226-2008-2024-6-16.

Ramsden, C.E., Zamora, D., Faurot, K.R., MacIntosh, B., Horowitz, M., & Keyes, G.S. (2021). Dietary alteration of n-3 and n-6 fatty acids for headache reduction in adults with migraine: Randomized controlled trial. *The British Medical Journal*, 374, n1448.

Rolnik, A., & Olas, B. (2021). The plants of the *Asteraceae* family as agentsin the protection of human health. *International Journal of Molecular Sciences*, 22 (6), 3009. https://doi.org/10.3390/ijms22063009.

Slobodianiuk, L., Budniak, L., Feshchenko, H., Sverstiuk, A., & Palaniza, Y. (2022). Quantitative analysis of fatty acids and monosaccharides composition in *Chamerion angustifolium* L. by GC/MS method. *Pharmacia*, 69 (1), 167–174. https://doi.org/10.3897/pharmacia.69.e76687.

Wang, Q., Zhang, H., Jin, Q., & Wang, X. (2023). Effects of dietary plant-derived low-ratio linoleic acid/alpha-linolenic acid on blood lipid profiles: a systematic review and meta-analysis. *Foods,* 12 (16), 3005.

Xu, W., Guo, Y.B., Li, X., He, M.-R., & Liu, S.-de. (2006). Palmitic acid induces hepatocellular oxidative stress and activation of inflammasomes. *Journal of Southern Medical University*, 36 (5), 655–659.

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**Slobodianiuk L.** – research concept and design, material collection, writing the article, final approval of the article;
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**Danyliv S.** – material collection, analyzing the data obtained and their statistical processing, writing an article;
**Kravchuk L.** – material collection, writing the article, final approval of the article;
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