Analysis of pharmaceutical market of dietary supplements with green tea leaves extract

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The aim of work is to study the assortment of dietary supplements with green tea leaves extract on the modern pharmaceutical market to further search for ways to improve and optimize pharmaceutical supply.

Materials and methods. The assortment of dietary supplements with green tea leaves extract was studied basing on the search of dietary supplements in pharmacies of Ukraine in the internet resources. For study of assortment of dietary supplements, the following methods were used: marketing, statistical, logic and graphic.

Results. The assortment of dietary supplements with green tea leaves extract has been analyzed. The results showed that the leaders in the number of manufacturers in the analyzed group of dietary supplements are the United States, Ukraine, and Poland, their part is 61 %, 16 % and 8 %, respectively. In terms of assortment, the United States ranks first – 66 %. Dietary supplements are presented in 6 dosage forms, most of them are capsules (60 %). It was determined that monopreparations predominate in the pharmaceutical market and account for 77 %. The price segmentation of the market of dietary supplements with green tea leaves extract has been provided, the results showed that most of these are dietary supplements in the price range of 200–500 UAH. The study of the company structure made it possible to identify leaders among foreign companies; the top three companies included Now Foods (27 %), Swanson (20 %), Puritan’s Pride (14 %).

Conclusions. There are 42 dietary supplements with green tea leaves extract at the beginning of 2022 in Ukraine. On the temporary pharmaceutical market of Ukraine 84 % of dietary supplements with green tea extract are presented by foreign manufacturers, mainly by monopreparations, in the form of capsules and in the price range from 200 to 500 UAH.

Key words: green tea, dietary supplements, analysis, pharmaceutical market, market research.
Under the influence of negative environmental factors, daily physical and mental stress, accompanied by poor nutrition, poor supply with vital macro- and micronutrients, the body’s redox balance shifts towards oxidative processes, causing the occurrence of an oxidative stress, which can disturb functions of different body systems as a result in the future, lead to the occurrence of pathologies [1]. An important role in supporting homeostasis is played by antioxidants of exogenous origin, the intake of which contributes to the normalization of balance [2].

Approximately 70 % of US adults use dietary supplements [3]. In Europe, the leaders in the consumption of dietary supplements are Italy, Russia, Germany, Great Britain and France. The Ukrainian market of dietary supplements in monetary terms in 2015 was estimated at 75.7 million euros with a tendency to reach 87.1 million euros in 2020 [4]. Today, there is a stable growth dynamics in demand and supply of dietary supplements with antioxidant activity [5]. The global antioxidants market size was valued at $3,437.3 million in 2020, and is projected to reach $7,376.4 million by 2026 [5]. According to the results, it has been determined that the first position in the ranking of country-manufacturer by the number of firms is the USA with 61 %, the second one belongs to Ukraine – 16 %, and the third – to Poland (8 %) (Fig. 1).

Aim

The aim was to study the assortment of dietary supplements with green tea leaves extract on the modern pharmaceutical market to further search for ways to improve and optimize pharmaceutical supply.

Materials and methods

The object of the study was information about dietary supplements with green tea leaves extract on pharmaceutical market of Ukraine. The assortment of dietary supplements with green tea leaves extract was studied basing on the search of dietary supplements in pharmacies of Ukraine in the internet resources. For study of assortment of dietary supplements, the following methods were used: marketing, statistical, logic and graphic.

Results

According to the obtained results as shown in Table 1, there are 14 dietary supplements with green tea leaves extract at the beginning of 2022 in Ukraine.

Today, there are 16 % of Ukrainian and 84 % of foreign dietary supplements on Ukrainian pharmaceutical market of dietary supplements with green tea leaves extract (Fig. 1). In addition, a part of mono- and combined preparations, equal 24 and 77 %, respectively, was established (Fig. 2). According to the results of the study, it is obvious that the number of mono-preparations is greater than that of the combined ones, which in turn is associated with the difficulties of technological production and the complexity of standardizing combined drugs.

According to the results, it has been determined that the first position in the ranking of country-manufacturer by the number of companies is the USA with 61 %. The second position belongs to Ukraine – 16 %, and the third – to Poland (8 %). Analysis of the rating of country-manufacturer on the range of dietary supplements with green tea leaves extract by the number of assortment has showed that the first position is occupied by the USA (66 %), the second one belongs to Ukraine (15 %), and the third one – to Poland (6 %) (Table 2).
| No. | Dietary supplements                          | Manufacturer       | Country | Dosage form | Average price, UAH |
|-----|---------------------------------------------|--------------------|---------|-------------|--------------------|
| 1   | Green Tea                                  | Jarrow Formulas    | USA     | Capsules    | 274                |
| 2   | EGCG                                        | Now foods          | USA     | Capsules    | 287                |
| 3   | Decaffeinated Mega Green Tea Extract        | Life Extension,    | USA     | Capsules    | 850                |
| 4   | Green Tea Phytosome                         | Thorne             | USA     | Capsules    | 702                |
| 5   | Green Tea Extract                           | Zhou Nutrition     | USA     | Capsules    | 624                |
| 6   | Advanced Inflammation                       | Klare Labs,        | USA     | Capsules    | 1886               |
| 7   | Green Tea Extract                           | Klare Labs,        | USA     | Capsules    | 1409               |
| 8   | Green Tea Extract                           | Source Naturals,    | USA     | Tablets     | 459                |
| 9   | Extract of green tea                        | Elit-pharm,        | Ukraine | Tablets     | 120                |
| 10  | Green Tea                                  | Pharmacom,         | Ukraine | Tablets     | 50                 |
| 11  | Super Green Tea                            | Natures Answer,    | USA     | Drops       | 548                |
| 12  | Green Tea Extract with EGCG+VIT C           | Zenwise Health,    | USA     | Capsules    | 720                |
| 13  | Green Tea Extract                           | Swanson            | USA     | Capsules    | 210                |
| 14  | Green Tea Phytosome                         | Swanson            | USA     | Capsules    | 160                |
| 15  | Green Tea Extract                           | Nosorog            | USA     | Capsules    | 95                 |
| 16  | Rodale Plus                                 | Amway              | USA     | Tablets     | 690                |
| 17  | Green Tea Fat Metabolizer                   | Inwi Naturals,     | USA     | Capsules    | 902                |
| 18  | Green Tea                                  | Gym Beam,          | USA     | Tablets     | 219                |
| 19  | Green Tea                                  | Olimp Nutrition,   | Poland  | Capsules    | 159                |
| 20  | Extract of green tea                        | Osocor             | Ukraine | Capsules    | 186                |
| 21  | Amber with green tea extract                | Primaflora,        | Ukraine | Tablets     | 186                |
| 22  | Green Tea                                  | Aysri              | India   | Capsules    | 328                |
| 23  | Green Tea                                  | Ostrovit           | Poland  | Tablets     | 328                |
| 24  | EGCG                                        | LuckyVitamin,      | USA     | Tablets     | 258                |
| 25  | Green Tea                                  | IronFlex           | USA     | Tablets     | 258                |
| 26  | Green Tea Leaf Extract                      | Evaluation Nutrition| USA  | Tablets     | 355                |
| 27  | Acai & Green Tea                            | Natrol             | USA     | Capsules    | 300                |
| 28  | Green Tea Light Cleaning Complex            | Euro Plus          | Austria | Tea         | 600                |
| 29  | Green Tea                                  | ALL NUTRITION      | USA     | Capsules    | 380                |
| 30  | Extract of green tea                        | Beurre             | Ukraine | Drops       | 370                |
| 31  | T-Lean Extreme                              | Now Food Sports    | USA     | Capsules    | 576                |
| 32  | Extract of Green Tea                        | Stark Pharm        | Ukraine | Tablets     | 685                |
| 33  | Complex protection “Solar filter in capsules” with green tea extract | Femblock | Spain | Capsules | 759 |
| 34  | Green tea                                  | Swanson            | USA     | Capsules    | 180                |
| 35  | Green tea                                  | Fito Pharma,       | Vietnam | Capsules    | 155                |
| 36  | Garcinia with green tea                     | Elit-pharm,        | Ukraine | Tablets     | 121                |
| 37  | Green Tea Complex                           | GNC Herbal PLUS    | USA     | Capsules    | 470                |
| 38  | Green Tea Extract Plus                      | Myvitamins,        | UK      | Capsules    | 384                |
| 39  | Green Tea                                  | Novofit            | Ukraine | Gel         | 75                 |
| 40  | Green Tea                                  | Bluebonnet Nutrition, | USA | Capsules | 720 |
| 41  | Cyto greens                                 | Allmax Nutrition   | Canada  | Powder     | 828                |
| 42  | Green Tea Extract                           | Puritan下跌的Pride | USA     | Capsules    | 400                |
The analysis of pharmaceutical manufacturers has provided an assessment of 6 leading positions in the range of dietary supplements in this group. The following leaders have been identified: NOW Foods – 31 %, Swanson – 23 %, Puritan’s Pride (13 %), Klaine Labs (13 %), Source Natural (13 %), Elit-pharm (13 %) (Fig. 3).

Price, along with the effectiveness, is an important criterion for choosing a dietary supplement. Thus, a price segmentation of the market of dietary supplements with green tea leaves extract has been provided, which allowed to identify 4 groups of dietary supplements in the study group by their value. According to the results, the share of dietary supplements priced up to 200 UAH is 28 %; drugs priced between 200 and 500 UAH account for 42 %. The price range from 500 to 800 UAH includes 22 % of supplements, and supplements priced over 800 UAH make 10 % (Fig. 4).

The minimum retail price for dietary supplements with green tea leaves extract is set at Green Tea Extract (Noso-rog, USA) – 95 UAH, the second position is taken by Green Tea (Novofit, Ukraine) – 75 UAH. The maximum price is for dietary supplements of foreign manufacture “Advanced Inflammation” (Klaire Labs, USA) – 1886 UAH. (Table 1)

Table 2. Ranking of country-manufacturer by number of companies producing dietary supplements with green tea leaves extract

| No. | Country-manufacturer | By number of companies | By assortment |
|-----|----------------------|------------------------|--------------|
|     | Absolute number of proposals | Relative number of proposals, % | Absolute number of proposals | Relative number of proposals, % |
| 1   | USA                  | 23                     | 61           | 31                       | 66           |
| 2   | Ukraine              | 6                      | 16           | 7                        | 15           |
| 3   | Poland               | 3                      | 8            | 3                        | 6            |
| 4   | India                | 1                      | 3            | 1                        | 2            |
| 5   | UK                   | 1                      | 3            | 1                        | 2            |
| 6   | Canada               | 1                      | 3            | 1                        | 2            |
| 7   | Austria              | 1                      | 3            | 1                        | 2            |
| 8   | Spain                | 1                      | 3            | 1                        | 2            |
| 9   | Vietnam              | 1                      | 3            | 1                        | 2            |
| Sum |                      | 38                     | 100          | 47                       | 100          |

Fig. 1. Distribution diagram of foreign and Ukrainian manufacturers of dietary supplements with green tea leaves extract.

Fig. 2. Distribution diagram of mono- and combined dietary supplements with green tea leaves extract.

Fig. 3. Distribution chart of dietary supplements with green tea leaves extract of 6 leading companies.
Convenient use and the best achievement of a therapeutic effect. A study of this market segment by dosage form indicated the heterogeneity of dietary supplements. Thus, the analyzed group of dietary supplements was represented by 6 dosage forms such as capsules, tablets, drops, gels, teas, powders. The most widespread dosage form is capsules (60 %), followed by tablets (28 %) and the smallest share belongs to drops, teas, gels and powders, with each equal to 2 % (Fig. 5).

**Discussions**

The number of dietary supplements, as of 2022, compared to 2015 has increased [8]. The part of foreign dietary supplements in 2022 is 5 times greater than Ukrainian ones and is 80 %. Ukrainian dietary supplements (16 %) in 2022 are presented; their number is 4 times more in comparison with the number of dietary supplements of Ukrainian production in 2012 (4 %). Despite the fact that the number of dietary supplements manufactured in Ukraine has increased, it is advisable to continue to work towards the development and implementation of dietary supplements.

**Conclusions**

1. There are 42 dietary supplements with green tea leaves extract at the beginning of 2022 in Ukraine.

2. According to the results of marketing research on the temporary pharmaceutical market of Ukraine, 84 % of dietary supplements with green tea leaves extract are presented by foreign manufacturers, mainly by monopreparations, in the form of capsules and in the price range from 200 to 500 UAH.

3. As the pharmaceutical market of Ukraine is dominated by foreign dietary supplements with green tea leaves extract, the results of the analysis of the assortment confirm the relevance of developing a new Ukrainian dietary supplements that could be used as antioxidants.

**Prospects for further research.** The results of the analysis indicate to further search for ways to improve and optimize pharmaceutical supply.

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References

[1] Maslov, O. Y., Kolisnyk, S. V., Komisarenko, M. A., Altukhov, A. A., Dynyk, K. V., & Stepanenko, V. I. (2021). Study and evaluation antioxidant activity of dietary supplements with green tea extract. Current issues in pharmacy and medicine: science and practice, 14(2), 215-219. https://doi.org/10.14739/2409-2932.2021.2.233306
[2] Maslov, O. Yu., Kolisnyk, S. V., Hrechana, O. V., & Serbin, A. H. (2021). Doslidzhennia yakisnoho skladu ta kilkisnoho vmistu deiakyh hrup biolohichno aktyvnykh rechovyn u diietychnykh dobavok z ekstraktom lystia zelenoho chialu [Study of the qualitative composition and quantitative content of some groups of BAS in dietary supplements with green tea leaf extract]. Zaporozhye Medical Journal, 23(1), 132-137. [in Ukrainian]. https://doi.org/10.14739/2310-1210.2021.1.224932
[3] Nutraceuticals World. (2016, November 31). Over 170 million Americans take dietary supplements. Nutraceuticals World. https://www.nutraceuticalsworld.com/contents/view_online-exclusives/2016-10-31/over-170-million-americans-take-dietary-supplements/
[4] Statista Research Department. (2015, September 22). Europe: food supplements, by country 2015 and 2020. Statista. https://www.statista.com/statistics/589452/value-dietary-supplements-markets-europe-by-country/
[5] Olivo, L. (2015, February 3). Natural, Potent & Focused: The Antioxidant Market in Review. Nutraceuticals World. https://www.nutraceuticalsworld.com/issues/2015-03/view_features/natural-potent-focused-the-antioxidant-market-in-review
[6] Kale, R., & Deshmukh, R. (2022). Antioxidants Market by Type (Natural Antioxidants and Synthetic Antioxidants), Form (Dry and Liquid), and Application (Food & Feed Additives, Pharmaceuticals & Personal Care Products, Fuel & Lubricant Additives, Plastic, Rubber,& Latex Additives, and Others): Global Opportunity Analysis and Industry Forecast, 2022-2031. Allied Market Research. https://www.alliedmarketresearch.com/anti-oxidants-market#:~:text=The%20global%20antioxidants%20market%20size,with%20a%20CAGR%20of%206.5%
[7] Yasinska, I., & Ivanova, V. (2018, June 4-7). Svitovyi rynok tovariv z antyoksydantnoiu diieiu: stan, perspektyvy rozvytku ta spozhyvchni nastroi [World market of goods with antioxidant action: state, prospects and consumer sentiment]. Stratehiia yakosti u promyslovosti i osviti. Proceedings of the 14th International Conference (Vol. 2, pp. 395-399). Dnipro. [in Ukrainian].
[8] Myliukovskaya, O. A. (2015). Farmatsiya vsevychynyi rynok Ukrainy: analiz suchasnoho stanu ta tendentsii rozvytku [Pharmaceutical market of Ukraine: analysis of the current state and development trends]. Pershyi Nezalezhnyi Naukovyi Visnyk, (2-1), 75-78. [in Ukrainian].