



Fund “Nauka” Project № 24027 Resume – Autumn Competition-based Session 2024:

“Essential oils and essential oil components: analysis and correlations of antitumor, antioxidant, and antimicrobial activity”

Project leader: Assoc. prof. Silviya Yordanova Atanasova-Stamova

The aim of the present project is to conduct an in-depth investigation of three key biological effects of selected essential oils (EOs) and their components—antitumor, antioxidant, and antimicrobial activities—and to analyze potential molecular, functional, and statistical correlations between these effects. The study focuses on plant species from the families Lamiaceae, Apiaceae, and Liliaceae. Specific goals include evaluating the inhibitory potential of essential oils on the growth of tumor and normal human cell lines to identify a high selective index, investigating antioxidant activity, and examining antimicrobial effects against various pathogens (bacteria and fungi).

The experimental methodology is designed to include studies on cell cultures, microbiological assays, in vitro photocolorimetric techniques, chromatographic analytical and separation methods, and statistical analysis of the obtained data. By uncovering the potential of underexplored essential oils, the project aims to contribute to modern medicine and pharmacy in addressing major global health challenges such as cancer and infections.

Изследователски задачи:

- (1) Анализ на литературни данни по проблема.**
- (2) Да се определи и анализира чувствителността на грам+ и грам-референтни щамове и значими клинични изолати срещу подбрани етерични масла .**
- (3) Да се определи и анализира чувствителността на комбинации от етерични масла спрямо клинични изолати и съответните им референтни щамове.**
- (4) Да се определи количественото съдържание на основни активни компоненти в най-голям процент в етеричните масла посредством газхроматографски анализ с мас детекция.**
- (5) Да се определи и анализира антиоксидантната активност на етерични масла спрямо кислород- и азот-съдържащи частици, налични в живите организми, посредством ин витро фотоколориметрични методи в микроскала.**

- (6) Да се определи и анализира инхибиторния потенциал на етерични масла срещу три вида туморни и нормални клетъчни линии.**
- (7) Изследване на потенциални адитивни и/или синергични ефекти между използваните етеричните масла.**
- (8) Изследване на потенциални адитивни и/или синергични ефекти между етерични масла и синтетични лекарства.**
- (9) Статистическа обработка, анализ на получените резултати и установяване на корелации между тях.**

The expected outcomes of the scientific project involve demonstrating the antioxidant, antitumor, and antimicrobial activities of the investigated essential oils. The research focus is directed toward examining the correlations between these effects and the chemical composition of each essential oil. It is anticipated that essential oils with higher antioxidant potential will exhibit stronger antitumor and antimicrobial activities. It is hypothesized that the magnitude of these effects will depend on both the concentration of the essential oils and the composition of their active components.

In addition to their individual effects, selected essential oils will be studied in combinations to identify potential synergistic and/ or additive effects. The development of combinations or therapeutic strategies based on natural compounds for the prevention and treatment of oncological and infectious diseases is of critical importance to modern science and medical practice. Such approaches are expected to demonstrate high efficacy against various pathogens, including multidrug-resistant strains, and against different cancer types. They are also anticipated to enhance cellular sensitivity to antimicrobial or chemotherapeutic agents while minimizing undesirable side effects.

The synergistic or additive combination of natural compounds with antibiotics and oncotherapeutics may also lead to improved therapeutic outcomes for patients through multitarget action against pathogens or tumor cells. The potent antimicrobial activity, antioxidant potential, and antitumor effects of essential oils, combined with their low cytotoxicity, are expected to offer an innovative, effective, and safe therapeutic solution. From a pharmacoeconomic perspective, such solutions could reduce public expenditure on hospital stays and lower the overall cost of therapy.