Investigation of Biologically Active Compounds in Berries of the Carpathians and the Black Sea Region as a Tool for Environmental Education

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Relevance of the research topic

The modern active level of human life leads to the formation of a new system of knowledge on prolonging a healthy lifestyle. Therefore, over the past 5 years, scientists have been focusing on various groups of flavonoids and their use in pharmaceuticals to exert biologically active effects on the human body.

Flavonoids are substances of plant origin with a wide range of effects, especially those that have a strengthening effect on the cardiovascular system. They are found in various parts of plants, but the most common are found in berries, which can be used as a source of flavonoids.

The determination of the qualitative and quantitative content of flavonoids in wild berries of the Carpathian region and common berries of the Mykolaiv region provides the basis for further use of this information to expand knowledge about the biological activity of flavonoids. The value of this information lies in the possibility of its practical use in the manufacture of pharmaceuticals.

The aim of the study is to conduct a comparative analysis of the qualitative and quantitative indicators of flavonoid content in berries in the South of Ukraine (Mykolaiv region) and the Carpathians.

In accordance with the aim of the study, the following tasks were set:

1) to analyse historical and reference information and determine the biological activity of flavonoids and their effect on the human body;

2) to determine the methodology of sampling and experimental part;

3) to determine the qualitative and quantitative composition of flavonoids in berries (blackberry, raspberry and black currant) and to conduct a comparative characterisation of flavonoid composition.

Subject of the study: qualitative and quantitative indicators of flavonoid content in blackberry, raspberry and black currant berries

Object of study: samples of blackberry, raspberry and blackcurrant berries from the territory of Mykolaiv region and the Carpathians.

Raspberries in the Carpathians

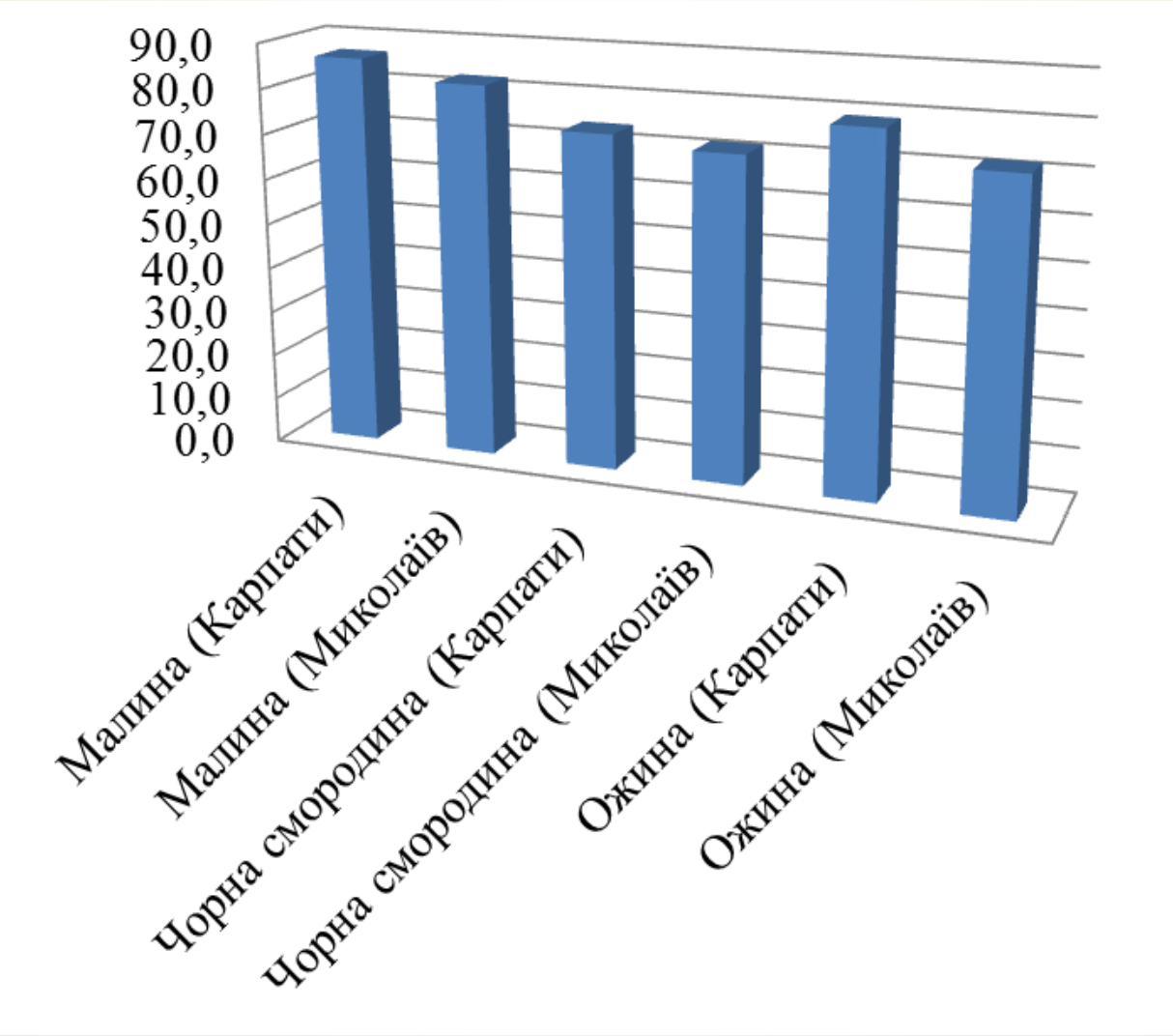
Blackberries in Mykolaiv

Theoretical and practical significance of the research: the results can be used in local history, biology, chemistry classes, as well as for additional materials on healthy lifestyles and food hygiene. It is possible to use the experimental data of the starting materials for the manufacture of pharmaceuticals with a higher concentration of flavonoids, which provides less production costs and reduces the cost of production.

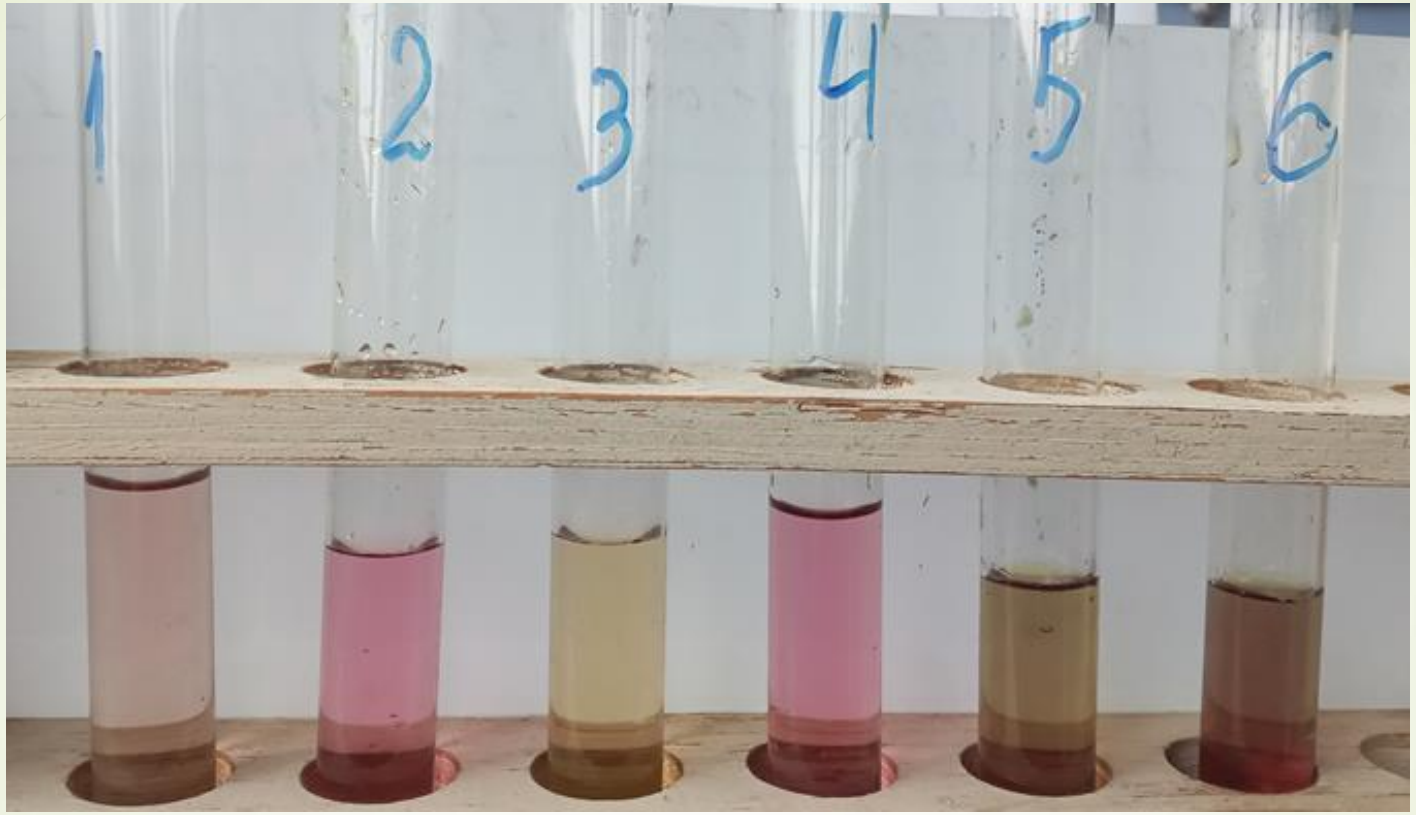
Research methods

1. Water hood
2. Extraction of flavonoids
3. Qualitative reactions to flavonoids
    - *A. Cyanidin test or Chinoda test*
    - *B. Cyanidin test according to Bryant*
    - *C. Reaction with aluminium chloride*
    - *D. Reaction with ammonia solution*
4. Quantitative analysis of rutin by the ophthometric method

Stage 1. Mass fraction of water in berry samples

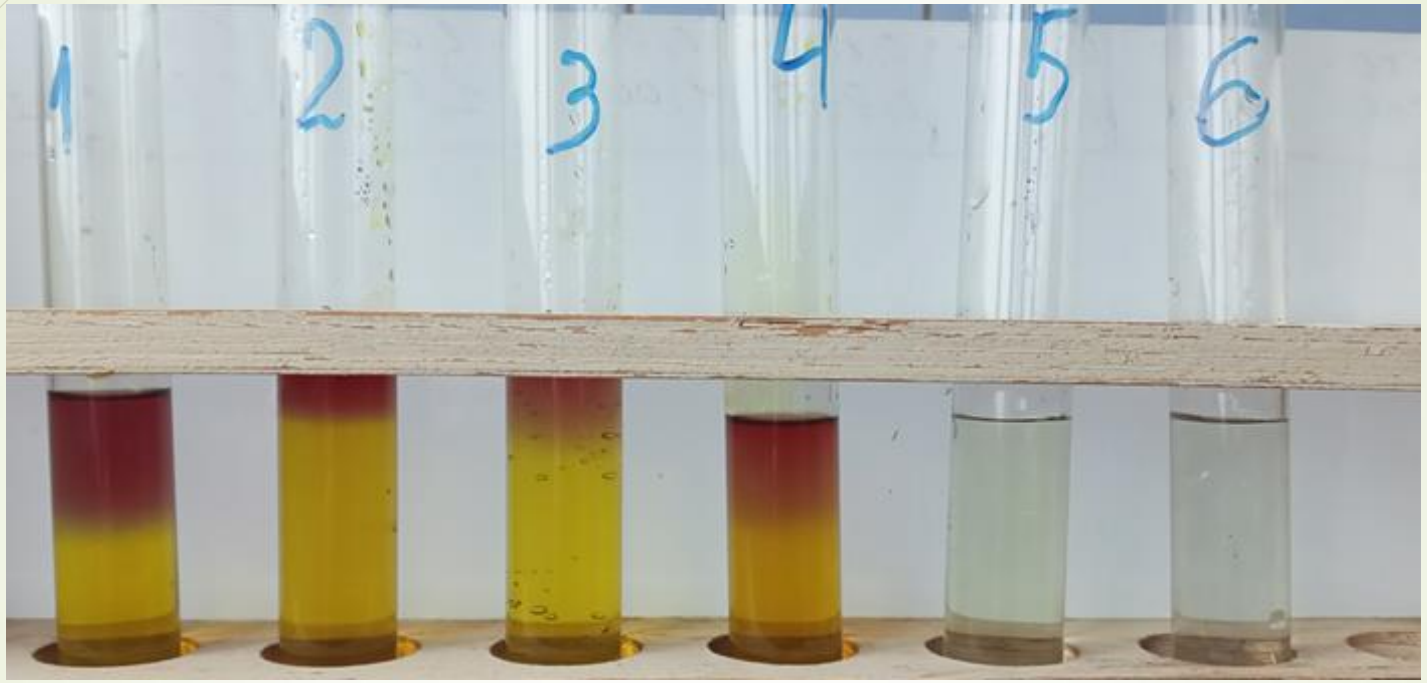


2 Step. Alcohol extract of berry samples



Notes: 1 - raspberries (Carpathians), 2 - raspberries (Mykolaiv), 3 - black currants (Carpathians), 4 - black currants (Mykolaiv), 5 - blackberries (Carpathians), 6 - blackberries (Mykolaiv).

Stage 3. Cyanidin test of berry samples

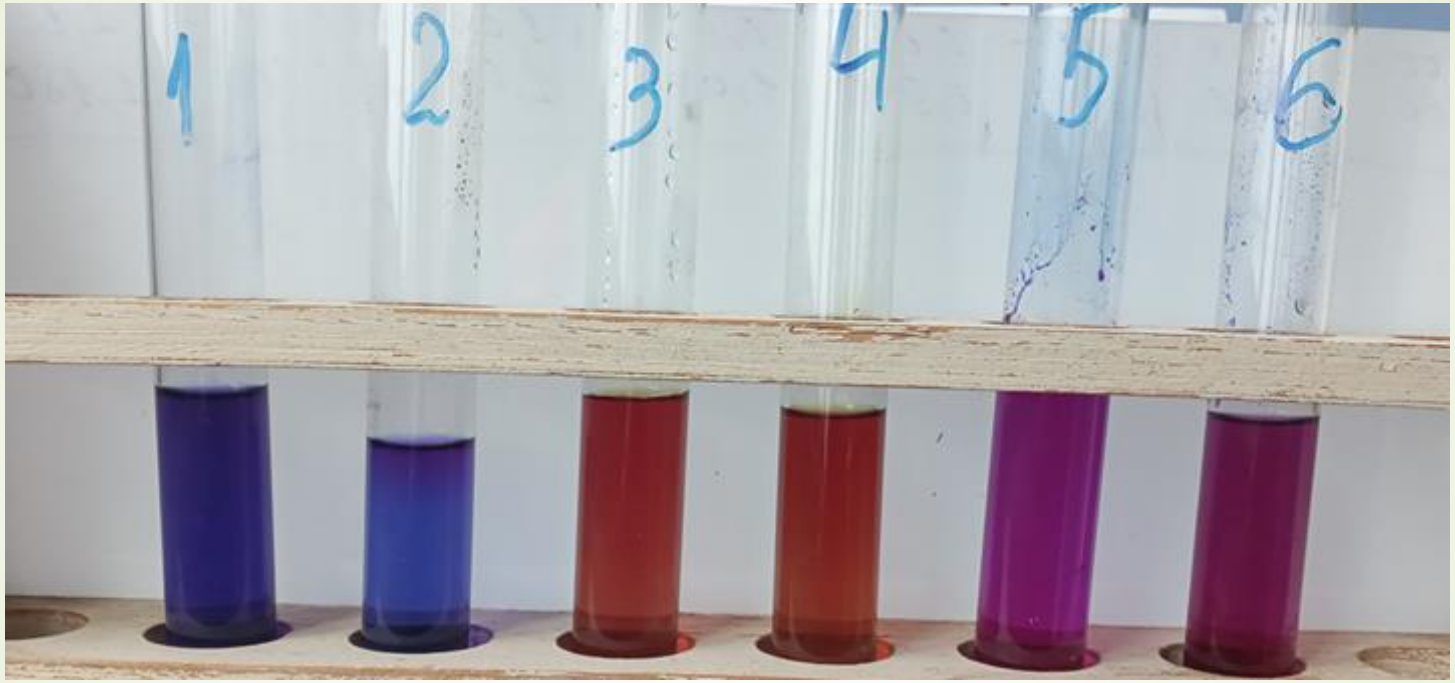


Notes: 1 - raspberries (Carpathians), 2 - raspberries (Mykolaiv), 3 - black currants (Carpathians), 4 - black currants (Mykolaiv), 5 - blackberries (Carpathians), 6 - blackberries (Mykolaiv).

Stage 4. Qualitative reaction of samples to flavonoids with aluminium chloride

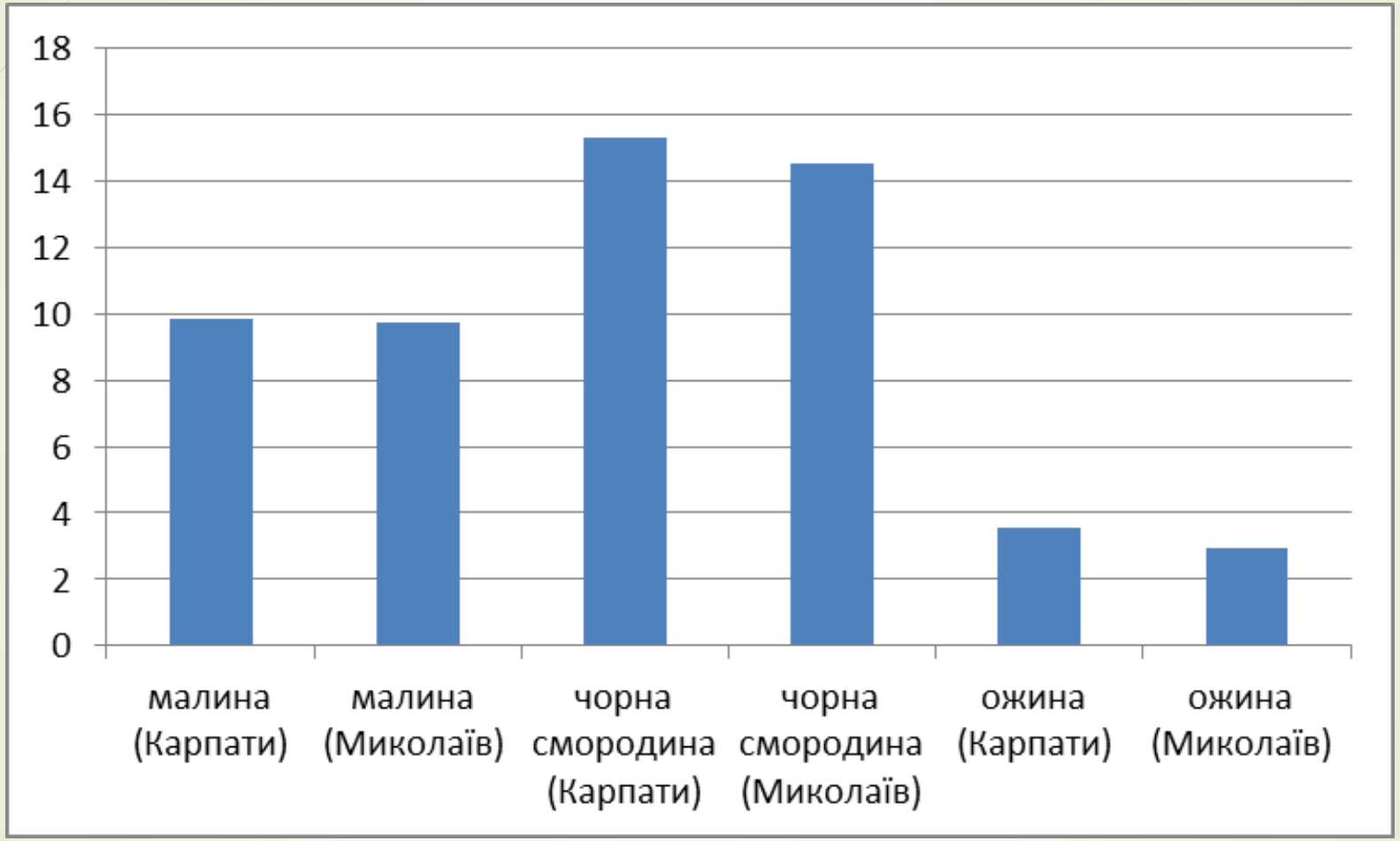
Notes: 1 - raspberries (Carpathians), 2 - raspberries (Mykolaiv), 3 - black currants (Carpathians), 4 - black currants (Mykolaiv), 5 - blackberries (Carpathians), 6 - blackberries (Mykolaiv).

Stage 5. Qualitative reaction of samples to flavonoids with ammonia



Notes: 1 - raspberries (Carpathians), 2 - raspberries (Mykolaiv), 3 - black currants (Carpathians), 4 - black currants (Mykolaiv), 5 - blackberries (Carpathians), 6 - blackberries (Mykolaiv).

6 Stage. Rutin content in berry samples



Conclusions

1. In the course of our research, we found out the peculiarities of flavonoids' effect on the human body based on a literature review of medical and statistical studies. We have determined that flavonoids have a positive effect on the body for preventive and antiseptic purposes, reduce the risk of developing cardiovascular diseases, neurodegenerative diseases (Alzheimer's and Parkinson's), promote vascular and functional activity, slow down the symptoms of diabetes mellitus, are effective in preventing platelet aggregation, and activate memory development and stimulate cognitive functions.

2. Sampling was carried out in July-August 2021 in Mykolaiv (Southern Ukraine) and in the area of Mount Khomyak (Carpathians). A total of 18 samples were collected, which were subjected to natural displacement. The methodology used was to determine the amount of water, flavonoid extraction, and qualitative reactions to flavonoids (cyanidin test or Chinoda test, cyanidin test according to Briant).

Conclusions

3.Practical aspects of the methodological approach to determining the average mass fraction of water in the analysed samples can be represented in the following inequalities (%):

- raspberry (Carpathians) 86.54 > raspberry (Mykolaiv) 82.36;
- black currant (Carpathians) 73.82 > black currant (Mykolaiv) 71.54;
- blackberry (Carpathians) 78.9 > blackberry (Mykolaiv) 71.9.

The maximum average mass fraction of water is observed in raspberries harvested in the Carpathians - 86.5 %, which is visually determined by the large size of the berries. The maximum average mass fraction was determined in the fruits of black currant collected in Mykolaiv - 71.5 %.

4. Practical aspects of the methodological approach to determining the content of rutin in the analysed berry samples can be presented in the following inequalities (mg/100g)

- raspberry (Carpathians) 9.82 > raspberry (Mykolaiv) 9.73;
- black currant (Mykolaiv) 15.31 > black currant (Carpathians) 14.5;
- blackberry (Carpathians) 3.56 > blackberry (Mykolaiv) 2.94.

The highest average routine index is observed in raspberries harvested in the Carpathians - 9.82. The maximum average statistical value of rutin was determined in the fruits of black currant collected in Mykolaiv - 2.94.

Thank you for your attention!