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EVALUATION OF THE CHEMICAL COMPOSITION AND ANTI-TUMOR ACTIVITY OF THE EXTRACT OF *HEDERA HELIX* L.

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Abstract:

Preliminary studies of Alternative and Complementary Medicine have allowed more and more natural compounds with therapeutic action used in traditional medicine to become a source for new medicines at the forefront of modern medicine. Until now, 12 species, 3 subspecies and one variety *Hedera helix* L., with the common name of ivy, have been recognized within the genus *Hedera*. The aim of the present study was to evaluate the chemical composition of the alcoholic extract of *Hedera helix* and to analyze its antiproliferative efficacy. The objectives of the study were to determine total polyphenols from the extract by spectrometry in UV-VIS; determination of individual polyphenols by the HPLC method and evaluation of the antiproliferative activity of the alcoholic extract of *Hedera helix* on the MCF-7 cell line. The obtained results demonstrated the dose-dependent reduction of cell proliferation and changes in cell morphology in all groups studied, with large doses of the extract showing necrotic and apoptotic morphological changes.

• Introduction

Breast cancer is the most frequently diagnosed and the leading cause of cancer deaths in women [29]. Even though a variety of drugs have been developed to treat breast cancer, resistance to these drugs often occurs and side effects are very common [28].

The identification and investigation of active components from natural plants is important for evaluating their potential for clinical use. A large number of purified plant components have been used to treat various types of cancer, including breast cancer.

α -Hederin is a triterpenoid monodesmosidic saponin present in plants of *Hedera* or *Nigella* species that exhibits numerous biological activities such as antiviral activity [13]; anti-inflammatory [30]; antioxidant [31]; and antispasmodic activity [14].



• Material and method

In order to evaluate the total content of polyphenols present in the ivy extract, we used the dried and crushed leaves that were subjected to ethanol extraction.

The extraction method chosen was maceration.

The content of total phenolic compounds and total flavonoids in *Hedera helix* leaf extract was determined by the Folin Ciocalteu spectrophotometric method.

The determination of individual polyphenols was performed by the HPLC method. Chromatographic analyzes were performed on Dionex UltiMate 3000, liquid chromatography system, equipped with a photodiode array detector.

To test the action of the extracts, the cell line MCF7 (mammary adenocarcinoma) from the cell bank of the Cell and Molecular Biology discipline of UMF "Victor Babeș" Timișoara was used.



• Results and discussions

The total content of phenolic compounds and total flavonoids in *Hedera helix* leaf extract by the spectrophotometric method Folin Ciocalteu: was 128.21 ± 1.24 mg gallic acid equivalent/g extract and 1.58 ± 0.27 mg quercetin equivalents/g extract, respectively.

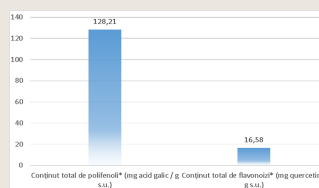


Fig.1. Total polyphenol and flavonoid content of the alcoholic extract of *Hedera helix*

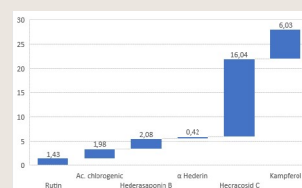


Fig. 2. Concentrations of compounds in the alcoholic extract of *Hedera helix*

The efficacy of the ivy extract was evaluated by the cell proliferation/multiplication test, assessing the rate of cell proliferation.

Cell morphology was highlighted by MCF (phase contrast microscopy) and allowed identification of cell shape.

Cellular inhibition rate (%) following the application of the alcoholic extract of *Hedera helix*

Rata de inhibitie (%) - la 24 h	Concentratie
22,8	25 µg/ml
37,5	50 µg/ml
65,2	150 µg/ml



Fig.3. Percentage values for cell viability and inhibition

• Conclusions

Following the study carried out on the alcoholic extract of ivy (*Hedera helix*) regarding the chromatographic analysis and testing of the antiproliferative capacity, we can conclude that:

- ✓ six compounds, including saponins and phenols, were identified in *Hedera helix* leaf extract;
- ✓ a dose-dependent reduction in cell proliferation and changes in cell morphology was obtained in all groups studied;
- ✓ at high doses of the extract, necrotic and apoptotic morphological alterations were revealed;
- ✓ the IC₅₀, which represents the concentration at which a marker substance reduces tissue viability by 50%, was reached at a concentration of 150 µg/ml and,
- ✓ the studied extract may be a promising candidate for use as an antitumor agent.