UDC 582.795.11.083/.085
DOI https://doi.org/10.32782/2522-9680-2026-2-192

Anna (Ganna) MEGALINSKA
PhD in Biology, Associate Professor, Associate Professor at the Department of Health-Preserving Education and Physical Recreation, Dragomanov Ukrainian State University, Pirogova str., 9, Kyiv, Ukraine, 01601 (anna_megalin@ukr.net)
ORCID: *0000-0001-8662-8584*
SCOPUS: *57214945842*

Zhanna BILYK
PhD in Biology, Senior Researcher at the Department for the Creation of Educational and Thematic Knowledge Systems, National Center "Junior Academy of Sciences of Ukraine", Dehtiarivska str., 38–44, Kyiv, Ukraine, 04119 (zhannabiluk@gmail.com)
ORCID: *0000-0002-2092-5241*
SCOPUS: *57204965320*

Valentyna BILYK
D. Sc. in Pedagogy, Professor, Head at the Department of Health-Preserving Education and Physical Recreation, Dragomanov Ukrainian State University, Pirogova str., 9, Kyiv, Ukraine, 01601 (valya-bilyk@ukr.net)
ORCID: *0000-0002-6860-7728*
SCOPUS: *57221967671*

Oksana DZIUBA
PhD in Biology, Senior Researcher at the Department of Alellopathy, M.M. Gryshko National Botanical Garden of National Academy of Sciences of Ukraine, Sadovo-Botanichna str., 1, Kyiv, Ukraine, 01014 (dzjuba@nas.gov.ua)
ORCID: *0000-0002-8298-9822*
SCOPUS: *57201644015*

Olha PANCHUK
PhD in Biology, Senior Teacher at the Department of Biology, Bogomolets National Medical University, Beresteyskyi ave., 34, Kyiv, Ukraine, 03057 (panchuknmu@gmail.com)
ORCID: *0000-0002-5475-5252*
SCOPUS: *57221967671*

To cite this article: Megalinska A., Bilyk Zh., Bilyk V., Dziuba O., Panchuk O. (2026). Biological activity of Ground elder (*Aegopodium podagraria* L.). *Fitoterapiia. Chasopys – Phytotherapy. Journal*, 2, 192–200, doi: https://doi.org/10.32782/2522-9680-2026-2-192

BIOLOGICAL ACTIVITY OF GROUND ELDER (*AEGOPODIUM PODAGRARIA* L.)

Actuality. *An important issue in modern phytotherapy is the search for new plants that have a complex of properties beneficial to the human body, including antibacterial, cytostatic, litholytic, and iron-enriching properties. Also an important property of wild plants is the presence of dietary fiber and vitamins. The combination of the aforementioned characteristics is typical of the food and medicinal plant ground elder and warrants further investigation into its beneficial properties.*

The aim *is to study the antibacterial, cytostatic, litholytic activity and iron-enriching properties of ground elder.*

Materials and methods. *The study of antibacterial activity was carried out by the disk diffusion method. Cytostatic activity was studied by observing the mitotic division of cucumber pericycle cells. Litholytic activity was explored by measuring the mass of calculi exposed to lectin-containing extract of ground elder in vitro.*

Research results. *The literature contains reports on the antibacterial activity of various extracts prepared from Ground elder raw material. However, there is no comprehensive summary regarding the effects of the aqueous extract of Ground elder on Gram-negative and Gram-positive bacteria. Our investigations revealed that the aqueous extract exhibited the greatest antibacterial activity against the Gram-positive species Staphylococcus aureus. At the same time, data on the lytic activity of Aegopodium podagraria – specifically its effects on urates – are lacking in the literature, although topical treatments such as ointments and compresses prepared from this plant have been recommended for gout. Bacteria Staphylococcus aureus, Escherichia coli, Pseudomonas aeruginosa and fungus Candida albicans were most sensitive to the water extract of ground elder. The study of the litholytic activity of the lectin-containing extract of ground elder showed that ground elder most actively dissolves phosphates (–60.8%) and urates (–42.5%). The mass of oxalates decreased by only 26.8%. In recent years, scientific literature has reported the presence of polyacetylenes in Aegopodium podagraria raw material and the associated antitumor activity. According to our experiment at low concentrations of the extract, no significant change in mitotic activity was observed. Ground elder contains a high concentration of trace elements, notably iron.*

In view of the need to develop interventions against iron-deficiency anemia, we considered the possibility of creating iron-enriching filters incorporating ground elder raw material, representing a novel approach to the utilization of medicinal plant biomass. A filter containing 5% ground elder was made on the basis of secondary paper. Passing the $FeCl_3$ solution through paper with ground elder led to a two-fold increase in Fe^{3+} concentration in the filtrate.

Conclusions. *The ground elder aqueous extract has an antibacterial effect, and the lectin-containing extract has significant litholytic activity. The ground elder aqueous extract acts as an inhibitor of proliferation. An attempt was made to manufacture a paper filter with a 5% content of ground elder raw materials, which can be used as an enrichment agent for the prevention of anemia. Filters can be recommended as a means of iron enrichment in high-altitude training conditions.*

Key words: *Aegopodium podagraria L., cytostatic and antibacterial activity, effects on urolithiasis, prevention of iron-deficiency anemia in sports and at high altitudes.*

Ганна МЕГАЛІНСЬКА
кандидат біологічних наук, доцент кафедри здоров'язбережувальної освіти та фізичної рекреації, Український державний університет імені Михайла Драгоманова, вул. Пирогова, 9, м. Київ, Україна, 01601 (anna.megalin@ukr.net)
ORCID: *0000-0001-8662-8584*
SCOPUS: *57214945842*

Жанна БІЛИК
кандидат біологічних наук, старший науковий співробітник відділу створення навчально-тематичних систем знань, Національний центр «Мала академія наук України», вул. Дегтярівська, 38–44, м. Київ, Україна, 04119 (zhannabiluk@gmail.com)
ORCID: *0000-0002-2092-5241*
SCOPUS: *57204965320*

Валентина БІЛИК
доктор педагогічних наук, професор, завідувачка кафедри здоров'язбережувальної освіти та фізичної рекреації, Український державний університет імені Михайла Драгоманова, вул. Пирогова, 9, м. Київ, Україна, 01601 (valya-bilyk@ukr.net)
ORCID: *0000-0002-6860-7728*
SCOPUS: *57221967671*

Оксана ДЗЮБА
кандидат біологічних наук, старший науковий співробітник відділу алелопатії, Національний ботанічний сад імені М. М. Гришка, Національна академія наук України, вул. Садово-Ботанічна, 1, м. Київ, Україна, 01014 (dzjuba@nas.gov.ua)
ORCID: *0000-0002-8298-9822*
SCOPUS: *57201644015*

Ольга ПАНЧУК
кандидат біологічних наук, старший викладач кафедри біології, Національний медичний університет імені О. О. Богомольця, просп. Берестейський, 34, м. Київ, Україна, 01601 (panchuknmu@gmail.com)
ORCID: *0000-0002-5475-5252*
SCOPUS: *57211433744*

Бібліографічний опис статті: Мегалінська Г., Білик Ж., Білик В., Дзюба О., Панчук О. (2026). Біологічна акивність яглиці звичайної (*Aegopodium podagraria* L.). *Фітотерапія. Часопис,* 3, 192–200, doi: https://doi.org/10.32782/2522-9680-2026-2-192

БІОЛОГІЧНА АКТИВНІСТЬ ЯГЛИЦІ ЗВИЧАЙНОЇ (*AEGOPODIUM PODAGRARIA* L.)

Актуальність. *Важливим питанням сучасної фітотерапії є пошук нових рослин, які володіють комплексом корисних для організму людини властивостей, зокрема антибактеріальними, цитостатичними, літолітичними та залізозбагачувальними характеристиками. Також важливою особливістю рослин-дикоросів є наявність у них харчових волокон та вітамінів. Сукупність зазначених властивостей характерна для харчової та лікарської рослини – яглиці звичайної, що потребує подальшого вивчення її корисних властивостей.*

Метою цієї роботи *є дослідження антибактеріальної, цитостатичної, літолітичної активності та залізозбагачувальних властивостей яглиці звичайної.*

Матеріали та методи. *Вивчення антибактеріальної активності проводилося методом дискової дисфузії. Цитостатичну активність вивчали, спостерігаючи за мітотичним поділом клітин перициклу огірка. Літолітичну активність досліджували шляхом вимірювання маси конкрементів, що піддавалися впливу лектиновмісного екстракту яглиці звичайної in vitro.*

Результати дослідження. *Літературні дані містять результати дослідження антибактеріальної активності різних екстрактів із сировини яглиці. Проте узагальнення щодо впливу водного екстракту яглиці на грамнегативні та грампозитивні бактерії відсутнє. Наші дослідження виявили, що найбільшу антибактеріальну активність водний екстракт яглиці демонструє щодо грампозитивного виду Staphylococcus aureus. Водночас у літературі відсутні дані щодо літичної активності яглиці, зокрема її вивпливу на урати, хоча є рекомендації лікування подагри за допомогою мазей і компересів із сировини цієї рослини. Вивчення літолітичної активності лектиновмісного ектракту яглиці звичайної показало, що яглиця звичайна найактивніше розчиняє фофати (–60,8 %) та урати (–42,5 %). Маса оксалатів зменшилася лише на 26,8 %. У науковій літературі останніх років з'явилися статті щодо наявності в сировині яглиці поліацетиленів та пов'язаної з цим протипухлинної активності. У наших дослідженнях за низьких концентрацій екстракту істотної зміни мітотичної активності не спостерігалося. Яглиця має високий вміст мікроелементів, зокрема заліза. У зв'язку з необхідністю пошуку засобів для боротьби із залізодефіцитною анемією нами розглядалася можливість створення залізозбагачувальних фільтрів із додаванням сировини яглиці, що є новим підходом до використання сировини лікарських рослин. Пропускання розчину* $FeCl_3$ *через папір із додаванням яглиці звичайної призвело до дворазового збільшення концентрації* Fe^{3+} *у фільтраті.*

Висновки. *Водний екстракт яглиці звичайної має антибактеріальну дію, а екстракт, що містить лектин, має значну літолітичну активність. Водний екстракт яглиці звичайної діє як інгібітор проліферації. Було зроблено спробу виготовити паперовий фільтр з 5%-м вмістом сировини яглиці звичайної, який може бути використаний як збагачувальний агент для профілактики анемії. Фільтри можна рекомендувати як засіб збагачення залізом в умовах високогірних тренувань.*

Ключові слова: *Aegopodium podagraria L., цитостатична та антибактеріальна активність, вплив на сечокам'яну хворобу, профілактика залізодефіцитної анемії у спорті та в умовах високогір'я.*

Introduction. Relevance. Given recent epidemics and pandemics, there is an urgent need to search for new natural remedies with antibacterial activity. In addition, to preserve the biotic cycle, it is necessary to minimize the use of antibiotics, which lead to the accumulation of resistance plasmids and resistant strains of bacteria.

An important issue of human ecology is the influence of the environment on the processes of nephrolithiasis. The human body is continuously exposed to technogenic pollution, chemicalization of agriculture, the use of preservatives in food products, which increase the risk of cancer, and the use of anthropogenically polluted water and low-quality products that lead to an increase in cases of urolithiasis.

Therefore, the search for plants with litholytic and cytostatic activity continues to be relevant. Many studies (Dębia et al., 2025; Jakubczyk et al., 2021; Tovchiga et al., 2017) have found ground elder to be a source of medicines.

Ground elder is an edible plant with nutritional and medicinal value (Sousa et al., 2021, Yevlash et al, 2025). Historically, ground elder greens have long been added to various dishes in Ukraine. Young leaves and stalks may replace cabbage, sorrel and nettle. Stalks are marinated in vinegar or caviar is prepared from them, and added to soups or salads (Dębia et al., 2025). In folk medicine, the raw ground elder is used as an anti-gout agent that stimulates tissue regeneration. Ground elder improves the activity of the digestive tract, increases the excretion of uric acid, and improves blood supply to the organs of the urinary system. Ground elder is also considered a remedy for anemia and vitamin C deficiency. Applications from crushed leaves are used in the treatment of gout and rheumatism. Ground elder rhizomes have fungicidal activity (Dębia et al., 2025; Tovchyha et al., 2006). A wide range of macro- and microelements allows one to recommend the plant to combat anemia and to increase the activity of enzyme systems (Tovchiga et al., 2017).

Ground elder leaves contain about 100 mg% ascorbic acid, 16 mg% iron, 2 mg% copper, 2.13 mg% manganese, 1.68 mg% titanium, and 3.9 mg% boron (Baranauskienė et al, 2025). The main group of compounds associated are polyacetylenes. Essential oils from the group of sesquiterpenes, coumarin and polyphenolic substances as well as antioxidant compounds have been extracted from this plant (Койро та ін., 2021). A galactose-specific lectin capable of inactivating ribosomal proteins was found in ground elder. Organic acids are found in the stem and leaves, while choline is found in the flowers. The fruits contain flavonoids and essential oils. Polyacetylenes are present in the underground organs (Dębia et al., 2025).

This set of secondary metabolites can provide antibacterial activity to plant materials. Brković (2006) demonstrated that ground elder extracts inhibit the growth of *Pseudomonas glycinea* and *Agrobacterium radiobacter pv tumefaciens* cultures, which are phytopathogens. *Klebsiella pneumonia* and *Enterobacter cloacae* were demonstrated to be sensitive to the ethanol extract of ground elder.

Tovchyga (2006) showed that ground elder extract increases the rate of glomerular filtration while inhibiting tubular reabsorption and increasing diuresis. Pharmacological preparations of ground elder enhance renal blood circulation. The author argued for the development of the nephroprotective and antigout drugs based on the extract of ground elder.

Koyro (2021) discovered that ground elder's hypouricemic effect is due to inhibition of xanthine oxidase and an increase in renal excretion of uric acid. The cited studies make the case for the study of the effect of *Aegopodium podagraria* extracts on various types of calculi formed in urolithiasis.

Yılmaz et al. (2023) became the first researchers to show that *Aegopodium podograria*, as an edible product, exhibits a cytotoxic effect towards human prostate cancer cells and has antioxidant activity.

In pharmacopeias and textbooks on phytotherapy, ground elder is described as a plant possessing diuretic, anti-inflammatory, antioxidant, wound-healing, and analgesic effects (Jakubczyk et al., 2021). In recent years, peer-reviewed literature has reported the presence of polyacetylenes in *Aegopodium podagraria* raw material and the associated antitumor activity. Conversely, we found no published data on the lytic activity of ground elder – specifically its effects on urate concretions – although compresses prepared from this plant have been recommended for the treatment of gout.

Despite a considerable body of ground elder research on the antioxidant, antigout, and nephroprotective properties of *Aegopodium podagraria*, a comprehensive assessment of its antibacterial, litholytic, and cytostatic activities remains insufficiently studied. Data on the potential use of raw material for the development of iron-enriching filters are virtually absent. These gaps motivated the present investigation.A summary of the medicinal properties of ground elder are presented in Fig. 1. The aim is to study the antibacterial, cytostatic, litholytic activity and iron-fortifying properties of ground elder.

Materials and methods. For preparation of the aqueous extract, dried aerial parts (young shoots and leaves) of *Aegopodium podagraria* were ground to a fine powder. Fifty grams of plant material were extracted in 100 hot distilled water to obtain a working concentration of 50 mg/ml.

Disk-diffusion method was used to study antibacterial activity (Valgas, 2007). Petri dishes with dried nutrient medium were sown with the studied culture as a continuous lawn. Using sterile tweezers, paper disks (4–5 pieces) moistened with a solution of the studied liquid were placed on the agar at an equal distance from each other. The size of the area of bacterial growth inhibition determines the degree of sensitivity of microorganisms to this solution. The test microorganisms were: *Escherihia coli* (Migula 1985) Castellani and Chalmers 1919 ATCC 25922, *Proteus vulgaris* Hauser, 1885 ATCC 6896, *Pseudomonas aeruginosa* Schroeter 1872, Migula 1900 ATCC 9027, and *Staphylococcus aureus* UKM B-919. All microorganisms were obtained from the Ukrainian collection of microorganisms of the D.K. Zabolotny Institute of Microbiology and Virology, National Academy of Sciences of Ukraine. Litholytic activity was studied according to Zheltovska's technique (Chernenko et al., 2018). One volume of vegetable material was mixed with 9 volumes of 0.9% NaCl and then vigorously stirred for 2 hours. The extract was filtered to obtain the lectin extract. Calculi that were surgically removed from the human excretory system were exposed to lectin-containing extract. Every 10 days, the calculi were dried and weighed. The calculi were sourced from the museum of the State Institution Vozianov Institute of Urology.

In order to determine the chemical composition of kidney stones removed during endoscopic interventions, infrared spectroscopy was used with the UR-20 device

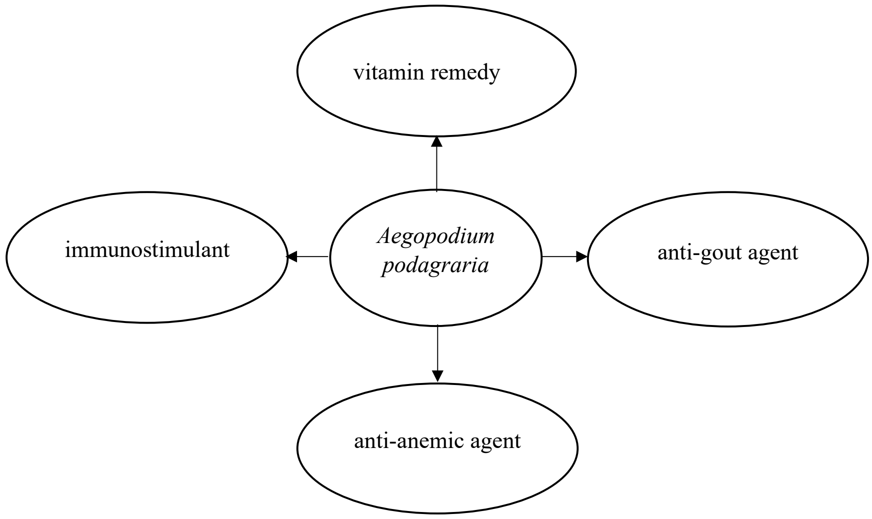

Fig. 1. Medicinal properties of *Aegopodium podagraria*

(Carl Zeiss, Germany), which enables the study of the composition and quantitative ratios of the complex components of kidney stones by the number, position and intensity of light absorption bands on spectrogram of the sample in the range of 4000–400 cm^{-1}.

Cytostatic activity was studied with the method for active cytostatics searching in modification of Megalinska A. P. (Megalinska et al., 2025). The technique lies in the inhibition of mitosis during the formation of lateral roots. In pumpkin roots, the laying of lateral roots takes place in the basal part of the meristem, while in the roots of other plants it happens in the zone of cell differentiation after stretching. At the same time, the length of the main root is an indicator of the activity of heteroauxins, and the length of the hypocotyl is an indicator of cytokinin activity. The effect of water extracts of ground elder was evaluated by the change in the intensity of mitotic divisions, as reflected in the development of lateral roots.

A transdisciplinary approach is the conceptual basis of our research (Dovgyi et al., 2020).

Statistical analysis of the obtained data was performed using variation statistics methods. All results are expressed as the mean ± standard error of the mean (M ± SEM). The measurements were conducted in five independent replicates (n = 5) for each test microorganism, n = 10 for cytostatic activity, n = 3 for litholytic activity.

To evaluate the significance of the effect of the microorganism type on the inhibition zone diameter, one-way analysis of variance (ANOVA) was employed. Prior to the analysis, the data were checked for normality of distribution and homogeneity of variance.

Post-hoc comparisons between group means were carried out using the Least Significant Difference (LSD) test. Differences were considered statistically significant at a confidence level of $p < 0.01$. All mathematical calculations and data processing were performed using statistical software JASP (Version 0.95.4).

Research results and their discussion. The results of the experimental study of the antibacterial activity of the aqueous extract of ground elder are presented in Table 1.

Aqueous extract of ground elder showed antibacterial activity against all tested microorganisms. The greatest antibacterial effect was observed against *Staphylococcus aureus*. Gram-negative microorganisms (*Escherichia coli* and *Pseudomonas aeruginosa*) proved to be less sensitive to the action of ground elder extract (zone of inhibition was 11 mm). Ground elder water extract also demonstrated fungicidal activity against *Candida albicans* (the zone of inhibition was 11 mm).

Table 1

Antibacterial activity of 50 mg/ml *Aegopodium podagraria* aqueous extract

Test microorganism	Inhibition zone (mm)
Escherihia coli	11 ± 1.5
Staphylococcus aureus	15 ± 1.4
Proteus vulgaris	8 ± 0.6
Pseudomonas aeruginosa	11 ± 0.9
Candida albicans	11 ± 1.1

Data are expressed as mean ± standard error of the mean (M ± SEM).

The calculation results made using the JASP program are presented in Table 2.

Table 2

Statistical analysis of antibacterial activity 50 mg/ml *Aegopodium podagraria* aqueous extract

Cases	Sum of Squeres	dF	Mean Square	F	P
Test microorganism	132.40	4	33.100	42	< 0.01
Residuals	15.60	20	0.780		

Means followed within the column are statistically significantly different at $p < 0.01$ according to the one-way ANOVA and the Least Significant Difference (LSD) post-hoc test.

The obtained data confirm the experimental findings of other authors regarding *Pseudomonas glycinea* and *Agrobacterium radiobacter pv tumefaciens* (Brković et al., 2006).

The 15 mm zone of inhibition of *Staphylococcus aureus* is close in value to the effect of such antibiotics as cefotetan, oxacillin, norfloxacin. 11 mm for *Escherichia coli* is equal to the effect of rifampin (Tovchiga et al., 2017).

A number of authors (Койро та ін., 2021) proved the hypouricemic effect of the ground elder herb and its inhibitory effect on xanthine oxidase, therefore, one can expect a litholytic effect from this plant in urolithiasis. To investigate this phenomenon, we monitored the mass of chemically diffirent calculi after exposure to the lectin-containing extract, according to the technique (Valgas, 2007).

The lectin fraction of any plant material makes way into the blood plasma and 5% of any consumed lectin 10 (Chernenko et al., 2018) enters the human bloodstream, which is filtered through the kidneys. At this moment, the calculus is washed with the lectin fraction of plant or animal raw materials.

The lectin-containing extract was poured into test tubes and pre-weighed calculi were introduced. The calculi were weighed every ten days throughout the exposure. The chemical composition of the studied kidney calculi was: oxalate weddellite $CaC_2O_4 \times 2H_2O$, phosphate – struvite $MgNH_4PO_4 \times 6H_2O$, urate – uric acid $C_5H_4N_4O_3$. At the end of each period, the calculi were removed from the experimental environment and weighed after 18-hour drying at 40^0 C. The results are presented in Table 3.

Table 3

Litholytic activity of ground elder

Exposure time	The dynamics of changes in the mass of calculi depending on the exposure time in the lectin-containing extract of ground elder (g)		
	Phosphate	**Oxalate**	**Urate**
Initial mass of concretions	0.186 ± 0.03	0.172 ± 0.05	0.182 ± 0.02
10 days of exposure	0.133 ± 0.04	0.164 ± 0.06	0.136 ± 0.04
The difference in mass compared to the initial mass	–28.6%	–4.7%	–25%
20 days of exposure	0.106 ± 0.03	0.140 ± 0.02	0.127 ± 0.02
The difference in mass compared to the initial mass	–42.9%	–18.7%	–30%
30 days exposure	0.072 ± 0.03	0.126 ± 0.02	0.104 ± 0.04
The difference in mass compared to the initial mass	–60.8%	–26.8 %	–42.5%

Mean values±standard error of three idependent experiments (n = 3).

The control solution was 0.9% NaCl. Observing the change in calculi mass in vitro enabled the evaluation of the activity of the ground elder extract. To do this, the rate of dissolution of the calculi was calculated by comparing their residual weight with the initial weight before exposure to the extract.

The percentage of dissolution was calculated using the formula (Yachi et al., 2018). A % = (V initial – V final) × 100%/V initial, where A % is the rate of calculi dissolution before and after incubation with a plant substrate. The rate of dissolution of calculi increased with exposure time.

As shown by the presented results, the aqueous extract of ground elder has a greater litholytic activity relative to phosphates and urates. In the first 10 days of exposure, ground elder extract reduced the mass of phosphates by 28.6%, urates by 25%, and oxalates by 4.7%. In the following 10 days of exposure, the mass of phosphates decreased by 42.9%, oxalates by 18.7%, and urates by 30%. There was a direct relationship between exposure time and dissolution rate.

After the third period of 10 days, the mass of phosphates decreased by 60.8%, oxalates by 26.8%, and urates by 42.5%. The nature of the solubility of the calculi is different. During the first period, phosphates and urates dissolved at almost the same rate. In the second and third periods of exposure, the rate of dissolution is higher for phosphates. Oxalates dissolved at almost the same rate across the 3 periods compared to other calculi (Fig. 2, 3, 4).

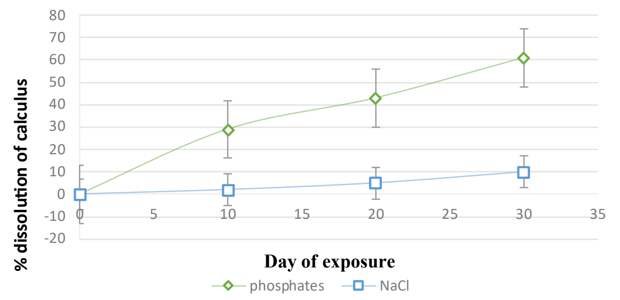

Fig. 2. The rate of phosphates dissolution in the lectin-containing extract of *Aegopodium podagraria*

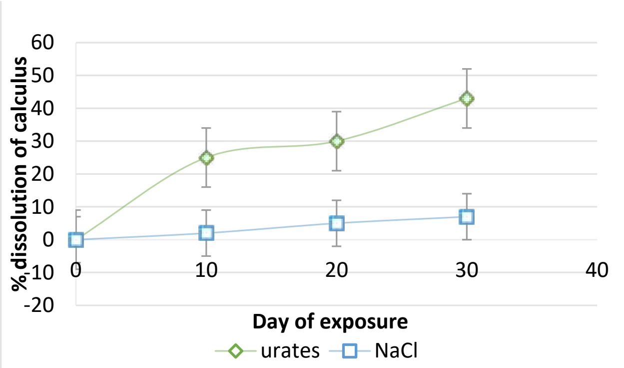

Fig. 3. The rate of urates dissolution in lectin-containing extract of *Aegopodium podagraria*

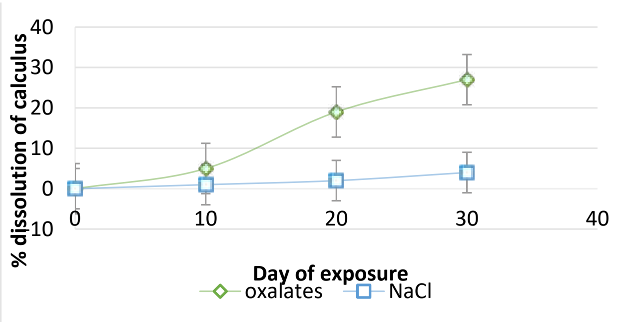

Fig 4. The rate of oxalates dissolution in the lectin-containing extract of *Aegopodium podagraria*

If the *in vitro* data are extrapolated to the human body, it can be assumed that ground elder has high litholytic activity and may have preventive value in the formation of phosphate and urate calculi. The obtained data can be explained by the research of (Койро та ін., 2021), who established the beneficial effect of biologically active substances of ground elder regarding the metabolism of the uric acid. Two mechanisms are involved: (i) an increase in renal excretion of uric acid and (ii) inhibition of xanthine oxidase.

New therapeutic and preventive approaches with high therapeutic efficacy and minimal side effects are needed for many forms of cancer. Therefore (Yılmaz et al., 2023), conducted an experiment to study the cytotoxic effect of ground elder on prostate, lung, and colorectal carcinoma cells. The authors showed a decrease in the vital activity of all cancer cells. The most powerful cytotoxic effect was noted for prostate cancer cells.

Therefore, the next stage of our research was to study the effect of the aqueous extract of ground elder shoots on the mitotic activity of the meristem. Pericycle meristematic cells of the Cucurbitaceae family plants roots are considered as a model of tumor growth (Megalinska et al., 2025). The study cytostatic activity are presented in Table 4.

Data are presented as mean ± standard error (M ± SEM), n = 10. Means within the same column followed are statistically significantly different at p < 0.01 according to the one-way ANOVA and the Least Significant Difference (LSD) post-hoc test when comparing the values of the number of lateral roots and the length of the main root, with the corresponding values in the control.

Examples of statistical analysis comparing the cytostatic effects of different concentrations of the extract, carried out by one-way analysis of variance (where the factor is concentration), are presented in Tables 5, 6.

As evidenced by the results presented in Table 4, ground elder acts as an inhibitor of proliferation. Inhibitory effect becomes noticeable at a concentration 250 mg/ml. At a concentration below 200 mg/ml, a slight effect of stimulating mitosis is observed.

Ground elder cannot be classified as an effective cytostatic. According to article (Engelhardt et al., 2022) the antitumor effect of ground elder can be explained by the ability of ground elder to absorb free radicals.

The length of the main root acts as an indicator of heteroauxin activity. As evidenced by the results presented in Table 4, ground elder extract is characterized by high auxin activity at concentrations from 50 to 200 mg/ml. At higher concentrations, hormonal activity decreases. This phenomenon can potentially explain the

Table 4

Cytostatic activity of *Aegopodium podograria*

Concentration extract	Number of lateral roots	% in relation to the control	Main root length (mm)	% in relation to the control
Control (0)	18 ± 1.1	100%	78.7 ± 1.9	100%
50 mg/ml	18 ± 0.7	100%	85.1 ± 0.8	108%
100 mg/ml	19.8 ± 1.8	110%	95.2 ± 2.2	120.9%
150 mg/ml	16.2 ± 1.3	90%	81.4 ± 1.7	103.4%
200 mg/ml	13.5 ± 0.6	75%	57.2 ± 1.3	72.6%
250 mg/ml	12.3 ± 0.4	68.3%	55.7 ± 1.3	70.7%
300 mg/ml	11.8 ± 0.8	65.5%	54 ± 1.8	68.6%
350 mg/ml	9.5 ± 1.1	52.7%	49.3 ± 0.6	62.6%
400 mg/ml	10.1 ± 0.7	56.1%	36.1 ± 1.1	95.8%
450 mg/ml	10.0 ± 0.5	55.5%	18.4 ± 0.4	23.3%

Table 5

Statistical analysis of the results of comparing the number of lateral roots at a concentration of 350 mg/ml and control

Cases	Sum of Squeres	dF	Mean Square	F	P
Concentration extract	42.05	1	42.050	7.811	.001
Residuals	99.60	18	5.383		

Table 6

Statistical analysis of the results of comparing the main root length at a concentration of 450 mg/ml and control

Cases	Sum of Squeres	dF	Mean Square	F	P
Concentration extract	18000.00	1	18000.00	7.811	< .001
Residuals	48.00	18	2.667		

high regenerative potential of the ground elder root system, which has an annual growth of 50 cm. Thus, it can be concluded that at low concentrations, ground elder has a stimulating mitosis effect, and at high concentrations, it acts as a weak inhibitor of proliferation.

The reserves of ground elder plant materials in Ukraine are large. The ground elder medicinal properties are considered in a number of scientific works. The history of consumption of ground elder as a vegetable crop is more than a century old. The idea emerged to use the shoot of this plant to make filter paper. Paper with a content of 5% ground elder was produced according to the technique of Vovk (Vovk et al., 2019). Secondary plant materials (wrapping paper) were crushed and moistened with distilled water until a homogeneous mass was formed. Then 30 g of starch was added to the raw materials. From the resulting homogenate, 95 g of mass was taken and 5 g of crushed mass of ground elder shoots were added. After drying, the mold was placed under a press for three days. Thus, the updated filter contains secondary raw materials, starch and crushed ground elder shoots. According to literature data, ground elder contains 16 mg% iron, which makes it a valuable plant with anti-anemic properties. The hypothesis that we tested in the following experiment was that paper enriched with ground elder could become a source of iron during water filtration or will retain iron in the presence of chelating ligands in the plant material. To test the efficiency of the filter, water was filtered with ferric chloride. In this case, we used two filters – a filter with ground elder and a filter without ground elder. The measurement of the amount of iron in the filtrate was carried out by voltametric method in the water quality laboratory of the O.M. Marzeev Institute of Public Health of the National Academy of Medical Sciences of Ukraine. The results are presented in Table 7.

Table 7

Iron concentration in filtered water

Filter type	Iron concentration in the filtrate mg/l
$FeCl_3$	5.2
Filter without a ground elder	5.9 ± 0.04*
Filter with the addition of ground elder	10.7 ± 0.03*

* Mean values±standard error of three independent experiments (n = 3). * p ≤ 0.05 compared with control (water), significantly by Student's t-test.

Conclusions

1. Aqueous extract of ground elder showed antibacterial activity against all tested microorganisms, especially with regard to gram-positive. *Staphylococcus aureus* was the most sensitive (zone of growth inhibition = 15 mm).

2. Aqueous extract of ground elder showed fungicidal activity against *Candida albicans.*

3. The study of the litholytic activity of the lectin-containing extract of ground elder in vitro allows us to conclude that the mass of phosphates decreased by 60.8%, urates – by 42.5%, and oxalates – by 26.8% after thirty days of exposure. Thus, hypothetically, ground elder, as a food product, can be considered a litholytic agent.

4. At concentrations between 50 mg/ml and 200 mg/ml, the aqueous extract of ground elder has a stimulating mitosis effect. At a concentration of more than 250 mg/ml, ground elder acts as a proliferation inhibitor.

5. The results obtained indicate the possibility of using paper filters containing ground elder berry as an iron enrichment method, which requires further research.

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Стаття надійшла до редакції 19.01.2026
Стаття прийнята до друку 21.04.2026
Дата публікації (оприлюднення) статті 03.09.2026

The authors declare no conflict of interest.
Contribution of the authors:
Megalinska A.P. – concept and design of the work, article writing, final approve of the article;
Bilyk Zh.I. – data collection and experiments, statistical analysis, translation into English;
Bilyk V.H. – data collection and analysis, correction of the article, abstract;
Dziuba O.I. – data collection and experiments, correction of the article;
Panchuk O.V. – critical literature review, correction of the article.

Email address for correspondence with the autors:
anna.megalin@ukr.net, zhannabiluk@gmail.com