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ANTIMICROBIAL ACTIVITY OF CHELIDONIUM SPECIES MAJUS L.

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Abstract

The present paper has as main objective the determination of the antimicrobial and antifungal activity of some pharmaceutical forms obtained in the laboratory of pharmaceutical technology of the Faculty of Pharmacy of the University "Lower Danube of Galati". We used semi-solid pharmaceutical forms with different concentrations of soft extract of Chelidonium majus L, 50%, 25% and 10% in two ointment bases, simple ointment and base III I performed the antimicrobial activity for all four ointments, compared to extract 1: 3.75 in hydroalcoholic solution (ethyl alcohol / water 35/65 by mass) from aerial parts of Chelidonium majus and alcohol 70 °. hydroalcoholic solution was obtained by cold preparation from the aerial parts of the plant Chelidonium majus. We determined the antimicrobial activity by the diffusimetric method (Kirby-Bauer) and the dilution method. The 50% concentration ointment (UNG A) shows activity on some Gram-negative and Gram-positive bacteria and not on the fungus Candida albicans.

Keywords*: simple ointment; base III; soft rosehip extract; gram positive; negative bacteria; Candida albicans.*

Introduction

Chelidonium majus L known as, celandine a long with many other medicinal plants, such as curcumin, chamomile, aloe vera, black pear, basil, pepper, etc., is an important source of active substances with pharmaceutical action, used in traditional medicine. This plant was said to have a force equal to that of the sun and that is why the Romans named it "Chelidonium", which means "gift of heaven", and the healers collected it only on the cross of the day, when the sun was in the sign of Leo. Trivial in appearance [fig.1], with its yellow flower placed on the cross, it is said that the celandine is one of the most powerful plants on earth. It was not for nothing that the alchemists believed that they could extract gold from its petals. Famous botanists of antiquity gave it great significance, so Paracelsus made an analogy between its orange milk and bile secretion, using it in diseases of the liver, bile and iron.

Hahnemann, the founder of homeopathy, healed the sick of the liver with rosehip, while long before him, Dioscoride recommended it for cataracts and conjunctivitis. A "historical" confirmation of her qualities also belongs to the great German painter Albrecht Durer, who immortalized her in a painting, after his help he was cured of a liver disease. Nowadays, the miraculous plant is recommended as a remedy in over 150 diseases, starting with common dermatoses, up to viral infections or cancer. The milky juice of the plant was, is and will be a

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common cure for warts. The effect is due to sanguinarine and chelerythrine with antimitotic and irritating properties, but also proteolytic enzymes. The whole plant is toxic in moderate doses because it contains a range of isoquinoline alkaloids; use in herbal medicine requires the correct dose [1].

Fig. 1. Image of the Celandine plant involved in the study

While alkaloids are found in the roots up to 3%, in the flowering aerial part they do not exceed 1%. Numerous alkaloids (over 20) with a benzyl-isoquinolein nucleus have been identified both in the roots and in the upper part of the plant, more important being the monomers chelidonine, sanghinarin, coptizine, chelerytin, berberine, protopine, as well as the dimer alkaloid chelidimerine. These alkaloids make up a complex whose therapeutic effect is, in fact, the result of the pharmacodynamic actions of its components. Chelidonium majus is an important plant, used in European therapy but also in traditional Asian medicine. Both plant extracts and purified compounds derived from it have a wide range of biological activities antimicrobial, anti-inflammatory, antioxidant, antitumor, analgesic, hepatoprotective, etc. [2,3,4] The characteristic latex also contains proteolytic enzymes and phytocystatin chelidostatin, a cysteine protease inhibitor. [5] It has an important role in reducing eczema - the application of celandine sap on the affected areas can help treat atopic dermatitis, reduce redness and itching; Due to its antibacterial properties, celandine, like other plants or residues from the extraction of active ingredients, such as pasture, is used in various skin conditions caused by gram-positive or negative bacteria [6,7,8,]; It is used successfully in acne. Chelidonine and homochelidonine have a morphine-like action, being depressants of the myocardium, have a narcotic and sedative action on the central nervous system. It also relaxes the smooth muscles of the coronaries and large vessels. The fresh plant is no longer officially used. There are no dose-finding studies, and reported clinical trials are characterized by considerable heterogeneity. The orange latex in the fresh plant is caustic and can therefore cause gastroenteritis or stomatitis if swallowed. By drying, the plant no longer has this effect. One of the alkaloids contained in rose hips, namely protopine, can cause bradycardia. Sometimes it can increase blood pressure, then decrease it, can affect the heart or even cause damage to the vasomotor center. Another alkaloid that Chelidonium possesses and has a toxic effect is chelerythrine which can cause spasms or even paralysis.

Internal administration of various preparations containing celandine should be done with great caution, because if taken improperly, they can cause damage to the body.

Materials and methods

The substances used were: 50%, 25% and 10% concentration ointment samples, having as ointment bases: simple ointment and base III, ethyl alcohol 70 °, chelidonium majus L. extract, culture media for germs: Mueller Hinton (Gram negative and Gram positive bacteria); Blood agar (streptococci and enterococci); Solid Sabouraud environment for fungi. The materials and equipment used to determine the antimicrobial activity were: sterile handles, cotton swabs, plastic pipettes, tweezers, antibiotic and antifungal discs, micropipette, gas bulb, Densimat apparatus and laboratory thermostat. Method: The working technique is represented by the standardized Kirby-Bauer diffusimetric method, according to the following stages: - preparation of the inoculum, inoculation, sampling, deposition of microcompresses, incubation, reading. For each bacterial strain isolated in pure culture, we made an inoculum with a turbidity of 0.5 Mc Farland (1.5 x 108 CFU / mL), nephelometrically controlled using the Densimat apparatus. After sowing, I left the plates for 5-10 minutes for the inoculum to be adsorbed in the medium and then I deposited the discs (microcompressed with antibiotics and blank discs) on the surface of the seeded medium using tweezers. The incubation time was 24 hours. Depending on the sensitivity of the antimicrobial substance impregnated in the disc, it diffuses into the environment and creates around the disc, an area of culture inhibition. I performed the reading with the naked eye, measuring the diameter of the inhibition area in mm, 2-3 times in different directions, using a ruler. For the transparent medium, we did the reading directly on the bottom of the plate, and on the blood agar plates we measured the diameters of the inhibition zone at the surface of the medium. -diameters of zones of inhibition: the area free of microbial colonies visible to the naked eye, including the diameter of the antibiotic disc -well-developed colonies appearing inside the inhibition zone. [Fig.2]

Fig. 2. Inhibition areas, disc diameter with antibiotic

Results and discussion

We performed the antimicrobial activity for all four ointments compared to extract 1: 3.75 in hydroalcoholic solution (ethyl alcohol / water 35/65 by mass) from aerial parts of Chelidonium majus and alcohol 70 °. hydroalcoholic was obtained by cold preparation from the aerial parts of the plant Chelidonium majus in the tables is found under the name of Extract CM The data

obtained after studying the antimicrobial activity of the samples on Gram negative bacteria are presented in table 1 and in Figure 3.

Table 1. Antimicrobial activity on Gram negative bacteria

Gram-negative bacteria	Samples analyzed						
	Oint.A	Oint.B	Oint.C	Oint.D	Extract CM	Alcool 70°	Gentamicină 10µ
Enterobacter hormaechei	6	6	6	6	6	6	25
Escherichia coli	12	10	10	7	6	6	6
Pseudomonas aeruginosa	13	6	6	6	12	8	20

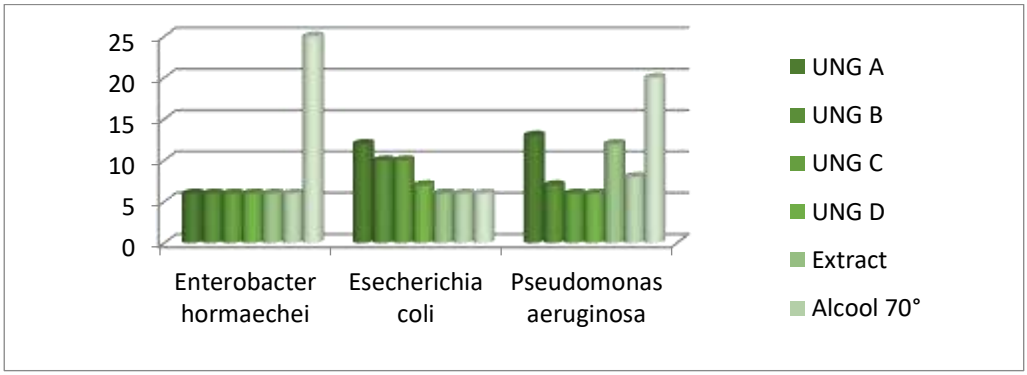

Fig. 3. Antimicrobial activity on Gram negative bacteria

Fig. 4. Activity on P. Aeruginosa

Fig. 5. Activity on MRSA 30561

The results obtained on the Gram negative strains used show that UNG A shows more intense activity than UNG B, C and D, but also compared to Gentamicin 10 µg, extract and alcohol 70 °. Also, in this group it is observed that UNG A and the extract have a higher inhibition range than UNG B, C, D and alcohol 70° on Pseudomonas aeruginosa the difference between the diameters of the inhibition zones being 6 mm for UNG A and respectively 8 mm for the extract, and the antibiotic Gentamicin 10 µg had an inhibition zone of 20 mm From Table 1 we observe that the solvent that was used in the preparation of the extract had smaller inhibition diameters compared to the rosehip extract. The latter showed inhibition diameters 4 mm larger than those

of alcohol. The highest antimicrobial activity, on Gram-negative strains, in the case of UNG A obtained in the laboratory was manifested on the Pseudomonas aeruginosa strain (the diameter of the inhibition zone being 13 mm). UNG A, B and C showed the largest diameters of the inhibition zone in the case of the Escherichia coli strain, these being 12 mm, 10 mm and 10 mm, respectively.

The results obtained regarding the bacterial strains used are different, namely: UNG A, UNG B and the extract had a higher antimicrobial potential (the diameters of the inhibition zone being 12 mm each), compared to UNG C, UNG D, alcohol 70 ° and Gentamicin 10 µg (the diameters of the inhibition zone being 6 mm each) in the case of the bacterium Staphilococcus aureus. The diameters of the inhibition zones of both the ointments and the solutions were smaller than those of the antibiotic on the bacterium Streptococcus pneumoniae (the diameter of the inhibition zone of 30 mm), and of the extract being 15 mm. The results showed that the use of the plant together with ethyl alcohol did not increase the diameter of the inhibition in the case of the bacteria tested in this study. This is mainly due to the biological actions of the samples. All samples taken including Gentamicin 10 µg did not show areas of inhibition on the *Enterococcus casselifavus strain.*

Table 2. Antimicrobial activity on Gram-positive bacteria

Gram-positive bacteria	**Samples analyzed**							
	Oint.A	Oint.B	Oint.C	Oint.D	Extract CM	Alcool 70°	Gentamicină 10µ	Penicilină 10µ
Staphilococcus aureus	12	12	6	6	12	6	6	-
Streptococcus β hemolitic	6	6	6	10	12	8	-	6
Enterococcus casseliflavus	6	6	6	6	6	6	6	-
Streptococcus pneumoniae	6	6	6	6	15	10	-	30
MRSA 30561	20	6	6	6	30	10	20	-

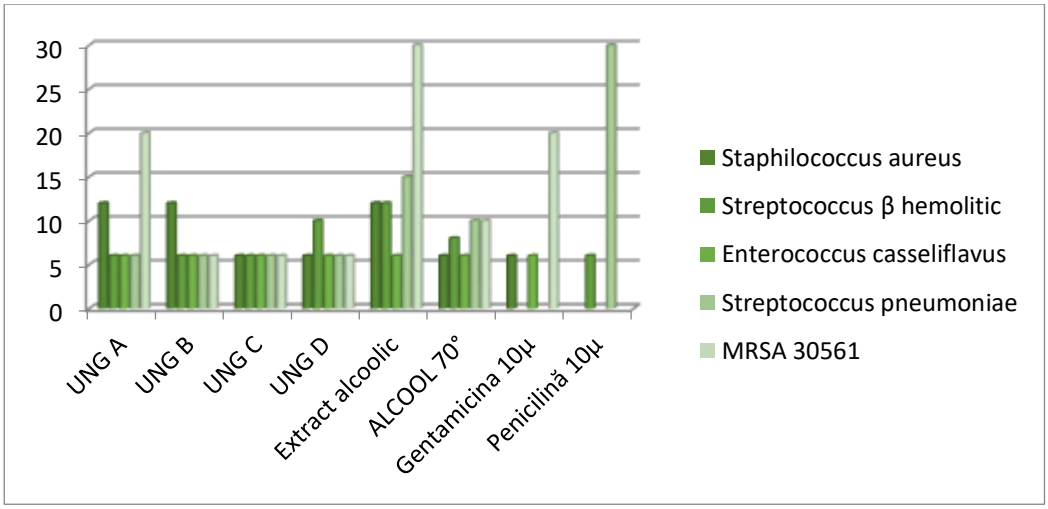

Fig. 6. Antimicrobial activity of ointments, solution, antibiotics and solvent on Gram-positive bacteria

Regarding the Streptococcus pyogenes strain, the extract (12 mm) has the largest area of inhibition, followed by UNG D (10 mm), the other samples having no action on the bacterium. MRSA 30561 (methylcilino-resistant Streptococcus aureus) is a strain obtained from a patient, on which the extract of Chelidonium majus L. showed the highest activity (30 mm zone of inhibition), UNG A and Gentamicin 10 µg had the same area of inhibition (20 mm), and the others were indifferent [Fig. 6]

Table 3. Antifungal activity

Fungous	**Samples analyzed**						
	Oint.A	Oint.B	Oint.C	Oint.D	Extract CM	Alcool 70°	Fluconazol 10 µg
Candida albicans	6	6	6	6	8	6	20

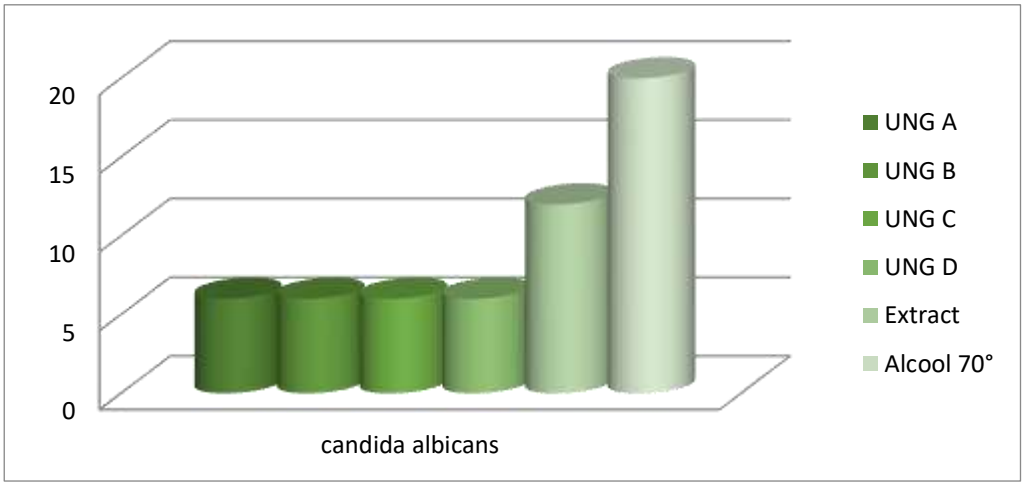

Fig. 7. Antifungal activity of samples, alcohol and antifungal on the Candida albicans strain

From the data in table 3 and in figure 7 can be found that the analyzed samples showed antifungal activity only on Fuconazole 10 µg extract and antifungal, not on ointments, regardless of their concentration or the base in which the extract was incorporated.

Conclusions

The 4 ointments were made of different concentrations, having as active substance soft extract of Chelidonium majus L., which in terms of quality were compliant with FR X, having a homogeneous appearance, a pH between 5.4-6.00 .

The alkaloid content expressed in Chelidonine was 0.2225g%. Methods for the quantitative determination of concentrations of active substances in pharmaceutical forms can be extended, methods can be used which detect small concentrations in active principles, such as methods based on screen-printed electrodes modified with carbon nanofibers or gas chromatography.

The determination of antimicrobial activity by the diffusimetric method (Kirby-Bauer) and the dilution method, led to the following conclusions:

-The 50% concentration ointment (UNG A) shows maximum activity on some Gram negative and Gram positive bacteria and not on the fungus Candida albicans.

- Ointment concentration 50% (UNG A) showed larger diameters of inhibition areas compared to the other ointments UNG B 25%, UNG C and D both concentration 10%.

Due to the multiple actions of the Chelodonium majus extract, and to obtain an action over a longer period of time, another pharmaceutical form can be made, with the extract, embedded in nano particles, in the structure of a liposome, which will determine better patient compliance.

References

[1] Gruenwald J., **PDR for Herbal Medicines,** Thomson PDR, *2000,* ISBN 978-1-56363-361-4

[2] Dumitriu Buzia O., Mardare N., Florea A, Diaconu C, Dinica R.M., Tatu A.L..*Formulation and preparation of pharmaceuticals with anti-rheumaticeffect using the active principles of capsicum annuum and piper nigrum,* **Revista de Chimie** (Bucharest), **69,** 10, 2018, pp. 2854-7.

[3] Niculet E., Neculia G.V., Tatu A.L., Dumitriu Buzia O., *Curcumin- Extraction, Physical and Chemical Analysis, Formulas and Control. Basic Methods for Further Research*. **Materiale Plastice, 55, 4**, 2018, pp. 672-675.

[4] Ploscutanu, G., Elisei A.M., Dumitriu Buzia O., *Nutraceutical Properties of Apples and Derived Products (Pomace, Seeds, Peels),* **Revista de Chimie** (Bucharest), **70, 3**, 2019, pp. 934-939.

[5] Rogel J.B., *Chelidocystatin, a novel phytocystatin from Chelidonium majus.* **Phytochemistry. 49** (6): 1645–9, 1998.

[6] Draganescu M., Baroiu N., Baroiu L., Diaconu C.**,** Dumitriu Buzia O., *Efficient Administration of Human Albumin in Clostridium Difficile Infection*, **Revista de Chimie** (Bucharest), 64, 3, 2017.

[7] Earar K., Dumitriu Buzia O., Schipor O., Zaharescu A., Girbacea C.M., Tatu A.L., Topor G., Elisei A., Gura G., *Microbiological study on different pharmaceutical forms with pasture,* **Journal of Oral Rehabilitation,** Vol. 13, no. 1,2021, pp. 244 – 251.

[8] Dumitriu Buzia O., Mardare N., Dragomir R., Miulescu M., Tatu A.L.,*Pharmaceutical Forms with Basil and Propolis to the Benefit of the Oral Cavity ,Formulation, preparation and microbiological analysis,* **Revista de Chimie** (Bucharest), 70, 1, 2019, pp.343-349.

[9] Apetrei I.M., Apetrei C., Dumitriu Buzia P., *Ordered mesoporous carbon based for sensitive detection of vitamin B6 in pharmaceuticals*, **Revista Framacia**, 64, 4, 2016, pp. 544-548.

[10] Robu S., Romila A., Buzia Dumitriu O., Spac A.F., Diaconu C., Tutunaru, D., Lisa E., Nechita, A., *Contribution to the Optimization of a Gas Chromatographic Method by QbD Approach used for Analysis of Essential Oils from Salvia officinalis,* **Revista de Chimie** (Bucharest), 70, 6, 2019, pp. 2015-2020.

[11] Tatu A.L., Elisei A.M., Bezman V., Diaconu C., Dumitriu Buzia O., *Liposomes, Formulation and Pharmacotechnical Assessment of Anti-Acne Preparations,* **Revista de Chimie** (Bucharest), 70, 2, 2019, pp.425-430.

[12] Dumitriu Buzia O., Manole Palivan C.C., Bezman V., Topor G., Tatu A.L., Earar, K., Ionita G. *Antibacterial action of certain tretinoin and benzoyl peroxide liposomes.Case study*, **Roumanian Journal of Oral Rehabilitation**, 12, 4, 2020, pp.272-280.

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