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ANTIRHEUMATIC CREAM BASED ON NATURAL INGREDIENTS

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Abstract

Choosing organic and natural products should be a top priority for a healthy skin. The aim of this research was to formulate and test a cream based on natural ingredients, used for skincare and also to relief rheumatic diseases. The main active ingredients used to obtain the cream were the following: burdock oil, macadamia nut oil, shea butter, ylang-ylang oil, harpagophytum oil, capsicum oil, and vitamin E. The properties of each ingredient have been taken into account in the preparation of the product, in accordance with the general methods for making creams. Organoleptic and physicochemical analyses confirmed the quality of the product, pleasant appearance and odor and a creamy consistency.

Key words*: active ingredients, burdock, cream, skin.*

INTRODUCTION

Rheumatic diseases, also known as musculoskeletal inflammatory diseases, affect everyone from children, adolescents, young people to the elderly (Hersh et al., 2011). Chronic inflammatory diseases that affect bones, joints, muscles, ligaments and tendons are grouped together under the term "rheumatism" and can have consequences for the health of the skin, heart, kidneys and lungs. They have a significant impact on quality of life (Benenson, 2010).

Cosmetic products are mainly used to protect the skin against various exogenous and endogenous harmful agents. Herbal cosmetics are formulated using certain base-forming substances, in which one or more herbal ingredients are incorporated to provide certain benefits (Liu, 2022).

Currently, plants are intensively used for the development of new types of cosmetic products called cosmeceuticals (Mahesh et al., 2019).

Cosmeceuticals are products that combine the benefits of cosmetics and pharmaceuticals (Radd, 2002) (Figure 1). They are designed to provide skincare benefits that go beyond basic beauty enhancement by addressing specific skin concerns (Choi et al., 2024). The use of cosmeceuticals is multi-purpose because they offer a range of skin benefits that bridge the gap between cosmetic beauty products and medical treatments (Morganti & Coltelli, 2019). People use cosmeceuticals for ***targeted skin treatment*** (acne, aging, pigmentation, rosacea) (Callender et al., 2017; Diguță et al., 2014), ***anti-aging benefits*** (wrinkles, fine lines, and sagging) (Shanbhag et al., 2019**),** ***improved skin health*** (hyaluronic acid help to hydrate and plump the skin, while antioxidants - vitamin C - help protect the skin from environmental damage and premature aging) (Boo, 2022; Bukhari, et al., 2018; Pirvu et al., 2011), ***enhanced skin function*** (improving skin's natural barrier function and/or hydration levels and protection against environmental stressors) (Selwyn & Govindaraj, 2023), ***non-invasive solutions*** (alternative to aggressive dermatological treatments, such as laser procedures or injections) (Tanha et al., 2023).

By containing active ingredients with therapeutic effects, cosmeceuticals are used to enhance cosmetic beauty while also addressing skin health. They are often recommended by dermatologists and are commonly found in professional skincare lines (Millikan, 2001; Callender et al., 2017).

The purpose of using cosmeceuticals is to achieve more than just superficial beauty enhancement (Draelos, 2009). They are meant to provide deeper, science-based benefits that improve skin function, treat specific skin

issues, and contribute to long-term skin health (Zhang & Falla, 2009).

Natural ingredients in cosmeceuticals for **rheumatic pain relief** help reduce inflammation, improve circulation, and soothe joint and muscle discomfort (Alamgir, 2017). These ingredients are often used in **creams, gels, balms, and oils** for conditions like arthritis, osteoarthritis, and fibromyalgia (Mahajan et al., 2023).

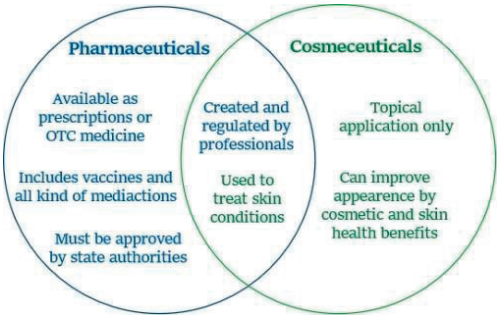

Figure 1. Similarities and differences between pharmaceuticals and cosmeceuticals

The main pain relief natural ingredients in cosmeceutical formulations for rheumatic disease include:

- Natural analgesics as pain-relieving agents (capsaicin from chili pepper extract, menthol from peppermint oil, methyl salicylate from wintergreen oil, eucalyptus oil, harpagophytum oil) (Kopustinskiene et al., 2022);
- Anti-inflammatory agents to reduce swelling and stiffness (turmeric, *Boswellia serrata* resin, ginger extract, *Arnica montana* extract, burdock oil, harpagophytum oil, willow bark extract, green tea, *Uncaria tomentosa extract*) (Sharma et al., 2023);
- Circulation-boosting agents to enhance blood flow and reduce pain **(**capsaicin from cayenne pepper, rosemary extract, cinnamon extract) (Kopustinskiene et al., 2022);
- Skin barrier and hydration support to prevent irritation from chronic inflammation (*Aloe vera*, shea butter, coconut oil, macadamia nut oil, jojoba oil, olive oil) (Kopustinskiene et al., 2022).

The aim of this research was to formulate a cream based on natural ingredients used both for the relief of rheumatic conditions and for skin care.

The main objectives consisted in formulating and obtaining a stable cosmeceutical cream (1) and highlighting its quality by organoleptic and physio-chemical tests (2).

MATERIALS AND METHODS

The formulated cream has been prepared under laboratory conditions, from natural ingredients, in compliance with the European regulations on ingredients and their admissible concentrations. The properties of each ingredient have been taken into account in the preparation of the product, in accordance with the general methods for making creams.

The ingredients used to formulate the cream are listed in Table 1.

Table 1. Ingredients used and their role in the cream formulation

Ingredient	Role in the formulation
Distilled water	Solvent
Cetyl alcohol	Emulsifier
Euxyl PE 9010	Conservant
Vegetable glycerin	Moisturizing agent
Lanolin	Emolient
Sodium lauryl sulfate	Surfactant
Paraffin oil	Emulsifier
Burdock oil	Active substance
Macadamia nut oil	Active substance
Shea oil	Active substance
Ylang-ylang oil	Odorizing agent
Harpagophytum oil	Active substance
Capsicum oil	Active substance
Vitamin E	Active substance

The cream was formulated under laboratory conditions, according to a particular recipe, in compliance with European pharmacological standards.

The main steps for making the cream are described below:

I. Mix ingredients of phase A: cetyl alcohol, lanolin, paraffin oil, glycerine;
II. Mix ingredients of phase B: sodium lauryl sulfate and euxyl;
III. Bring the two phases to 70°C in a water bath;
IV. Add phase B over phase A;
V. Add water over the A + B mixture;
VI. Add the thermosensitive ingredients (phase C): burdock oil, macadamia nut oil, shea

oil, ylang-ylang oil, harpagophytum oil, capsicum oil, vitamin E.

The cream was obtained using two Berzelius beakers. In the first one, the ingredients of phase A are introduced, in the second one, the ingredients of phase B, according to Table 2. Both beakers were heated to 70ºC using a water bath, to dissolve the solid ingredients. Then, the beakers were removed from the water bath and phase B is added over phase A. After homogenization with a mixer, the mixture is left to cool until the temperature reaches 40°C, after which the thermolabile ingredients of phase C are added, stirring continuously.

Table 2. Cream formulation

	Ingredient	Quantity for 100 g product
1.	Distilled water	46 mL
2.	Cetyl alcohol	18 mL
3.	Euxyl PE 9010	0.6 mL
4.	Vegetable glycerin	6 mL
5.	Lanolin	9 g
6.	Sodium lauryl sulfate	1.4 g
7.	Paraffin oil	5 mL
8.	Burdock oil	6 mL
9.	Macadamia nut oil	1 mL
10	Shea oil	1 mL
11.	Ylang-ylang oil	1 mL
12	Harpagophyum oil	3 mL
13.	Capsicum oil	2 mL
14.	Vitamin E	2 mL

After the preparation, the quality of the cream was determined by organoleptic and physico-chemical analysis, according to the regulations specified in the Romanian Pharmacopoeia X (R.P. X, 1998).

The organoleptic analyses focused on appearance, smell and color.

To determine the **appearance**, 1 g of sample was pressed between two 10 x 25 cm glass plates until a uniform layer of about 0.5 mm was obtained. The product was then examined in natural light. No drops of oil, water or grease were allowed and the cream layer must be free from crystalline particles or solid agglomerations.

The **smell** was determined by spreading a thin layer of sample on a glass plate or paper filter strip and then examined closely. The smell should be characteristic of the substances present in the cream, with no musty or rancid smell (R.P. X, 1998).

Color was determined by spreading the sample in a thin layer on a white paper and visual examination in natural light (R.P. X, 1998).

The physico-chemical analyses focused on pH, solubility, type of emulsion, spreadability, peroxide value and stability under accelerated conditions.

The **pH value** was determined by usual colorimetric or potentiometric methods in the aqueous solution obtained by shaking 5 g sample with 20 ml distilled water. The mixture was filtered and the pH was determined from the filtrate.

The determination of **spreadability** was performed using the Del Pozo Ojeda-Suñé Arbussá extensometer. 1 g of sample was placed between two 11 cm wide glass plates, over which weights between 100 and 500 g were added at 1 min intervals. The diameter of the cream layer was measured after the addition of each weight (Garg et al., 2002).

Several solvents were used for **solubility** determination of the cream: methanol, carbon tetrachloride, benzene, petroleum ether, hot distilled water. The sample is considered completely dissolved when the solution examined with the naked eye is free of suspended particles.

The **type of emulsion** was determined by the conductivity method. Two electrodes were inserted in the cream, if the cream allows current to pass through it means that the mass of the current forms water, so the type of emulsion is O/W. If the cream does not allow electric current to pass between the two electrodes, the emulsion has continuous oil phase type W/O.

The **peroxide value** indicates the degree of oxidative rancidity of fats. It represents the content of peroxide and other oxidizing substances in the sample that oxidize potassium iodide releasing iodine. The sample was dissolved in a mixture of acetic acid and chloroform, potassium iodide was added, then the free iodine was titrated with sodium thiosulphate (R.P. X, 1998).

The cream was also tested for **stability** under accelerated degradation in different temperature values. The sample was placed in closed vials which were kept for 8 hours, first at 4°C, then at 40°C. The cream is considered stable if the two phases, aqueous and oily, do

not separate and if, after testing, no significant differences are reported compared with the quality tests carried out on freshly prepared cream.

RESULTS AND DISCUSSIONS

The quality of dermatocosmetic products is determined by appearance (Figure 2), smell and colour.

Figure 2. Freshly made cream

The Table 3 shows the results of organoleptic analyses performed shortly after preparation of the cream.

Table 3. Organoleptic test results

Organoleptic characteristic	Characteristics of freshly made cream
Appearance	Creamy, homogeneous, consistent, no phase separations, spreads easily
Smell	Pleasant, fragrant odour, specific to ylang-ylang oil
Colour	Yellowish-white

The cream had a pleasant appearance, with a creamy consistency and no signs of phase separation.

The odour was pleasant, perfumed, and specific to ylang-ylang oil.

The yellowish-white colour of the cream was due to the ingredients used, mainly burdock and capsicum oils.

For the skin, a balanced **pH**, usually between 5.4-5.9, plays a crucial role in maintaining the natural protective barrier. This barrier helps to protect the skin against bacteria and other harmful microorganisms and to keep moisture in the dermal layers.

The pH is determined to verify if the cream may irritate the skin or mucous membranes. It should be as close as possible to that of the skin. According to F.R. X, it should be between 4.5-8.5.

Considering that normal, balanced skin has a pH of 5.5-6, the value of 5.8, obtained for the freshly prepared cream, shows that it can be safely used on the skin.

The **spreadability** is determined to verify if the the cream will spread well on the skin. Basically, the deformability of the cream is determined by pressing 1 g of cream between two glass plates (142 g per plate).

The results obtained for cream spreadability are presented in Figure 3.

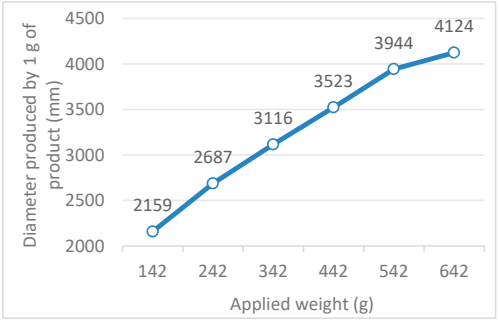

Figure 3. Results obtained for cream spreadability

Testing the **solubility** of the cream in certain solvents showed that it was insoluble in all the solvents we used (Table 4).

Table 4. Solvents for solubility determination

Solvent	Solubility
Methanol	Insoluble
Carbon tetrachloride	Insoluble
Benzen	Insoluble
Petroleum ether	Insoluble
Hot water	Insoluble

The conductivity method was used to determine the **emulsion type**. After applying the protocol, it was determined that the cream allowed the electric current to pass through its mass, thus the emulsion is O/W type.

The **peroxide value** is a parameter that measures the degree of oxidation of cosmetic products and reflects the oxygen content in the form of peroxide (hydroperoxide) in a substance. For oils in particular, it indicates the degree of rancidity.

The peroxide value determined for the cream was in the limits set by the Romanian Pharmacopoeia X (R.P. X, 1998).

The peroxide value was 0.75%, a value close to 0 and very far from 5, the maximum permissible value. The results proved that the ingredients used were fresh and of good quality.

The **stability test** is of major importance for cosmetic products. Due to its complex composition containing ingredients with different degrees of unsaturation, with a mainly organic structure, creams can be altered by temperature variations and the oxygen in the atmosphere. The ingredients may suffer structural alterations, resulting in changes in colour, splitting of some chains, formation of oxygenated groups and free radicals that continue the destructive process.

In case of the analysed cream, the main characteristics of the product did not change significantly. Both appearance and smell remained the same, with no major differences from the initial tests, and the phases did not separate.

The pH did not change after refrigeration, but a decrease of 0.2 units was measured after exposure to 40°C. Even so, the value was still in the optimum range.

Regarding spreadability, no major differences from the initial determinations were observed, with the largest deviations, up to 24 mm, observed after refrigeration.

The peroxide value showed slight increases in stability tests. The results were 0.79, after refrigeration and 0.85, after exposure at 40°C.

CONCLUSIONS

The tests performed on the formulated cream resulted in the following main conclusions:

- ✓ The organoleptic tests demonstrated the quality of the cream. It had a pleasing appearance and colour, creamy consistency, with no signs of phase separations, and the odour was specific to ylang-ylang oil;
- ✓ The pH value of 5.8 showed that the cream can be safely applied on the skin, without the risk of irritation caused by too high or too low acidity;
- ✓ The cream was insoluble in all the tested solvents;
- ✓ The peroxide value confirmed the quality of the cream and the freshness of the ingredients. Even after the stability tests no major increases from the initial values were determined.

The tests and analyses have demonstrated a high quality cosmeceutical formula, homogeneous, with good speadability, with anti-rheumatic properties due especially to the burdock oil, capsicum oil and harpagophytum oil.

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