

MOISTURIZERS MADE WITH NATURAL INGREDIENTS

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Abstract

The skin has remarkable properties of protection and defense against external aggressions, so it is very important that its health is permanently maintained. The main purpose of this research paper consisted in the formulation of two moisturizing creams based only on natural ingredients. The main ingredients were: fresh lavender flowers, aloe vera gel and coconut butter. The moisturisers were organoleptically, physicochemically and microbiologically analysed. The organoleptic tests showed that the moisturizing creams homogenized very well, did not show phase separations and the smell was very pleasant, specific to lavender. The pH values, between 5.0 and 5.3, were close to the optimal recommended, 5.5, which means that their use will have positive effects on the skin. Following the determination of the acidity index, values between 1.68 and 1.91 were obtained, which means that the products can be used safely, as they have not undergone alteration processes. Microbiological analyses showed low contamination with bacteria and fungi, as both lavender and aloe vera are known for their antibacterial and antifungal effects.

Key words: aloe vera; lavender; moisturizing creams; skin.

INTRODUCTION

Herbs have always been used as remedies, selected over millennia, excluding harmful ones and using beneficial ones to treat certain diseases or injuries (Maqbool et al., 2019).

Until today's chemical and biological analysis of active ingredients, plants have stood the test of time, so that now that drug abuse is one of civilisation's shortcomings, the return to natural products is a process that is increasingly encouraged (Grigore et al., 2020). In this respect, collaboration between doctors, pharmacists, chemists and biologists has led to the preparation of natural supplements and adjuvants used to prevent and treat various diseases and pathological conditions (Maqbool et al., 2019). Since the beginning of time we enhanced our attractiveness and magnetism by primping, perfuming, and decorating our bodies. Although we no longer use crocodile manure for face masks and lead paint for whitening the skin, natural skin care has always been a priority for people (Oumeish, 2001.). Botanical extracts have remained the most important resource for healing and beautifying in the natural world, since the beginning civilization. The use of botanical extracts such as essential

oils in the right amounts to handmade moisturizing creams and lotions allow for customization of the products, contributing to both psychological and physiological well-being (Bijauliya et al., 2017). That's why blends that offer a combination of important botanicals in lotions, creams and ointments are gaining more and more popularity.

An important advantage of natural homemade moisturizing creams is that they can be produced and customized using special ingredients for their specific properties. Homemade moisturizing creams made only with natural ingredients are full of skin-nourishing vitamins and minerals (Goldner, 1992). Their natural benefits include the ability to restore damaged skin cells, to hydrate and rejuvenate skin and to prevent future damage caused by harsh environmental factors by creating protective temporary barriers on skin (Morais, 2019). Because skin products can be labeled and stored in reusable containers, there is less waste from the disposal of packaging (Drobac et al., 2020).

There is a very large variety of moisturizers on the world market, the most popular being body lotions, face creams, face milk and body butters. They can be easily prepared at home with only

a few simple natural ingredients that basically need to be melted together and cooled before they are stored in their containers for later use. Creams and lotions are comprised of three main components: a) “base” or “carrier” oil, which will be a healing and nourishing oil of personal preference; b) water that is purified of toxins and pollutants, distilled water, pure floral waters or other water-based liquids may also be used; c) emulsifier (wax or a combination of other natural ingredients that provide emulsifying properties) (Ruiz et al., 2007).

Emulsifiers are binding agents that keep the oils and water joined together in a moisturizer, because these two components can not be combine naturally; they are the key component for creating the fixed and lasting emulsion of oil and water (Mukherjee et al., 1999).

Lavender is one of the most popular herbs, especially for treating nervous, digestive or joint problems.

The versatility of lavender makes it the preferred ingredient for preparing topical solutions. Products that use lavender to moisturize the skin, control dryness, span all stages of a skincare routine, from cleansers, to toners and serums, and finally to body and face creams (Shahdadi et al., 2017).

The natural antimicrobial and antioxidant properties in lavender refresh and neutralize the skin, which helps eliminate bacteria and excess oil (Shahdadi et al., 2017).

Aloe vera is a plant with healing properties, used as a remedy since ancient times, with a multitude of beneficial effects for the health of the whole body. The leaves of the plant contain up to 240 active substances, with a role in the treatment of various ailments, and it is used both in the cosmetic industry and in phytotherapy (Dal’Belo et al., 2006). It has a strong moisturizing effect due to its high water content (about 95-99%) and is used as a beneficial ingredient in skin care products.

The gel extracted from this plant is a natural remedy for many ailments and has multiple beneficial properties for beauty and health, with countless uses in nutrition and care.

In the cosmetic industry it is used for skin care: moisturizing, stimulating collagen production, reducing wrinkles and acne, soothing psoriasis. The nutrients and active substances give plants the therapeutic properties: anti-inflammatory,

analgesic, antiseptic, antioxidant and antibacterial.

Coconut oil is a great natural remedy to keep skin looking younger for longer. It contains powerful antioxidants and ferulic acid that help to fade fine lines and blemishes, leaving skin feeling light and refreshed. Applied to the skin after sun exposure, coconut oil has moisturising and healing properties, reducing burns and soothing irritated skin (Nasir et al., 2018).

MATERIALS AND METHODS

The purpose of this research consisted in the formulation of two moisturizing creams based only on natural ingredients. The main ingredients were: fresh lavender flowers, aloe vera gel and coconut butter.

Both creams can be used as moisturizers, make-up removers, face or hair masks, to treat sunburns, minor wounds, eczema and psoriasis. They were prepared according to our own methods and formulas, using only natural ingredients (Tables 1 and 2):

Table 1. Ingredients used in the formulation of aloe vera moisturizing creams

Ingredient	Therapeutic role/therapeutic effect
Fresh aloe vera gel (extracted from leaves)	Antioxidant and antibacterial, prevents the formation of wrinkles.
Coconut oil	Emollient, nutritious, anti-aging
Grape seed oil	Emollient, antioxidant, nutritious
Olive oil	Emollient, nutritious

The moisturizing creams were prepared taking into account the physico-chemical properties of each ingredient.

Table 2. Ingredients used in the formulation of lavender moisturizing creams

Ingredient	Therapeutic role/therapeutic effect
Lavender flowers	Antibacterial, anti-inflammatory
Aloe vera gel	Antioxidant and antibacterial, prevents the formation of wrinkles
Coconut oil	Emollient, nutritious, anti-aging

Formulation of aloe vera moisturizing creams

Freshly harvested aloe vera, coconut butter, olive oil and grape-seed oil were used to make the aloe vera cream.

To prepare the fresh aloe vera moisturizing cream, first the aloe vera gel was obtained. Aloe vera leaves were cut into 3-5 cm pieces, then kept for 30 minutes in a bowl of water to remove the sap ("latex"). The leaves were peeled to harvest the fresh aloe gel, and the obtained pulp was blended until completely homogenized. Coconut oil, grape-seed oil and olive oil were added successively, mixing moderately after each ingredient.

The moisturizing creams with fresh aloe vera was distributed in a hermetically sealed container and stored in the refrigerator.

Formulation of lavender moisturizing creams

Freshly harvested lavender, fresh aloe vera gel and coconut butter were used to make the lavender cream.

The lavender inflorescence was first washed with water to remove impurities and soil. The flowers were dried and subjected to extraction of the active principles with coconut butter. The extraction was carried out at 90°C, for 2 hours. The fresh lavender oil was coarsely filtered, decanted, and then filtered again under heat. The aloe vera gel was added in portions over the cooled lavender oil, stirring continuously, until homogenised and a stable emulsion was obtained.

The moisturizing creams were distributed in hermetically sealed containers and stored in a cold refrigerator to avoid spoilage.

Several types of creams were prepared, varying the quantities of ingredients, as shown in Tables 3 and 4.

Table 3. Variants of aloe vera moisturizing creams

Ingredient	Quantity (g)		
	Sample 1 (AV ₁)	Sample 2 (AV ₂)	Sample 3 (AV ₃)
Fresh aloe vera gel	70	60	80
Coconut oil	50	60	40
Grape-seed oil	10	10	10
Olive oil	10	10	10

Table 4. Variants of lavender moisturizing creams

Ingredient	Quantity (g)		
	Sample 1 (L ₁)	Sample 2 (L ₂)	Sample 3 (L ₃)
Lavender flowers	20	20	20
Fresh aloe vera gel	70	60	80
Coconut oil	70	80	60

The quality of the moisturizing creams was assessed through a series of analyses (FDC legislation, 2011):

- Organoleptic tests (appearance, smell, colour);
- Physic-chemical analysis (pH and acidity index);
- Microbiological analyses;
- Stability analysis (physical, chemical and microbiological).

The organoleptic tests consists in the preliminary verification of the main characteristics of the moisturizing creams: appearance, color, smell, smoothness, adhesion.

They must have a homogeneous appearance, color and a pleasant smell, characteristic of the products from the composition, all these properties making the cream attractive and pleasant to administer on the skin. These characteristics must remain unchanged during storage. The determination of pH is carried out to check whether or not the pharmaceutical preparation irritates the skin and mucous membranes. According to Romanian Pharmacopoeia 10th Edition, the pH of creams must be 4.5-8.5, as close as possible to that of the skin (Romanian Pharmacopoeia 10th Ed., 1998). The pH measurement was carried out with a pH-meter. Determination of pH was done by the usual colorimetric or potentiometric methods in aqueous solution obtained by shaking the ointment with the required amount of water (Mukherjee et al., 1999).

5 g of product and 20 ml of distilled water are vigorously stirred for 1 minute, filtered and then the pH is determined in the filtrate.

The value of the acidity index allows to assess the quality of creams, by determining the free fatty acids that occur as a result of partial hydrolysis in the presence of microorganisms, as well as the degradative transformations of the rancidity process.

To determine the acidity index, 5 g of cream were dissolved in 50 ml of alcohol-ether mixture neutralized with phenolphthalein. The titration was done with a potassium hydroxide solution, until the pink coloration.

Microbial contamination control aims to determine the total number of aerobic microorganisms or the absence of pathogenic or conditionally pathogenic microorganisms, possibly present in pharmaceutical products,

from raw materials to finished forms. The microbiological determinations were carried out by direct seeding of the samples on culture media specific to each type of microorganism: aerobic bacteria, fungi. After incubation, plates were examined for colony counts.

The most important consideration with respect to pharmaceutical and cosmetic emulsions is the stability of the finished product. The chemical and physical characteristics, including the variation of pH and acidity index, observation of color and odor were determined (John, 1985).

Tests were performed for 4 consecutive weeks at room temperature. The measurements were made in triplicate and the average value was determined for each parameter.

RESULTS AND DISCUSSIONS

Organoleptic tests

The organoleptic tests showed that the moisturizing creams had a homogeneous appearance and a creamy consistency, adhering to the skin, pleasant color and smell, specific to the ingredients used. All these characteristics made the creams attractive and pleasant to apply on the skin.

The creams prepared from lavender were particularly noted, due to the specific smell of the plant, recognized for its special qualities.

pH tests

A balanced pH level plays a significant role in the way skin looks. A high pH level, above 7, damages the skin by drying it out, and a low pH level, below 4, irritates it.

Dry skin has a $\text{pH} < 5.5$, with increased acidity, while oily skin is alkaline and has a $\text{pH} > 6$. Bacteria and other micro-organisms prefer alkaline environments, which can lead to acne breakouts in oily skin, while acidic pH inhibits them but can trigger skin irritations and eczema (Hye-Yeon et al., 2018).

The pH values obtained from the testing of aloe vera moisturizing creams were between 5.2-5.4, while for lavender creams the values were slightly higher, between 5.3-5.6 (Figure 1). Values slightly lower than the optimal value of 5.5 mean that the preparations obtained will have beneficial effects on the skin and can be used effectively for moisturising or treating various conditions.

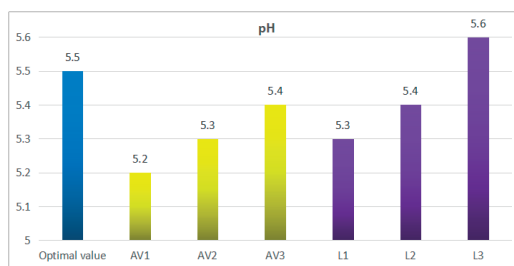


Figure 1. pH of aloe vera and lavender moisturizing creams

Acidity index

The acidity index represents the volume of potassium hydroxide required to neutralize the content of free fatty acids in the sample.

The acidity index values were between 1.71 and 1.97, for aloe vera creams, and 1.64 and 1.88, for lavender creams, which means a low content of free fatty acids (Figure 2).

Considering that these products are used for moisturizing and/or treating various skin conditions, a content as low as possible in free fatty acids is beneficial, meaning that the products can be used with confidence, since they have not undergone alteration processes.

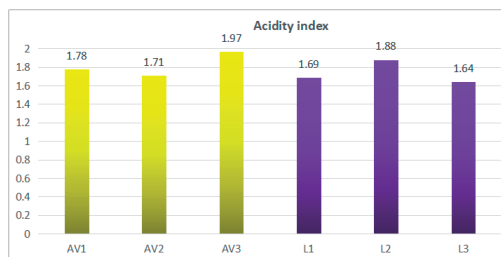


Figure 2. Acidity index of moisturizing creams

Total aerobic bacteria count

For the aloe vera moisturizing creams, a fairly high bacterial contamination was found, but within the limits of the FRX (Figure 3). This is due to the fact that the aloe vera leaves were only washed with cold water and then processed to extract the gel.

For lavender moisturizing creams, bacterial contamination was much lower compared to aloe vera moisturizing creams (Figure 3).

The reduced presence of bacteria in the prepared moisturizing creams is primarily due to the recognised antibacterial effect of lavender and aloe vera.

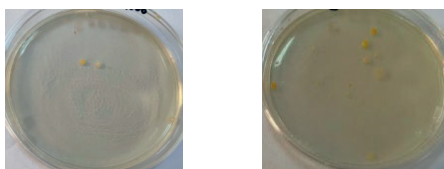


Figure 3. Contamination with aerobic bacteria of:
Aloe vera moisturizing cream Lavender moisturizing cream

Total fungi count (yeasts and filamentous fungi)

Fungal contamination was extremely low, with colony growth only observed in plates inoculated with 1: 10 dilutions. For these plates a CFU/g value of 3×10^4 was calculated for the aloe vera cream and 2×10^4 , for the lavender cream, as shown in Figure 4.

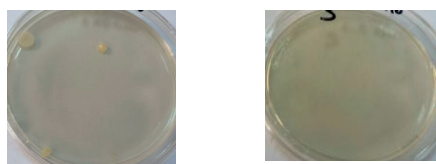


Figure 4. Contamination with fungi of:
Aloe vera moisturizing cream Lavender moisturizing cream

Again, the ingredients used played an important role, as both lavender and aloe vera are well known for their antifungal effects.

Stability tests

Having a complex composition, with ingredients of varying degrees of unsaturation within wide limits and a predominantly organic structure, moisturizing creams are subject to the destructive processes of UV radiation and atmospheric oxygen and moisture.

During four weeks, the moisturizing creams were analysed four times, once a week, monitoring changes in organoleptic, physico-chemical and microbiological characteristics.

The organoleptic characteristics of the tested products did not change significantly during the test period. The organoleptic tests did not particularly highlight a special moisturizing cream, because all characteristics were maintained very well during the testing period. The pH of samples AV₁, AV₂ and AV₃ decreased slightly over the four weeks, from

5.4 to a minimum of 5.0. The pH of sample L₁, L₂ and L₃ showed an excellent stability during the four weeks, as shown in Figures 5 and 6. Of all six moisturizing creams, AV₃ and L₃ had the best evolutions as they maintained their pH during the entire testing period.

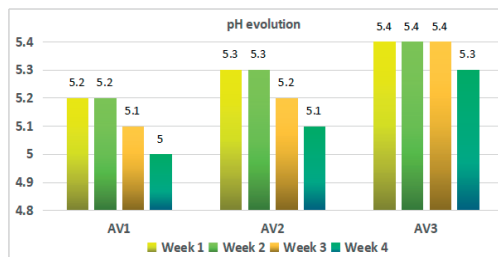


Figure 5. pH evolution of aloe vera moisturizing creams

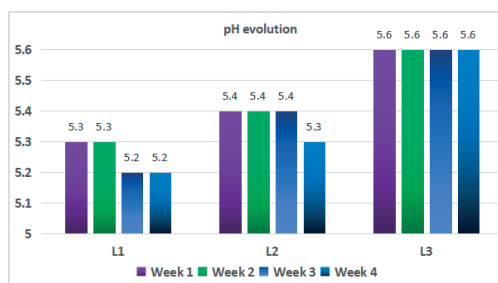


Figure 6. pH evolution of lavender moisturizing creams

The evolution of the acidity index was similar to that of the pH, it changed quite little during the stability test (Table 5). The results showed the importance of using as fresh and natural ingredients as possible.

Table 5. Variation of acidity index of moisturizing creams

Sample/ Acidity index	Week 1	Week 2	Week 3	Week 4
AV ₁	1.78	1.88	1.86	2.05
AV ₂	1.71	1.8	1.92	2.07
AV ₃	1.97	1.93	1.95	1.98
L ₁	1.69	1.74	1.79	1.82
L ₂	1.88	1.89	1.86	1.90
L ₃	1.64	1.65	1.68	1.71

From a microbiological point of view, the moisturizing creams proved to be valuable products, as the degree of contamination with aerobic bacteria and fungi did not increase, as expected. The main reason for inhibiting the growth of microorganisms is given by the main

ingredients, aloe vera and lavender, known for their antibacterial and antifungal effects. Of the six moisturizing creams, AV₃ and L₃ stood out, having the highest content in aloe vera, proving once again the superior value of this plant.

CONCLUSIONS

All moisturizing creams have exhibited stable organoleptic characteristics.

The initial pH remained constant over time (between 5-5.6). These values, close to the skin's optimum, means that the moisturizing creams do not cause irritation when applied to the skin and have beneficial effects on the skin. Following the analysis of the acidity index, the importance of using the freshest and most natural ingredients in obtaining these types of pharmaceutical products was highlighted.

The low contamination with aerobic bacteria and fungi further increases the value of the products, proving once again the benefits of using aloe vera and lavender as main ingredients.

The technological processes applied to obtain the creams led to the production of quality pharmaceutical products, proved by the results obtained in the verification of some physico-chemical parameters and stability tests. Analyzing the results in this research, we selected AV₃ and L₃ creams as the most valuable and beneficial pharmaceutical products because they maintained their physical and chemical characteristics and had the least microbial contamination.

REFERENCES

- Bijauliya, R.K., Alok, S., Kumar, M., Chanchal, D.K., & Yadav, S. (2017). A comprehensive review on herbal cosmetics. *International Journal of Pharmaceutical Sciences and Research*, 8(12), 4930-4949.
- Dal' Belo, S.E., Gaspar, L.R., Berardo, P.M., & Campos, G. (2006). Moisturizing effect of cosmetic formulations containing Aloe vera extract in different concentrations assessed by skin bioengineering techniques. *Skin Research and Technology*, 12(4), 241-6.
- Drobac, J., Alivojvodic, V., Maksic, P., & Stamenovic, M. (2020). Green face of packaging-sustainability issues of the cosmetic industry packaging. In *MATEC Web of Conferences*, EDP Sciences, Vol. 318.
- FDC legislation. (2011). Assurance of Cosmetics Among Europe. USA and Republic of Korea, 6(1) 19-28.
- Goldner, R. (1992). Moisturizers: A Dermatologist's Perspective. *Journal of Toxicology: Cutaneous and Ocular Toxicology*, 11(3), 193-197.
- Grigore, A., Colceru-Mihul, S., Bubueanu, C., Pirvu, L., Matei, R., Bajenaru, I., Paraschiv, I., & Nichita, C. (2020). Research on the potential cosmetic application of a poly-herbal preparation. *Scientific Bulletin. Series F. Biotechnologies*, Vol. XXIV, No.1, 209-213.
- Hye-Yeon, Yeo, & Jeong-Hee, Kim. (2018). Stability Determination of the Various Cosmetic Formulations containing Glycolic Acid. *Journal of Fashion Business*, 22(3), 30-38.
- John, S.(1985). Fundamentals of stability testing. *International J. of Cosmetic Sci.*, 7, 291-303.
- Maqbool, M., Dar, M.A., Gani, I., Mir, S.A., & Khan, M. (2019). Herbal medicines as an alternative source of therapy: a review. *World J Pharm Pharm Sci*, 3, 374-80.
- Morais, I.C.D. (2019). Re-enchantment of consumption through craft products: an analysis of the homemade cosmetics context (Doctoral dissertation).
- Mukherjee S., Habif S., & Rick D. (1999). Stable cosmetic compositions with different pH emulsions. Partent No. US 5935589 A.
- Nasir, N.A.M., Abllah, Z., Jalaludin, A.A., Shahdan, I. A., & Abd Manan, W.N. (2018). Virgin coconut oil and its antimicrobial properties against pathogenic microorganisms: a review. In *International dental conference of sumatera utara 2017*, Atlantis Press., 192-199.
- Oumeish, O.Y. (2001). The cultural and philosophical concepts of cosmetics in beauty and art through the medical history of mankind. *Clinics in dermatology*, 19(4), 375-386.
- Romanian Pharmacopoeia. (1998). 10th Edition, Medical Publisher.
- Ruiz M.A., Clares B., Morales M.E., Cazalla S., & Gallardo V. (2007). Preparation and stability of cosmetic formulations with an anti-aging peptide. *Journal of Cosmetic Science*, 58(2), 157-171.
- Shahdadi, H., Bahador, R.S., Eteghadi, A., & Boraiinejad, S. (2017). Lavender a plant for medical uses: a literature review. *Indian J. Public Health Res. Dev*, 8, 328-332.