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Dedicated to Professor Dr. Sorin Dan Anghel on His 65th Anniversary

FORMULATION AND OPTIMIZING OF A ANTI-AGING COSMETIC CREAM

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ABSTRACT. The research and development of cosmetics, especially the composite active ingredients, should be based on their clarified sources, structures, interactive mechanisms with the skin, and, most importantly, their efficacy and safety on the targeted components of skin. This study has as main objective the development and formulation of a anti-aging cosmetic product which incorporates effective and innovative ingredients, used in the developed formulation to support the cosmetic claimed of the product. An important study is the quality control of the anti-aging cream by determining the physico-chemical characteristics and appropriate pharmacotechnical (pH, viscosity) characteristics, both initially and over time (30 days from the preparation of the product).

The formulation is monitored under accelerated stability studies over a period of 30 days while maintaining the product at 4, 20 and 40 °C.

Keywords: *anti-aging cosmetic cream, physico-chemical characteristics, accelerated stability studies.*

INTRODUCTION

Cosmetics are commercially available products that are used to improve the appearance of the skin. Consumer demand for more effective products that more substantively beautify the appearance has resulted in increased basic science research and product development in the cosmetics industry. The result

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has been more ingredients that may actually improve not just the appearance of the skin, but the health of the skin as well. We now have products that renew, restore, and rejuvenate—not just cleanse, protect, and moisturize. [1,2].

Skin aging is characterized by a progressive deterioration of the skin's functional properties, linked to alterations of dermal connective tissue due to the changes at the cell, gene and protein levels. Skin aging can be divided into two basic processes: intrinsic aging and photoaging [3].

Cutaneous ageing cab be defined as the result of two different and cumulated processes: intrinsic and extrinsic ageing (also known as photoageing). While intrinsic ageing is natural and mainly due to the passage of time (influence of genetic factors, oxidative stress, cellular senescence etc.) and its consequences, photoageing is mainly linked with the detrimental effects of solar exposure on the skin, although pollution, diet and smoking are also contributing factors [4].

Skin barrier function, principally the stratum corneum, is the primary line of defence against extrinsic stress such as UV-induced photo-damage, microbial infections and physical deterioration resulting from ageing and environmental exposure. Scientific evidence suggests that both intrinsec and invornmental factors contribute to „compromised" skin barrier function. The stratum corneum functions as an effective barrier and is critical for controlling and preventing water loss [5].

Aging affects all levels of the skin. From the stratum corneum downwords aging creates corneocyte dysfunction, epidermal atrophy, dysplasia and abnormal pigmentation (Figure 1) [6, 7]. Aging occurs in all organs of the body*;* however, the skin appearance, such as wrinkles and furrows, is markedly observed for aging notices. It is a challenging work for cosmetic scientists to find the means for reducing the changes on the skin appearance due to aging. Wrinkles appear over time due to changes in the support structures of the skin from chronological ageing, but photoageing speeds the process considerably leading to quickly formed, deep wrinkles [8].

Skincare products that affect wrinkles are a reality and are well established in consumer, practitioner and corporate perspectives. In the broadest definition, ''products'' range from classic and simple cosmetic preparations through vitamins, antioxidants, topical and oral cosmeceutical and pharmaceutical preparations, and even to surgical and laser interventions [9]. Application of cosmetic products containing oils with antioxidant activity is widely acceptable to benefit healthy skin [10].

Regardless of the etiology of skin aging, there are important characteristics of aged skin that must be considered. These changes occur throughout the epidermis, dermis, and subcutaneous tissue and can result in wide-ranging alterations in the topography of the skin [11].

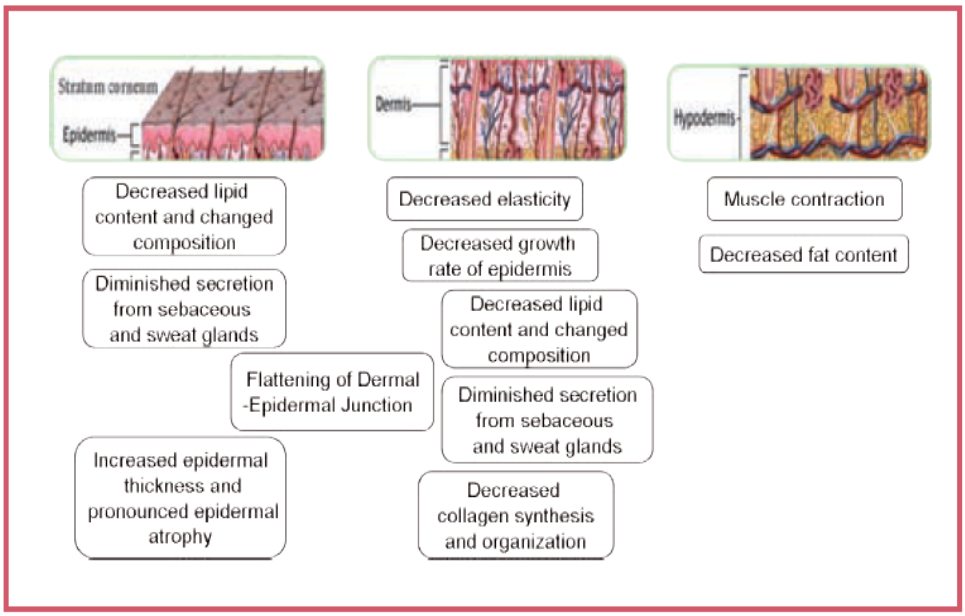

Fig. 1. Changes occuring in aged skin layers

The clinical characteristics of photoaged skin are more pronounced compared with those observed in intrinsic aging (Table1) [12]:

Table 1. Clinical characteristics of intrinsic aging and photoaging

Clinical characteristic	Intrinsic aging	Photoaging
Pigmentation	Pale, white, hypopigmentation	Mottled, confluent, and focal hyperpigmentation
Wrinkling	Fine lines	Deep furrows
Hydration	Dry and flakey	Dry and rough
Growths	Benign	Cancerous and benign

There are a lot of treatments boasting the capability to improve wrinkles: pharmaceutical, surgical and cosmetic solutions. These treatments are intended to change the nature of ageing collagen, stretch the skin, fill in the depressions of the skin or paralyse the muscles that cause the wrinkle. Retinoid products, for example, act by inhibiting enzymes from breaking down collagen, but they may produce redness, burning and general discomfort [10]; alpha-hydroxy acids penetrate

into the top layer of the skin, producing only subtle improvement, though, and causing a mild and temporary irritation, increasing the skin's sensitivity to the sun and particularly increasing the possibility of sunburn [13].

Wrinkle cosmetic treatment is exerted by a variety of active functional ingredients: modern anti-ageing cosmetics go well beyond the simple moisturizing function of traditional anti-wrinkle creams, by exerting a more complex function in protecting the skin from external injuries, nourishing it, and removing its superficial layers. That is the reason why the term "cosmetceuticals" is increasingly used: there are many cosmetic products that fit into this category defined in the regulatory systems of some countries [14].

The anti-aging "active" ingredients, are cosmetic products with properties very similar to a pharmaceutical product (drug-like benefits)- cosmeceuticals [9].

EXPERIMENTAL

Qualitative data of the anti-aging cream formulation is presented in Table 2.

Figure 2 shows by comparison, the composition of the studied cream. The different ratios between lipophilic and hydrophilic components are noticed.

Table 2. Qualitative formulation Anti-aging cream

Anti-Aging Cream				
Phase	**Ingredient**	**INCI designation**	**Function**	**Supplier**
A	Deionised Water	Aqua	solvent	
	Glycerol	Glycerin	denaturant/humectant/ solvent	Dr. Straetmans
	dermofeel® PA-3	Sodium Phytate, Aqua	chelating	Dr. Straetmans
	dermosoft® LP	Caprylyl Glycol, Glycerin, Glyceryl Caprylate, Phenylpropanol	preservative	Dr. Straetmans
A1	Rapithix A 100	Sodium Polyacrylate	viscosity controlling / binding / film forming	ISP
	Keltrol RD	Xanthan Gum	binding/emulsion stabilising/viscosity controlling/gel forming	CP Kelco
B	symbio®muls CG	Glyceryl Stearate Citrate, Cetearyl Alcohol, Glyceryl Caprylate	emollient / emulsifying/ skin conditioning	Dr. Straetmans
	Plantec Natural Shea Butter	Butyrospermum Parkii	skin conditioning/emollient	SOPHIM

Phase	Ingredient	INCI designation	Function	Supplier
	Fitoderm	Squalane	emollient/skin conditioning	Cognis
	dermofeel® sensolv	Isoamyl Laurate	emollient / skin conditioning	Dr. Straetmans
	DC 345 Fluid	Cyclopentasiloxane, Cyclohexasiloxane	emollient /	Dow Corning
	Almond oil	Prunus Amygdalus Dulcis Oil	emollient / skin conditioning	SOPHIM
	dermofeel® E 74 A	Tocopheryl Acetate, Helianthus Annuus (Sunflower) Seed Oil	antioxidant	Dr. Straetmans
C	*Biomimetic Collagen*	*Glycine, Proline, Hydroxyproline*	active ingredient	M&G Cosmetics
	Red Wine Extract	*VITIS VINIFERA EXTRACT*	active ingredient	M&G Cosmetics
D	Parf. Kenzomo D'ete	Parfum	parfum	CPL

STANDARDS AND REAGENTS

Sample preparation of the anti-aging cream

Phase A (demineralized water, dermorganics® Glycerin (Glycerin), dermofeel® PA-3 (Sodium Phytate, Aqua), dermosoft® LP (Caprylyl Glycol, Glycerin, Glyceryl Caprylate, Phenylpropanol)) was heated at 80°C. Phase A1 (xanthan gum and Sodium Polyacrylate) was disperesed in phase A.

Phase B (symbio®muls CG (Glyceryl Stearate Citrate, Cetearyl Alcohol, Glyceryl Caprylate), Plantec Natural Shea Butter (Butyrospermum Parkii), Fitoderm (Squalane), dermofeel®sensolv (Isoamyl Laurate), DC 345 Fluid (Cyclopentasiloxane, Cyclohexasiloxane), dermofeel® E 74 A (Tocopheryl Acetate, Helianthus Annuus (Sunflower) Seed Oil) and almond oil) was melted on water bath at 75°C. Phase A was emulsified with phase B under stirring and cooling down to 40°C was started under medium stirring.

Phase C (Biomimetic Collagen (Glycine, Proline, Hydroxyproline) and red grape extract (Vitis Vinifera Extract) was added under stirring.

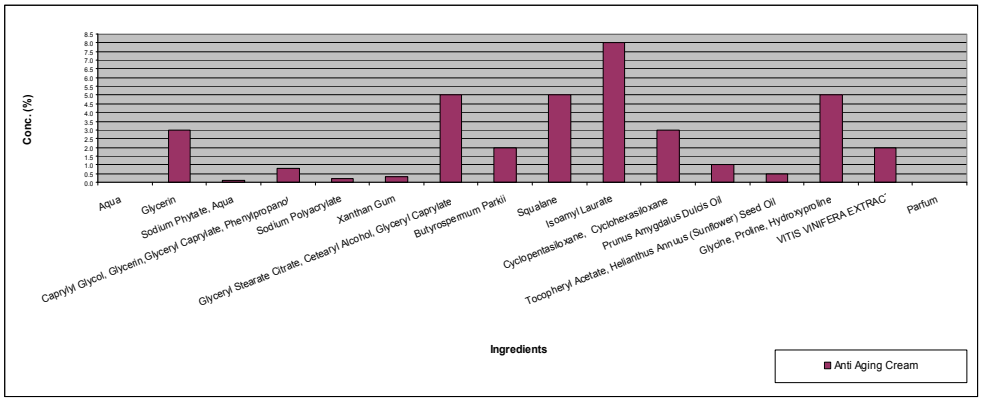

Fig. 2. The composition of the Anti-aging cream

Physico-chemical characteristics of the developed Anti-aging cream-relevant characteristics, acceptance criteria, test methods

Quality control consisted of the following determinations:

Appearance

The appearance, color and odor were tested organoleptically.

pH determination

Was performed using a pH meter (Mettler Toledo (Schwerzenbach, Switzerland)).

Determination of the viscosity

Was performed using a HAAKE Viscotester VT550 (spindle R = 6, shear rate D=5 s^{-1}, temperature T=20 ^{0} C).

Accelerated stability studies

The developed cosmetic formulation was monitored under accelerated stability studies. Accelerated stability tests were performed over a period of 30 days while maintaining the product at 4, 20 and 40 ° C.

RESULTS AND DISCUSSION

Presentation of the developed cosmetic formulation

The anti-aging cream formulation associates a complex of fats and oils that play an essential role in restoring the hydro-lipid protective skin barrier, contributing to a highly softening, nourishing and moisturizing the sensitive skin, affected by external factors, dehydrated and wrinkled, with red wine extract having regenerative properties, collagen and alpha tocopherol acetate with anti-aging action for the skin.

Natural almond oil is recognized for its excellent emollient properties, soothing and nourishing the skin with a good spreadability and without leaving any greasy feeling. Rich in essential fatty acids (oleic, linoleic), triglycerides, proteins, vitamins A, D and E, having a good spreadability almond oil has a geriatric activity on wrinkled skin, reducing fine lines and wrinkle and, improving scleroderma. It concerns cell regeneration, epithelization of superficial wounds, relieves pruritus and sunburn generally to the treatment of inflammation and dryness of the skin caused by eczema, psoriasis, dermatitis.

Phytosqualane has a geriatric type activity on wrinkled skin, reducing fine lines.

Shea butter is known for its excellent softening, moisturizing and nourishing properties with a good spreadability and leaving a non greasy feeling to the skin.

α-tocopheryl acetate (dermofeel ® E 74 A) is an effective antioxidant, helping to combat skin aging processes caused by free radicals. It softens the skin and improves skin elasticity.

Red wine extract rich in polyphenols, sugars, vitamins and minerals, stimulates, protects, hydrates and regenerates the skin.

The beneficial presence of collagen, natural component of the skin, stimulates young neo-fibrillogenesis and ensures permanent maintenance of skin hydration.

Applied regularly, the anti-aging cosmetic product developed slows the aging process of the skin, reduces wrinkles, improves the appearance of sensitive, irritated, dry skin.

Physico-chemical characteristics of the developed anti-aging cream

Quality control of the developed cosmetic cream revealed: achieving an acceptable cosmetic preparation with elegant appearance and appropriate physico-chemical and pharmacotechnical (pH, viscosity) characteristics.

The initial determination results are shown in Table 3:

Table 3. Initial physico-chemical determination of the cosmetic cream

Nr.	*Properties*	*Admissibility conditions*
1.	Appearance	homogeneous emulsion
2.	Colour	soft light white
3.	Odour	characteristic
4.	pH	5- 5,5
5.	Viscosity	20.000 mPas

Accelerated stability studies performed over a period of 30 days, while maintaining the product at 4, 20 and 40°C, showed that the formulated and studied dermatocosmetic product is stable. The results are shown in Table 4:

Table 4. Physico-chemical determination of the cosmetic cream

Test	*Admissibility conditions (initial)*	*Admissibility conditions (after 30 days)*
Appearance	homogeneous emulsion	proper
Odour	characteristic	proper
Colour	soft light white	proper
pH	5-5,5	5- 5,5
Viscosity	20.000 mPas	40.000 mPas

CONCLUSIONS

Cosmetics are commercially available products that are used to improve the appearance of the skin. Consumer demand for more effective products that more substantively beautify the appearance has resulted in increased basic

science research and product development in the cosmetics industry. The result has been more ingredients that may actually improve not just the appearance of the skin, but the health of the skin as well. We now have products that renew, restore, and rejuvenate—not just cleanse, protect, and moisturize [1].

The latest innovation in the field of cosmetics is the development of active cosmetics. Currently, cosmetics are not only intended for the improvement of the appearance or odor of the consumer, but are also intended for the benefit of their target, whether it is the skin, the hair, the mucous membrane, or the tooth. With this functional approach, products became diversified and started to claim a multitude of actions on the body. In order for cosmetic products to support these activities, raw materials became more efficacious, safe, bioavailable, and innovative, while remaining affordable. Subsequently, the cosmetic market greatly expanded, becoming accessible to millions of consumers worldwide [9].

The research presented in this paper had as main objective the development and formulation of a anti-aging cosmetic formulation. The developed cosmetic formulation associates valuable emollients- Shea butter, a known emollient in cosmetics for its regenerative and moisturizing effects and Phytosqualane having a geriatric type activity on wrinkled skin, reducing fine lines. The emollient raw materials, respectively Shea butter was added in a 2% concentration in the formulation and Phytosqualane 5%. The concentration of active ingredient has been introduced in the formulation at a concentration of 5% collagen and 2% red wine extract. The cream slows the aging process of the skin, reduces wrinkles and, improves the appearance of sensitive, irritated, dry skin.

Quality control of the developed cosmetic cream revealed: achieving an acceptable cosmetic preparation with elegant appearance and appropriate physico-chemical and pharmacotechnical (pH, viscosity) characteristics (after preparation and after 30 days of preparation).

Accelerated stability studies performed over a period of 30 days, while maintaining the product at 4, 20 and 40°C, showed that the formulated and studied dermatocosmetic product is stable.

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