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Development of Anti-Ageing Cream from Chicken Feathers.

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ABSTRACT

This work presents the development of anti-ageing cream. Keratin protein derived from chicken feathers is used as an active ingredient in creams. Keratin was extracted by using reducing agent. Anti-ageing creams were produced by using several ingredients comprise of emulsifier, emollient, preservatives and surfactant. The creams were formulated using safe ingredients that include competitively price materials which are easily available in Malaysia. All the formulations were evaluated for acute skin irritancy involving animal study. Our observations on rabbit skin indicated that these formulations did not produce any skin irritation and enhance the skin structure. For stability study, all creams formulated had shown no changes in pH, colour and phase separation. Using keratin as an active ingredient in biomedical products will not only provide benefits to consumers – it will also encourage responsible waste management and sustainable commercial activities.

Keywords: Keratin; Anti-ageing Cream; Chicken feathers; Skin

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INTRODUCTION

Keratin protein is fibrous protein that can be found in mammalian hair, bird feathers and outermost layer of skin in most animals. Extracted keratin extracted from chicken feathers is categorized as beta (β) keratin [1]. Keratin is found to have several important functions and it is being used in the production of personal care products. The important functions of keratin are improving skin firmness, stimulate the production of new cell, anti-inflammatory and anti-oxidant.

Human skin cell is containing keratin and it is the first protection line in defending diseases. The integumentary system plays as natural sunscreen, provide spaces for fatty tissue storage and regulating the body temperature by providing the sensory input to brain [2]. As a multifunctional layer, skin is exposed to variety defect factors that lead to skin ageing. Skin ageing happens in several ways. It may looks as wrinkles, dullness and pigmentation occurs in skin [3]. As human beings grow older, the maximal functioning and reverse capacity is decreasing and this phenomenon called an ageing process [4].

Collagen synthesis plays a big role in the ageing process. Collagen synthesis in skin is inhibited because incomplete degradation of collagen by UV leads it to accumulate as partial fragments in the skin. As the collagen degradation products increased, the less or no collagen will produce. There are four keys in the ageing process. The processes are oxidative stress, inflammation, glycation and deoxyribonucleic acid (DNA) damage.

In this investigation, an anti-ageing creams from keratin were produced and analyzed. Both keratin and soy lecithin usage in the formulation were analyzed and discussed.

MATERIALS AND METHODS

Keratin

Active ingredient used in the anti-ageing cream is keratin. Keratin used in this research is extracted from chicken feathers. Chicken feathers were obtained from commercial poultry plants and cleaned. It was first sterilized before proceed with the reducing agents and processed to get the extracted keratin. The keratin was obtained from Centre for Bio-Composites and Innovative Materials, Faculty of Chemical and Natural Resources Engineering, Universiti Malaysia Pahang and the established purification method was employed [5-7].

Preparation of anti-ageing cream

In the formulation of anti-ageing creams, water bath was used to mix all the ingredients in the beaker at 60°C. Water bath was used to make cream formulation well mixed because the heat was distributed evenly in the beaker. Oil and water phase was prepared separately. Cetostearyl alcohol was mixed into glycerin until clear solution obtained. Then, palm oil was added in the clear solution and the oil phase was done. Water phase solution was prepared by dissolving citric acid in the distilled water. Water and oil phase were mixed. Then, cremophor and zinc oxide were added. The cream mixture produced was transferred to cold it down and continuously stirred. Finally, keratin was added to the cold solution and homogenized. The formulations of anti-ageing creams were done based on the ratios (Table 1).

Table 1: Formulation of creams

Ingredients	K1-L0 (g)	K2-L0 (g)	K1-L1 (g)	K2-L1 (g)
Cetostearyl alcohol	3.0	3.0	3.0	3.0
Palm Oil	3.0	3.0	3.0	3.0
Glycerin	4.0	4.0	4.0	4.0
Zinc oxide	2.0	2.0	2.0	2.0
Citric acid	1.0	1.0	1.0	1.0
Keratin	2.0	4.0	2.0	4.0
Distilled Water	q.s.	q.s.	q.s.	q.s.
Cremophor	2.0	2.0	2.0	2.0
Lecithin	-	-	1.0	1.0

Droplet size measurement

Anti-ageing creams droplet size distributions were analyzed by Laser Particle Size Analyzer (BT-9300H). The cream sample was first diluted into distilled water before tested with particle size analyzer.

Viscosities

Viscosities of anti-ageing cream were tested by Brookfield DV-III Ultra Programmable Rheometer. The cream sample was put on the spindle and applied to a stress for 30s.

Phase separation

The anti-ageing creams prepared were stored for three months at refrigerated, room and accelerated temperature.

pH

The anti-ageing creams produced were tested with HANNA HI 991001 pH/Temperature Meter to identify the pH of each cream.

Animals

Six male rabbits weighing between (300-500 g) were used for this study. The animals were maintain clean and fed with commercial rabbit food. All procedure was carried out approved by Institutional Animal Care and Use Committee (IACUC) of International Islamic University Malaysia (IIUM).

Dermal irritation and ageing test

The rabbits were shaved with an electrical razor over an area of 4 cm x 4 cm and cleaned with antiseptics. The initial rabbit's skins were observed using skin microscope. After 12h, anti ageing cream was applied (everyday) on rabbit's skin and microscopic test was done after 1h, 24h, 72h and every week until eight weeks.

RESULTS

Anti-ageing cream prepared

The anti-ageing creams were prepared (Table 1), which were creamy, white and soft. The creams exhibited white color.

Droplet size of anti-ageing cream

The droplet sizes of anti-ageing creams were analyzed. The SPAN values (Table 2) show the anti aging creams with soy lecithin have smaller values than anti-ageing cream without soy lecithin. The SPAN values with manual calculation were calculated using Eq. (1):

$$Span = \frac{D_{v0.9} - D_{v0.1}}{D_{v0.5}}$$

SPAN values from the manual calculation showed anti-ageing cream with soy lecithin also having higher SPAN values compared with anti-ageing cream without soy lecithin. It shows that the result from software and manual calculation were parallel, even though there are some values differences.

Phase separation

After three months, the creams were observed. There were no phase separations occurred in the cream and the colour of cream are remain the same.

pH

The pH values of an anti-ageing cream tested were stated in Table 3. The pH values anti-ageing cream prepared was almost the same but it was differentiated with the keratin volume. Keratin is alkaline, so the pH values of formulation K2-L0 and K2-L1 were slightly alkaline, since the keratin volume were doubled compared to formulation K1-L0 and K2-L0. The formulation of K0-L0 was having the lowest pH value since no keratin was added in the formulation.

Viscosities

The viscosities of the cream produced were tested with viscometer. The viscosities (Table 2) obtained from the viscometer showed the formulation of K1-L0 and K2-L0 was higher than formulation K1-L1 and K2-L1. The formulations of anti-ageing cream without lecithin have higher viscosities values compared an anti-ageing cream with lecithin. Meanwhile, viscosity of formulation K0-L0 was the lowest. It shows that the presence of keratin and lecithin affect the value of viscosities since the formulation of K0-L0 was the blank sample. Blank sample was made without keratin and lecithin.

Microscopic test on rabbit skin

Rabbit skin was observed and it shows the improvements in the skin structures. Initially, the rabbit skin was wrinkled and rough and after 90 days, the structure of skin was less wrinkles. The rabbits skin showed no redness and other complications.

Table 2: SPAN Values

Formulation	K1-L0	K2-L0	K1-L1	K2-L1
SPAN Value (Software)	1.13	1.16	1.12	1.11
SPAN Value (Manual Calculation)	1.15	1.19	1.13	1.15
Difference Percentage, %	1.75	2.55	0.89	3.54

Table 3: pH Values

pH Values				
K1-L0	K2-L0	K0-L0	K1-L1	K2-L1
6.56	6.84	6.55	6.77	6.98

Table 4: Viscosity Values

Cream	K1L0	K2L0	K0L0	K1L1	K2L1
Viscosity, Pa.s	447.12	453.42	411.56	463.75	471.58

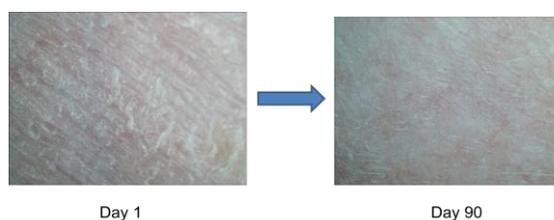


Figure 4: Skin Structure

DISCUSSION

Ageing processes occur because of collagen breakdown and it will make wrinkle to appear on skin. Keratin used in this research has antioxidant properties which will lead to anti-ageing. Particle size analysis is crucial part in the production of anti-ageing cream because it will gives statistical inventory of the dispersed

phase fragmentation. In the production of anti-ageing cream, there will be some random stirring processes and this will affect the breaking and coalescence steps in the dynamic equilibrium. The particle size analysis also determines the viscosity and stability of the system [8].

In the production of an anti-ageing cream, phase separation indicates the stability of the creams. From the results, it shows there are no phase separation occurred in the cream structure in three months. The creams conditions are the same as original states as it is just produced. Therefore, the creams were stable. It was to assure the optimum stable molecules and creams were maintained during distributions procedure before it reaches to consumers [9].

Animal study was conducted by applying anti-ageing creams on rabbit skin. There was no skin irritation on rabbit skin and skin structures improve as observed from the microscopic pictures taken (10). In this research, the pH values of creams were in the range of less acidic to normal, so there are no irritant effects on rabbit skin and as proved, in the other research stated that more acidic and more alkaline products were having higher irritation index compared neutral pH products [11]. Keratin plays the big role in improving the skin structures. The anti-ageing creams with keratin were compared with the cream without keratin. The results shows, the skin structures with keratin application are smooth if compared with skin without keratin application.

In conclusion, anti-ageing cream from keratin applied on skin was found to improve the skin structure and safe to apply on skin. The ingredients used in this research were safe and give no harm to skin.

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