

Macadamia Nuts Oil in Nanocream and Conventional Cream as Skin Anti-Aging: A Comparative Study

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Abstract

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BACKGROUND: The effect of an active substance in a dosage form can be influenced by the different method of preparation. Nanotechnology has been used widely in all aspects including drug delivery system. Nanocream is one of the cosmetic dosage forms to improve the absorption of active substances on the skin.

AIM: The study was to compare macadamia nuts oil nanocream with conventional cream as skin antiaging dosage form.

METHODS: The formulation of nanocream was consisted of macadamia nuts oil 10%, tween 80, propylene glycol, cetyl alcohol, methyl paraben, propyl paraben and distilled water. The anti-aging was conducted by comparing the nanocream and conventional cream. The evaluation of anti-aging activity was conducted using skin analyzer apparatus. The aging parameters were moisture, evenness, pore size, black spot, and wrinkle of the skin. The data were collected for 4 weeks. All the data obtained were statistically analyzed.

RESULTS: Macadamia nut oil nanocream dosage form showed better antiaging activity on the skin compared to conventional cream which were characterized by changes in skin condition on each aging skin parameter such as water content, pore size, melanin, and wrinkles.

CONCLUSION: It is concluded that macadamia nuts oil in nanocream dosage form has better antiaging activity on the skin compared to conventional cream and macadamia nuts oil can be used as an effective skin anti-aging dosage form.

Introduction

With the advent of retirement age, there has been an increase interest in antiaging dosage forms, or cosmeceuticals, and their purposed ability to enhance a person's more youthful appearance. Topical antiaging dosage forms are less invasive, non-surgical alternatives to slow the effects of aging on the skin [1].

There are several technological innovations in the cosmetic refining system on cosmetic products, one of which is nanocream. Nanocream is a semisolid dosage forms in the form of a stable emulsion and has a droplet diameter range of 20-500 nm. The advantage of selecting nanocream as a topical dosage forms is it can increase the absorption of active substances on the skin. In addition, the

nanocream dosage forms are also easier to use and spreadable to the skin, and also comfortable [2].

Macadamia nut oil is high in monounsaturated fatty acids, and contains vitamin E (tocotrienol and tocopherol) which are natural antioxidants. These antioxidants can reduce inflammation and oxidative stress of the skin [3]. This vegetable oil can penetrate the skin because the components in it are very similar to the skin's natural oils, and serve to maintain moisture and nourish the skin. Macadamia nut oil often used as a skin care product and anti-aging, and is safe to be made as a cosmetic product [4].

Our society highly values health and beauty. Thus, antiaging formulations are becoming increasingly popular. Number of companies utilizing nanomaterials sell antiaging products in the market which due to their unique property of beneficial

delivery to the skin renders extended efficacy. New technologies and techniques are creeping in the field of nanotechnology to improve the cosmetic market even more, although a lot of research and human studies in this field is required to obtain a real life data.

The development of macadamia nuts oil (MNO) in nanocream dosage form is very potential if it is related to the many properties possessed. Nanocream technology is also an effective method for releasing macadamia nuts oil as an active ingredient due to the small size of the droplet, so that it easily penetrates through the skin layer.

Therefore, in this study macadamia nuts oil nanocream was evaluated as a skin antiaging compared to conventional cream dosage forms.

Materials and Methods

Materials

The materials used in this study were macadamia nuts oil, Tween 80 (Bratachem), propylene glycol (Bratachem), cetyl alcohol (Bratachem), methyl paraben (Bratachem), propyl paraben (Bratachem), and distilled water.

Formulation of macadamia nuts oil nanocream

The formulation of nanocream followed the method described in Abdulkarim et al with slight modification. Oil phase was mixed using hotplate stirrer with 350 rpm speed at 55°C. Water phase: Methyl paraben and propyl paraben were dissolved in distilled water and then heated using hotplate. The solution was cooled and mixed with the surfactants, then stirred at 350 rpm using a magnetic stirrer. Water phase was added to oil phase by dripping method, then homogenized using magnetic stirrer at 2000-3000 rpm for 8 hours. The homogenized emulsion was stirred with a high shear stirring method for 30 minutes [2].

Formulation of conventional cream

The procedure to prepare the conventional cream was done following the same steps of nanocream but for the mixing process, it used mortar and stampfer instead of magnetic stirrer.

Antiaging activity evaluation

Antiaging activity evaluation using Aramo skin analyzer, with test parameters including measurement of moisture, pore, melanin and wrinkle levels. The

measurement was begun by measuring the initial conditions of the volunteers' skin, then the macadamia nut oil nanocream and conventional cream were applied every morning and evening. Once a week the changes were measured, resulting 4 times measurement in 4 weeks.

Data Analysis

All the data was presented as mean \pm standard deviation and statistically analysed using SPSS 17 software programme.

Results

Moisture level

Data from the measurement of moisture content on volunteer facial skin can be seen in Figure 1.

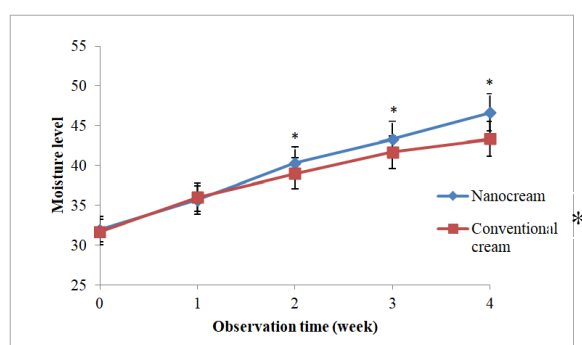


Figure 1: The moisture level of volunteers' facial skin in the treatment time. Data is presented as mean \pm SD with $n=3$ volunteers. * indicated significant difference between the formula

The initial moisture levels of the volunteers' facial skin ranged between 30 to 34 which were in the dry state category [5]. Based on the results of measurements of moisture as shown in Figure 2, the macadamia nuts oil nanocream formula promoted the moisture of the facial skin from the condition of the dry skin (0-39) being a normal skin (40-59) after 4 weeks treatment with an increase in moisture level of 45.83%. Meanwhile, the conventional cream showed the same results with an increase in moisture level of 36.84%. However, the value shown by F1 was significant higher than F2 since the second week which represented the effect of the nanosize of the cream was better than the conventional cream.

Pore size

Figure 2 showed the result of the pore size measurement. At the initial condition of the facial skin, it showed that the pore size of both groups of

volunteers were not significant different. It meant that there was no different between the pore size of the group treated with the nanocream formula and the group treated with the conventional cream formula. The skin pore size shrunk significantly after three weeks treatment with the macadamia nuts oil, either in nanocream or in conventional cream. The pore size also showed significantly difference between the formula after three weeks treatment. This result proved that there was influence of the nanocream to the pore size reduction compared to the conventional cream. In addition, the greatest percentage of decrease of the pore size was shown by the nanocream dosage form with 30.16%, whereby the conventional cream gave 23.26% only in 4 weeks treatment.

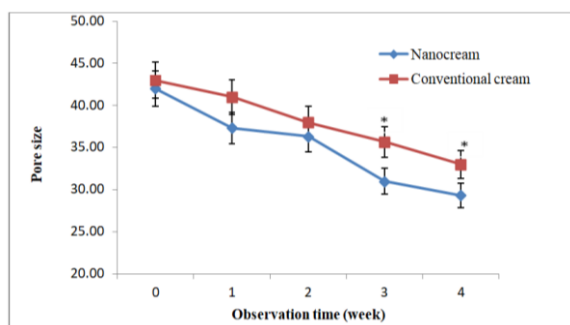


Figure 2: The pore size result of the facial skin after treated with macadamia nuts oil in nanocream and conventional cream. Data is presented as mean \pm SD with $n = 3$ volunteers. * indicated significant difference between the formula

Melanin

Based on the result of melanin measurement, it was shown in Figure 3 that the effect of macadamia nuts oil changed the condition of the facial skin from requiring treatment at the initial week to good condition after the second week and getting better every week. However, there was no significant difference between the two formula. The melanin reduction after the fourth week treatment for nanocream and conventional cream was 24.24% and 23.02%, respectively.

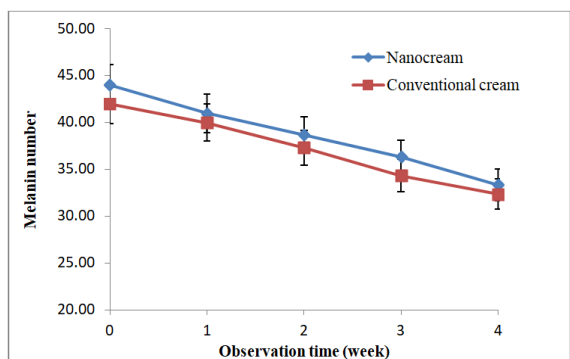


Figure 3: Melanin measurement after treated with macadamia nuts oil in nanocream and conventional cream dosage forms. Data is presented as mean \pm SD with $n = 3$ volunteers

Wrinkle

Obviously, there was no significant difference between the two dosage form. However, the wrinkle value declined through the treatment with macadamia nuts oil. The percentage of wrinkle reduction for both nanocream and conventional cream was 28.57% and 27.18%, respectively. It was started with requiring intensive treatment condition at the initial week and getting better to good condition state after 4 weeks treatment

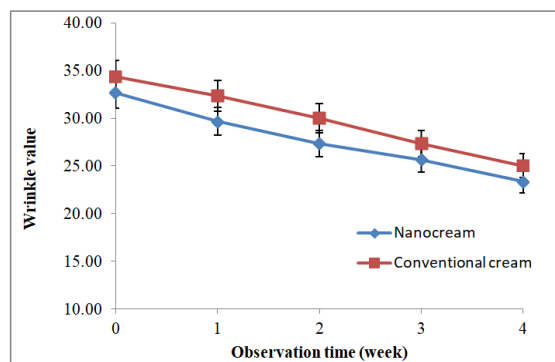


Figure 4: Wrinkle measurement after treated with macadamia nuts oil in nanocream and conventional cream dosage forms. Data is presented as mean \pm SD with $n = 3$ volunteers

Discussion

Macadamia nuts oil contains unsaturated fatty acids such as oleic acid, palmitic acid, palmitoleic acid, linoleic acid, sterol compounds and also vitamin E groups (tocopherol and tocotrienol) [6]. Both of the formula showed an increase in moisture level. The increase of the water level due to the contents of the macadamia nut oil such as oleic acid and tocopherol. Oleic acid is very good to soften the skin, for cell regeneration and to moist the skin [7]. Vitamin E is also known to have a water binding property which can keep the moisture level of the skin [8].

The pore size of the skin showed a reduction in both formula. Oil in the skin naturally affected the size of the skin pore. Body produced sebum or oil to prevent the skin from dryness. The skin pore will be large due to the reduction in elasticity and the accumulation of the skin dead cells. Activities which can increase the body temperature can also enlarge the pore size [9].

Macadamia oil contains palmitic acid. Palmitic acid is found in human sebum, but decreases dramatically in adulthood. Macadamia oil also contains a lot of oleic acid, which is great for softening the skin, regenerating skin cells, moisturizing the skin, and is a natural anti-inflammatory. Linoleic acid content helps restore skin barrier function and reduces transepidermal water loss (TEWL). Fatty

acids that are often used in cosmetics are palmitic acid, which is part of human skin sebum. Palmitic acid content contained in macadamia oil is widely formulated for skin care products [10]. Phytosterols are also found in macadamia nut oil with effective amounts which consist mostly of B-sitosterol, campesterol and stigmasterol. Phytosterol has a function similar to cortisone, which can reduce itching, redness, and soothe irritated skin [3].

The second main cell of epidermis (after keratinocyte) is melanocyte which is found in the basal layer. Pigment granules are synthesized in the melanocyte cells. The granules are usually called as melanosome. Melanosome contains brown biochrome which is called melanin. The number of melanins in the keratinocytes are responsible to determine the skin colour. Melanocytes protect the skin from the bad effect of sunlight. Otherwise, over exposure of sunlight can increase the melanosome and melanin production. More sunlight exposes to the skin causing the active production of melanin and resulting the brown colour spot on the skin [11]. Macadamia oil also contains squalene which benefits cell regeneration and is useful as an antioxidant by protecting the skin from UV-induced lipid peroxidation [3]. Macadamia oil has a good benefit value, moreover it is safe to be made as a cosmetic product [12].

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