EFFECT OF CURCUMA LONGA 0.5% EXTRACT ON SEBUM COMPOSITION AND SKIN MOISTURE IN DRY SKIN PATIENTS: A RANDOMISED STUDY

Rani Bachmid[*,1], **Faridha Ilyas**[*], **Sri Vitayani Muchtar**[*], **Ilham Jaya Pattelongi**[**], **Gemini Alam**[△] **and Khairuddin Djawad**[*]

[*]Department of Dermatology and Venereology, Faculty of Medicine, Hasanuddin University, Makassar, Indonesia, [**]Department of Biostatistic, Faculty of Public Health, Hasanuddin University, Makassar, Indonesia;, [△]Department of Pharmaceutical, Faculty of Pharmaceutical, Hasanuddin University, Makassar, Indonesia

ABSTRACT Introduction Dry skin is a problem for millions of people and often causes discomfort and even psychological stress. Curcuma Longa (C. Longa) has been known to affect in improving skin texture due to exogenous effects associated with dry skin. **Objective** This study aims to determine the effect of C.Longa 0.5% extract on sebum composition and skin moisture in patients with dry skin associated with premature ageing. The sample used was 13 women with a twice-daily application on the upper and lower arms of C.Longa extract and cream base ingredients as controls. Therapy response was measured using a skin analyser at weeks 1, 3 and 6. **Methods** The data in this study was obtained and will be processed by using computerised statistic program. The analysis used is descriptive analysis for mean and standard deviation of the moisturisation score and frequency distribution on criteria of sebum composition of stratum corneum at various time of observation. The amount of change of score with the Paired test, a difference of score change using Mann Whitney Test and to assess the difference of distribution using X2 test. **Result** Provision of C.Longa extract of 0.5% can improve sebum composition and skin moisture in dry skin patients when used for at least six weeks. **Conclusions and recommendations** Significant changes were obtained in the third week. The change in sebum composition by 87.5% was obtained at the sixth week. Although the change is only 50% in moisture score, it is enough to prove that there is an improvement in skin moisture. So we consider the use of longer than six weeks.

KEYWORDS: Curcuma Longa 0.5% extract, skin moisture, dry skin, skin sebum

INTRODUCTION

Dry skin is a problem for millions of people and often causes discomfort and even psychological stress. Clinical symptoms of dry skin include tight and stiff, rough, dull, scaly, itchy, redness and even pain. Dry skin mainly describes abnormalities in the stratum corneum of the epidermis.

DOI:10.5455/IJMRCR.curcuma-longa-sebum-dry-skin
First Received: April 30, 2018
Accepted: May 03, 2018
Manuscript Associate Editor: Cvetanka Hristova (BG)
Reviewers: Ivan Inkov (BG)
[1]Rani Bachmid, Department of Dermatology and Venereology, Faculty of Medicine, Hasanuddin University, Makassar, Indonesia E-mail:ranibachmid@yahoo.com

Various studies were conducted to obtain optimal dry skin management. One of them is by producing moisturiser that effectively increases the water content in the stratum corneum and. Even the market for moisturising products in the United States was ranked the most significant cosmetics sales of 1 billion dollars per year.[2]

Moisturizers work with an occlusive and humectant composition as well as components in Natural Moisturizing Factor (NMF). Occlusive compositions are physically blocking water loss from the surface of the skin while the humectant composition works by pulling water into the skin. The moisture-guarded skin can defend against the damage caused by the ageing process.3 In a study by Piccioni et al. (2017), it was found that anti-inflammatory and anti-oxidant moisturisers increased the secretion of sebum and hydration significantly and reduced erythema in subjects and increased moisture. [4]

In this study, we use yellow turmeric extract (Curcuma Longa) which has shown its usefulness as an antioxidant, anti-inflammatory, anti-carcinogenic, and antimutagenic.[5] Thus, these anti-oxidant and anti-inflammatory effects will affect skin moisture.

Scientific research that spans over four decades has confirmed the pharmacological effects of Curcuma Longa (C. Longa) and its ability as a chemopreventive agent and potential therapeutic agent against several chronic diseases. Curcuma Longa, almost two centuries old in scientific history, and still attracts researchers from around the world. Starting from 1815, when curcumin was first isolated from C. Longa, there were only a few reports until 1970 on chemical structure, synthesis, biochemical activity and antioxidants. However, after a report by Aggarwal and colleagues in the 1990s on its potential effects as anticancer, the research rate of C.Longa has overgrown, with more than 14,000 citations.[6]

Curcuma Longa has been known as the scavenger of most ROS, thus functioning as an antioxidant in normal cells. ROS contains oxidant free radicals and molecular oxidants. Free radical oxidants play a role in hydrogen abstraction and also in electron transfer reactions. The three active ingredients C.Longa can cause oxidative.6 In addition to potent antioxidants as effective as ROS scavenger, C. Longa also can inhibit lipid peroxidation.[7] In the extract, C. Longa obtained some free fatty acids such as palmitic acid, oleic acid, linoleic acid, palmitoleic acid, stearic acid and myristic acid and β-sitosterol and sterol stigma which contribute to the control of sebum production to moisturise the skin.[8]

Madalene Heng from America has been researching the target of the C.Longa signal pathway as the basis for anti-photoaging and anticancer therapy. Application of C.Longa gel on the subject of telangiectasis and pigment changes gives change after six months application. Other cases were found to change after 6-month of C. longa gel application on actinic keratosis. In patients with wrinkles, telangiectasis and erythema due to exposure to sunlight, it improves after ten months of use of C.Longa gel after sunscreen application. In this study found C. Longa has been shown to protect from trauma due to sunlight by reducing oxidative stress and suppress inflammation. C. Longa's ability to block multiple targets on this pathway serves as a basis that C. Longa has potential in the use of phytochemicals in photoaging skin and photocarcinogenesis. Inhibitor effects of C. longa on inflammation, premature ageing and photocarcinogenesis.[9]

Kaur and Nerves (2011), researches the effects of C.Longa on skin damage from ultraviolet radiation by measuring the levels of sebum and skin moisture. Kaur and Nerves using a 0.5% -2% cream extract of C.Longa on the subject with the same sun exposure activity for four weeks, showed elevated levels of sebum and moisture. C.Longa contains a moisture component that increases the penetration of the cream into the skin layer that keeps moisture and sebum levels of the skin.[5] This study aims to determine the effect of C.Longa 0.5% extract on sebum levels and skin moisture in patients with dry skin related to premature ageing.

MATERIALS AND METHODS

This research was conducted in RS. Wahidin Sudirohusodo (RSWS) and the network as a place of sampling which took place from December 2017 until January 2018. This study did not receive any financial support from any institutions.

This research uses clinical trial research design. The research variables consist of a free variable (Cream Extract C. Longa 0,5%), the dependent variable (Change of moisturisation score), moderator variable (exposure of ultraviolet ray), and variable between (change of sebum composition).

The population used is women aged 25-40 years with dry skin residing in RSWS and its network. The study sample was the entire accessible population that met the inclusion criteria. Patients who are willing to be samples of this research then fill out a statement of consent by signing informed consent then conducted data collection. Data collection is done by interview/anamnesis, physical examination, and application of the sample.

The data in this study obtained will be processed by using electronic statistic program. The analysis used is descriptive analysis for mean and standard deviation of the moisturisation score and frequency distribution on criteria of sebum composition of stratum corneum at various time of observation. The magnitude of the moisturisation score change and the sebum composition criteria at weeks 1.3 and six were tested with the Paired test in each group while the difference test of moisture score and the sebum composition criteria at weeks 1.3 and 6 used Mann Whitney Test. To assess the differences in humidity distribution and the normal sebum composition criteria of the skins of the three groups were used X2 test.

RESULTS

This study took the sample of 13 women aged 25-40 years (table 1). To know the effect of C.Longa 0,5% extract in the change of sebum composition compared with the control was done some test that is sebum composition analysis between group of C.Longa 0,5% extract with control at the beginning before treatment (table 2) and analysis of sebum composition change based on each stage of observation (table 3 and figure 1) In table 2 it can be seen that most sebum criteria Little (L), Little (M) and Much (L) are only small; respectively the percentage (84.6% vs 7.7% vs 7.7%). Each is evenly distributed in both groups; Little (L) respectively 28.2% in C.Longa extract group and 28.2% in control. Similarly to the criteria sebum Little (M) and Much (L). X2 test results show p = 1,000 (p> 0,05); meaning there is no significant distribution difference based on the sebum criteria in both groups. To see differences in the alteration of sebum criteria for both groups at each observation step (duration of use); then for analysis; the sebum criteria analysed were sebum with the Little (L) criterion, the number of samples most likely to be analyzed (n = 40). The results of the analysis can be seen in table 3 and figure 1.

Table 1 Sample characteristics

Characteristics		N	%
Age	25-30	6	46
	31-35	5	38
	36-40	2	8
Occupation	College students	69	
	9		
	Swasta	4	31

The change/improvement of the sebum conditions in the C.Longa extract group was faster than the control group, either

Table 2 Sebum Criteria Distribution in Both Groups

			Early Sebum Criteria			
			Little (L)	Little (M)	Much(L)	Total
Group	C.Longa	Total	22	2	2	26
	extract	% of total	28.2%	2,6%	2.6%	33,3%
	Control	Total	22	2	2	26
		% of total	28.2%	2,6%	2,6%	33,3%
Total		Total	66	6	6	78
		% of total	84.7%	7.7%	7.7%	100.0%
$X^2 \rightarrow$ P=1,000						

at the end of week 1 (10.0% vs 0.0%), week 3 (50.0% vs 31.3%) and week 6 (87.5% vs 43.8%). Although there was a difference in percentage change of sebum composition criteria between the two groups at the end of the 1st, 3rd and 6th weeks, but only significantly different (p <0.05) at the end of week 6. (Table 3).

The percentage change of Sebum criteria from Little (L) to Much (H) in the C.Longa extract group increased almost linearly with duration of intervention and was higher than for changes in the control group; this suggest6666s that the C.Longa extract accelerates the repair of skin sebum conditions rather than controls (Figure 1).

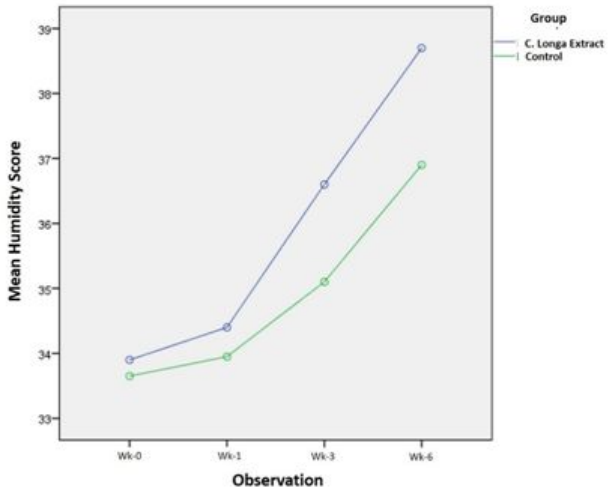

Figure 1: Criteria change the percentage of Sebum from Little (L) to Much (H) based on observation stage (length of intervention) in both groups

To observe the effect of C.Longa 0,5% extract for skin moisture score change, there are several tests that is the skin moisture score change in both groups at each stage of usage (table 4 and figure 2) and the analysis of normal skin moisture distribution category at each stage of usage (figure 3 and table 5).

At the end of week-1, there was a significant increase in skin moisture score in the 0.5% (P <0.05) group of C.Longa extract on

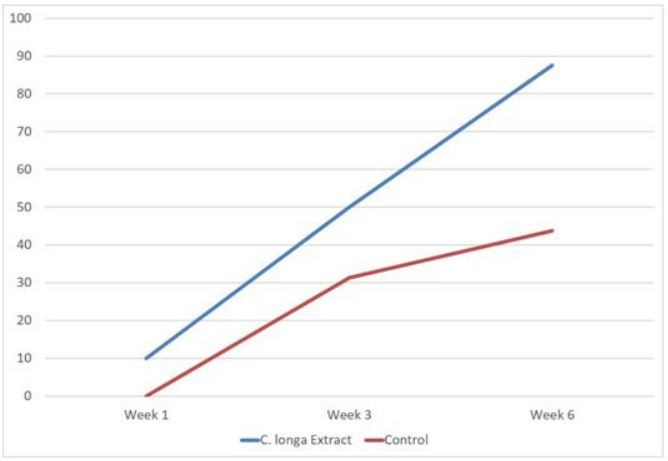

Figure 2: Change of skin moisturization in each group and stage of observation

average by 0.38±0.77 from 34.25±1.62 to 34.63±1.41; whereas in the control group there was no significant increase (p> 0.05) averaging 0.04±0.55 from 34.08±1.50 to 34.13±1.48. Furthermore, at the end of the 3-week increase in skin moisture score became even higher in each group (p <0.05). In the extract group C. Longa 0.5% increase in the score of 2.70±1.22 from 33.90±1.45 to 36.60±0.88 while the control only increases of 1.20±1, 51 from 33.75±1.33 to 34.95±1.40. At week six it increased by 4.80±2.38, and in the control group, there was an increase of 2.50±1.79 from 33.75±1.33 to 36.25±1.59 (Table 4).

There was an increase in skin moisture score in both groups based on length of treatment. A score of skin moisture in group given C.Longa extract had the highest curve and lowest control. The moisture-level curve of the C.Longa extract group is above the control curve, since the end of week-1 and is getting separated by the end of week-6. This means that the increase in skin moisture score in the C.Longa extract group is 0.5% faster than control either at week 1, 3 or 6. (Figure 2)

Increased skin moisture scores occurred in the C.Longa extract group from the end of 1-week, and the increase in scores was higher at the end of 3 weeks and more significant by the end of the 6th week than the increase in skin moisture score in the control group.)

At the end of the 3rd week, the extract of C.Longa 0.5% in dry skin patients has only reached 5% which can be categorised

Table 3 Sebum Criteria change based on observation (length of intervention) in both groups

Groups	Criteria Change Presentation of Litle (L) to Much (H)			P
	End of Week1	End of week3	End of week6	
C.Longa Extract	10,0%	50,0%	87,5%	0,027
Control	0,0%	31,3%	43,8%	
X2 test, Similar superscribe on the same column shows insignificant change P>0,05, while different superscribe shows significant change P<0,05				

Table 4 Change of skin moisturization in each group and stage of observation

The range of Observation Stage	Group	Mean±SD Score Skin Moisture			P value
		Before	After	Difference	
End of Week 1	C.L extract (n=24)	34,25±1,62	34,63±1,41	0,38±0,77	0,026
	Control (n=24)	34,08±1,50	34,13±1,48	0,04±0,55	0,714
Start of week 3	Extract C.L(n=20)	33,90±1,45	36,60±0,88	2,70±1,22	<0,001
	Control (n=20)	33,75±1,33	34,95±1,40	1,20±1,51	0,001
Start of week 6	C.L extract (n=20)	33,90±1,45	38,70±1,63	4,80±2,38	<0,001
	Control (n=20)	33,75±1,33	36,25±1,59	2,50±1,79	<0,001
*Paired sample t-test					

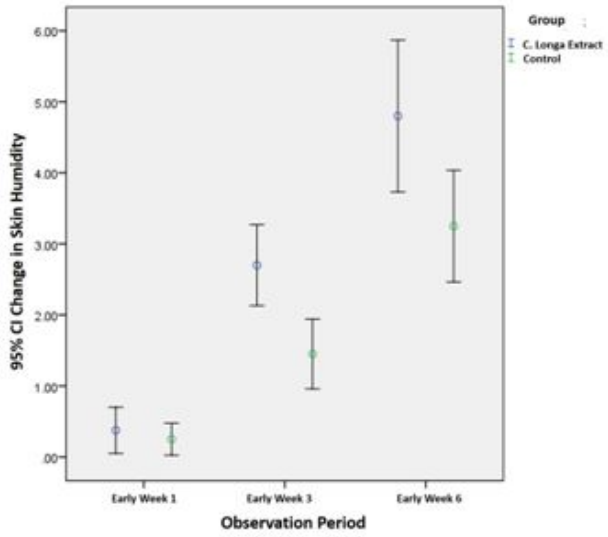

Figure 3: Increased Skin Moisture Score at the end of week 1,3, and 6 in three groups

as normal skin moisture and is no different from the control (the essential ingredients of the cream). The new difference occurred at the end of the 6th week wherein the extract group C.Longa 0.5% reached 50% while in the control group only reached 25% (Table 5).

Table 5 The skin Moisture distribution normal category in each stage of observation

Observation Stage	Distribusi Kelembaban Kulit (Normal)	
	C.Longa Extract	Control
Week-3 (n=20)	1 (5,0%)	1 (5,0%)
Week-6 (n=20)	10 (50,0%)	5 (25,0,%)

DISCUSSION

In this study 13 women who have dry skin where the subjects aged 25-40 years. This study was conducted for six weeks where the initial examination before the application of cream and then after the application of the cream of week 1, 3 and 6. This corresponds to a skin regeneration process that lasts for 21 to 28 days. According to Nelson and Thiboutot (2012), the period of the sebaceous glands in removing lipids (holocrine secretion) is 21-25 days.[10]

Premature ageing can be caused by the presence of free radicals that can cause oxidative stress that triggers premature ageing, one of which decreases sebum gland function. The composition of sebum on the surface of the skin, where it consists of triglycerides, free fatty acids, wax, squalene, sterols and glycophospholipids. In human sebum plays an essential role in protecting the skin from microorganisms and hazardous chemicals. It also potentiates the skin's emollient function by retaining water. Excess sebum production, on the other hand, results in oily skin that can cause acne and seborrhoeic dermatitis.

Research by Zaman and Akhtar (2013), aims to formulate

a cream containing turmeric extract and evaluate its effect on sebum secretion in human volunteers. The volunteers come to the laboratory every two weeks for measurement. On the sebum, the face suggests that along with other applications of turmeric for medicinal purposes to improve skin conditions, potent extract creams can be used to control sebum production in human skin. People with excessively oily skin or acne will be beneficial.

The skin moisture content was found to be significant at week 3 and increased again at week six on the use of both C.Longa and control extracts. This is by a study by Plianbangchang et al. (2013), which found the anti-oxidant effects of C.Longa extracts that can maintain skin moisture and elasticity. The study was conducted on 33 women with C.Longa for four weeks on the face.[11]

UV plays a significant role in causing premature ageing, where early signs can be dry skin.11 UV radiation is a generator of ROS and reactive nitrogen species (RNS) that play a role in causing biological effects.

Dysfunction of lipid matrix due to exposure to sunlight causes premature ageing characterised by dry skin, wrinkles and freckles on the skin. For this purpose, moisturisers generally contain lipids and mixtures that are emollient, humectant and or occlusive. Moisturizers containing anti-inflammatory and antioxidants can minimise the inflammatory reaction and modulate vascular reactivity. In the study by Piccioni et al. found that moisturisers containing anti-inflammatory and anti-oxidants increased sebum and hydration secretion significantly where the reduction of erythema in the subject and increased moisture.[4]

Curcuma Longa as a phosphorylase kinase inhibitor plays a role in preventing UV-induced trauma by minimising post-traumatic inflammation.[9] The lipid layer on Curcuma Longa can penetrate the thickest part of the skin which retains skin moisture by maintaining hydration in the epidermal stratum corneum.[12]

In this study, there was a significant improvement in C.Longa extract preparation compared with control. In general, curcumin produces anti-inflammatory and antiproliferative activity. Polyphenols in C.Longa act as potent antioxidants and ROS breakers such as free radicals, superoxide radicals, hydroxyl radicals, hydrogen peroxidase and single oxygen. A very beneficial effect on moisture is obtained from the alignment of antioxidants, anti-inflammation, and protective agents contained in the preparation, in this case, the lipid content and mixing agent extracts.[12]

However, there are some limitations in this study. First, the treatment period in this study may not be sufficient to show the optimal THD extract towards sebum concentration and skin moisture. This study also only examines one type of preparation and concentration. Further studies with longer treatment period comparing different types of preparations and concentrations need to be conducted.

CONCLUSION AND RECOMMENDATIONS

Researchers concluded that dry skin does not only occur in people with skin disorders but related to environmental factors. Therapy is also aimed at improving the function of a barrier to reduce patient discomfort. Curcuma Longa as an antioxidant and anti-inflammatory role in sebum and skin moisture to maintain skin hydration. At week six it was found that the improvement of sebum composition was 87.5% and the skin moisture was only 50%, but it was enough to prove that the use could provide improvement. Extracts of C.Longa 0.5% faster-improved sebum composition and skin moisture compared to controls. The authors suggest that follow-up studies with higher levels of turmeric cream, longer time, preparations and different parameters.

AUTHORS' STATEMENTS

COMPETING INTERESTS

The authors declare no conflict of interest.

REFERENCES

1. Egelrud, T. 2000. Desquamation. In: M., L. & Maibach, H. I. (eds.) Dry Skin and Moisturizer, Chemistry and Function. Boca Raton, London, New York, Washington, DC.: CRC Press.

2. Bauman, L. 2002a. Basic Science of the Epidermis. In: Baumann, L. & Weisberg (eds.) Cosmetic Dermatology: Principles and Practice. New York: The McGraw-Hill Companies.

3. Warner, R. R. & Boissy, Y. L. 2000. Effect of Moisturizing Product on the Structure of Lipid in the Outer Stratum Corneum of Human. In: Loden, M. & Maibach, H. I. (eds.) Dry Skin and Moisturizer, Chemistry and Function. Boca Raton, London, New York, Washington, DC.: CRC Press.

4. Piccioni, A., García-Rodrigo, C. G., Pellegrini, C., Mazzocchetti, G. & Fargnoli, M. C. 2017. Improving Skin Aging, Skin Hydration and Sensitive Skin with Four Specific Skin Care Products: Results from a Single-Centre, Observational, Prospective Study. J of Cosm, Dermatol Scie App, 7, 48-56.

5. Kaur, C. D. & Saraf, S. 2011. Topical Vesicular Formulations Of Curcuma Longa Extract On Recuperating The Ultraviolet Radiation–Damaged Skin. J Cosmet Dermatol, 10, 260-265.

6. Priyadarsini, K. I. 2014. The Chemistry of Curcumin: From Extraction to Therapeutic Agent. Molecules J, 19, 20091-20112.

7. Barzegar, A. & Moosavi-Movahedi, A. A. 2011. Intracellular ROS Protection Efficiency and Free Radical-Scavenging Activity of Curcumin. RIFS, 6, 1-7.

8. Zaman, S. U. & Akhtar, N. 2013. Effect of Turmeric (Curcuma longa Zingiberaceae) Extract Cream on Human Skin Sebum Secretion. Trop J Pharm Res, 5, 665-9.

9. Heng, M. C. Y. 2010. Curcumin Targeted Signaling Pathways: Basis For Anti-Photoaging And Anti-Carcinogenic Therapy. Int J Dermatol, 49, 608-622.

10. Nelson, A. M. & Thiboutot, D. M. 2012. Biology of Sebaceous Glands. In: Goldsmith, L. A., Katz, S. I., Gilchrest, B. A., Paller, A. S., Leffell, D. J. & Wolff, K. (eds.) Fitzpatrick's Dermatology in General Medicine. 8th ed. New York: Mc Graw Hill.

11. Plianbangchang, P., Tungpradit, W. & Tiyaboonchai, W. 2013. Efficacy and Safety of Curcuminoids Loaded Solid Lipid Nano particle Facial Cream as an Antiaging Agent. U of Tech Biodi, 1-10.

12. Saraf, S., Jeswani, G., Kaur, C. D. & Saraf, S. 2011. Development Of Novel Herbal Cosmetic Cream With Curcuma Longa Extract Loaded Transfersomes For Antiwrinkle Effect. Afr. J. Pharm. Pharmacol., 5, 1054-62.