Research article

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Researching on manufacturing vaseline skin moisturizer

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Abstract

Introduction: Nowadays, moisturizer products based on formulas containing vitamin C and vitamin E are limited. The research was conducted to meet the demand for skincare product with moisturizing, brightening and softening properties.

Aim: This study was carried out to develope a vaseline moisturizer formula containing vitamin C and vitamin E, and develop quality criteria according to the Vietnam Pharmacopoeia V.

Materials-Methods: The reseach investigated of formula ingredients: the influence of lipophilic excipients (vaselin, lanolin, cetyl alcohol), emulsifiers (Span 80 and Tween 80), investigating the parameters of homogenized speed and time. Then these products were evaluated based on semi-finished products and finished products.

Results: The formulation for Vaseline moisturizer consisted of vitamin C, vitamin E, span 80, vaselin, lanolin, propylene glycol, dinatri edetat and citrate buffer solution. The moisturizer manufacturing procedure was formulated. Product quality indicators included: appearance, pH, finished product testing (mass uniformity quantity, uniformity, and quality of vitamin C and vitamin E).

Conclusion: The result of the study provided the moisturizing cream formula with active ingredients vitamin C and vitamin E that met quality requiments.

Keyword: Emulsion, moisturizer, vitamin C, vitamin E.

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1. INTRODUCTION

Skin plays many functional roles and creates aesthetic beauty for humans. Therefore, skin care is a necessary need [1]. To have healthy and beautiful skin, in addition to diet and exercise, it is essential to combine it with skin care products, especially quality moisturizers [2].

Many products on the market use vaseline as a moisturizer for the skin, for example, Vaseline Chapped cream (Le Huu Trac Burn Institute), Vaseline moisturizing cream (Military Medical Academy), Vaseline pure (OPC Pharmaceutical Joint Stock Company), Vaseline Pure Petroleum Jelly - Vaseline Original, Mustela Stelatopia Emollient Cream,…

In addition, some preparations combine with vitamin C and vitamin E. These active ingredients have skin-lightening, anti-inflammatory, and antioxidant effects, help to strengthen the skin's protective barrier and prevent dehydration, slowing down the aging process. However, research on products formulated with vaseline, vitamin C, and vitamin E is limited. Therefore, this research meets consumer demand for a cream product with moisturizing, skin-brightening, and antioxidant effects [2] with two goals:

1. Develop the formula and process for preparing vaseline moisturizer cream.

2. Evaluate the moisturizer cream quality according to the quality standards of Vietnamese pharmacopoeia V.

2. MATERIALS-METHODS

2.1. Materials

Materials: The research used some materials such as: vaseline (China), lanolin (China), cetyl alcohol (China), span 80 (China), vitamin E

(China), vitamin C (China), propylene glycol (China), disodium EDTA (China).

Standard substances: Ascorbic acid (lot number QT016 100420) and α - tocopheryl acetate (lot number QT064 160122) are from Ho Chi Minh City Drug Testing Institute.

Equipment: High-speed stirrer (T25 digital Ultra-Turrax, IKA - Germany), Centrifuge (D-78564 Wehingen, Hermle - Germany), Orion Star A211 pH meter (Thermo Scientific - Indonesia) are the main equipments used.

The research was conducted at the Faculty of Pharmacy, Pham Ngoc Thach University of Medicine.

2.2. Methods

2.2.1. Develop the moisturer cream formula

The expected formula for a sample size of 100 g composes of vaselin (50 g), lanolin (15 g), cetyl alcohol (2 g), span 80 (4 g), vitamin E (1 g), vitamin C (10 g), propylen glycol (4 g), tri-sodium citrate dihydrate (4 g), dinatri EDTA (1 g), distilled water (sufficient 100 g) [3].

2.2.1.1. Investigate the influence of excipients

Keep other excipients unchanged, change the composition of the lipophilic excipients to investigate the influence of the oil phase on the formulation. The composition of the lipophilic excipients is presented in Table 1.

Table 1. The composition of the lipophilic excipients

Ingredients	Formulas				
	1	**2**	**3**	**4**	**5**
Vaselin (g)	50.0	50.0	50.0	50.0	50.0
Lanolin (g)	15.0	15.0	10.0	6.0	4.0
Cetyl alcol (g)	2.0	1.0	-	-	-

2.2.1.2. Investigate the influence of emulsifiers

The emulsifier mixture from 3%, 4% and 5% are presented in Table 2.

Table 2. The emulsifier mixture of span 80 and tween 80

Ingredients	Formulas					
	5	**6**	**7**	**8**	**9**	**10**
Span 80 (g)	3.0	2.8	4.0	3.7	5.0	4.6
Tween 80 (g)	-	0.2	-	0.3	-	0.4

2.2.2. Develop a preparation process

2.2.2.1. Process description

Firstly, the oil phase was made by weigh and melt the mixture of vaseline and lanolin (1). Add span 80 in mixture (1) and stir well (2). Combine vitamin E with mixture (2) and homogenize with appropriate speed and time. After that, the water phase was prepared by dissolving propylene glycol with enough distilled water, heat the mixture for the appropriate time and temperature. Add the mixture containing vitamin C and sodium EDTA. Stir well. Then, homogenize the oil phase and water phase by slowly mix the water phase into the oil phase [3], [4]. Finally, the product is packaged in the 15 g bottle.

2.2.2.2. Survey the parameters

The mixing speed and time were surveyed as follows:

- Oil phase: stirring at 3000, 4000, and 5000 rpm for 3, 5, and 7 minutes, respectively.
- Water phase: stirring at 400, 500, and 600 rpm for 30, 60, and 90 seconds, respectively.
- Homogenization: the two-phase mixing time was investigated for 3, 5, and 7 minutes at speeds of 7000, 8000, 9000, 10000, and 11000 rpm, respectively.
- Evaluate each sample to select appropriate parameters based on the following criteria:

+ Appearance: the cream is milky white, odorless, smooth, uniform, does not separate under normal conditions.

+ pH: the pH of the cream is determined using pH indicator paper. The pH of the product must be between 4 and 6 (the indicator paper changes color between 4 and 6).

2.2.3. Product testing

Testing criteria and testing methods according to Vietnam Pharmacopoeia V include appearence, mass uniformity, uniformity, vitamin C and vitamin E identification. In addition, cream stability was also carried out at 30 oC ± 2.

2.3. Data processing methods

Each experiment was repeated three times. MS Excel 2010 was used to analyze data.

3. RESULTS

3.1. Results of developing the moisturizer cream formula

After investigating the changes in lipophilic excipients and emulsifiers, the appearance, physical and stability of the cream were evaluated. The results are presented in Table 3 and 4.

Table 3. Results of surveys on the influence of lipophilic excipients

Characteristics	Formulas				
	1	2	3	4	5
Visual appearance	Not smooth	Smooth	Smooth	Smooth	Smooth
Physical	Hard	Hard	Slightly hard	Slightly hard	Slightly hard
Physical stability	Seperation	Separation	Separation	Separation	Lightly separation

As a results, cream prepared from formula 5 has better appearance and stability than others.

Table 4. Results of investigating the influence of emulsifiers

Characteristics	Formulas					
	5	6	7	8	9	10
Visual appearance	Smooth	Smooth	Smooth	Smooth	Smooth	Smooth
Physical	Slightly thick	Slightly thick	Slightly soft	Soft	Slightly thick	Soft
Physical stability	Lightly separation	Separation	Stability	Lightly separation	Separation	Separation

It can be seen that, formula 7 can be use to prepare vaseline moisturizer cream.

Finally, the composition of vaseline moisturizer formula is vaselin (50 g), lanolin (4 g), span 80 (4 g), vitamin E (1 g), vitamin C (10 g), propylen glycol (4 g), Tri-sodium citrate dihydrate (4 g), dinatri EDTA (1 g), distilled water (sufficient 100 g).

3.2. Results of developing the preparation process

Table 6 shows the investigating results of the speed and mixing time of the oil phase. As can be seen, the oil phase can be mixed at a speed of 5000 rpm for 3 minutes.

Table 6. The investigating results of the speed and mixing time of the oil phase

Time (minutes) / Speed (rpm)	3	5	7
3000	-	-	+
4000	-	+	+
5000	+	+	+

(-): Irregular, (+): even

Table 7 shows the investigating results of the speed and mixing time of the water phase. The water phase can be mixed at a speed of 600 rpm for 60 seconds.

Table 7. The investigating results of the speed and mixing time of the water phase

Time (seconds) / Speed (rpm)	30	60	90	120
200	-	-	-	+
400	-	-	+	+
600	-	+	+	+
800	-	+	+	+

(-): Does not dissolve, (+): dissolves

Table 8 shows the investigating results of the homogenization speed and time. As a result, the two-phase can be homogenized at 10.000 rpm for 5 minutes.

Table 8. The investigating results of the homogenization speed and time

Time (minutes) / Speed (rpm)	3	5	7
7000	-	-	-
8000	-	-	+
9000	-	-	+
10000	-	+	+
11000	-	+	+

(-) Not uniform, (+): homogeneous

Vaselin cream is then evaluated about the appearance and pH.

Appearance

Vaselin cream meets the requirements of color (opaque white), odor (odorless), smooth, homogeneous and non phase-separation under normal storage conditions.

pH

The results show that the indicator paper changes color in the pH range of 4 - 5 (Figure 1), meeting the pH requirements of topical use products (pH of 4 - 6).

Figure 1. Results of pH testing

3.3. Vaselin moisturizer cream quality testing results

Appearance

Vaselin cream meets the requirements of color (opaque white), odor (odorless), smooth, homogeneous and non phase-separation under normal storage conditions.

Mass uniformity

The weight of vaselin moisturizer cream are presented in Table 9.

Table 9. The weight of vaselin moisturizer cream

Sample	Packaging unit weight (g)	Container weight (g)	Cream weight (g)
1	21.74	6.72	15.02
2	21.65	6.67	14.98
3	21.63	6.63	15.00
4	21.63	6.70	14.93
5	21.70	6.72	14.98

The product meets the mass uniformity within the value range ± 10% (13.5 g - 16.5 g).

Uniformity

No particles can be seen in all 4 sample units when observed with the naked eye. Therefore, the product meets the requirements for uniformity.

Identification of vitamin C

+ pH value of the extract containing vitamin C after testing with pH indicator paper is about 2-4 that was described in Figure 2.

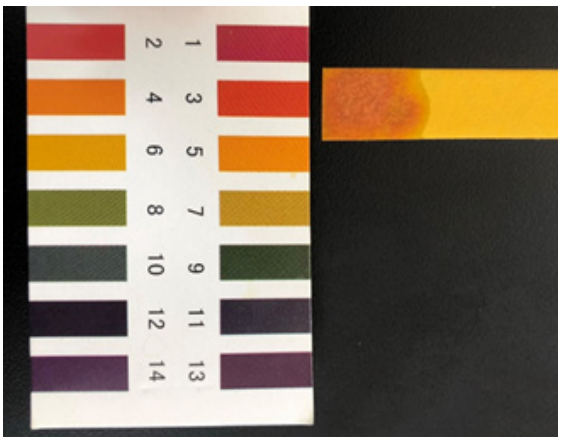


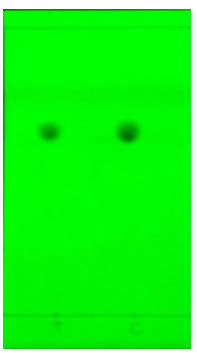
Figure 2. pH value of the extract containing vitamin C

+ Dissolve the cream with water, then filter and obtain the extract, react with 2% silver nitrate. As a result, a dark gray precipitate appeared (Figure 3).

Figure 3. The dark gray precipitate of the identification chemical reaction of vitamin C

- The filtrate of the test sample is subjected to thin layer chromatography with ascorbic acid standard solution.

Figure 6 is the chromatogram image of the filtrate of the test sample and ascorbic acid standard solution. It can be seen that the sample and the standard had the same Rf (0.64). That mean the sample of vaselin cream has vitamin C (Figure 4).

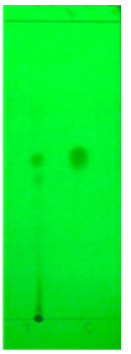


Thin plate: silica gel 60 F254
Developing solvent: ethanol-water (6:1)
Sample solvent: water
Standard sample: ascorbic acid 5% in water
Detection: UV 254 nm
Standard Rf = 0.64
Test Rf = 0.64

Figure 4. Chromatography results in vitamin C identification

Identification of vitamin E: The filtrate of the test sample is subjected to thin layer chromatography with vitamin E standard solution.

Figure 5 is the chromatogram image of the filtrate of the test sample and vitamin E standard solution. The result shows that the sample and the standard had the same Rf (0.55). That mean the sample of vaselin cream has vitamin E.



Thin plate: silica gel 60 F254
Developing solvent: n-hexane : chloroform (1:1)
Sample solvent: acetone
Standard sample: α-tocopherol 2% in acetone
Detection: UV 254 nm
Standard Rf = 0.55
Test Rf = 0.55

Figure 5. Chromatography results in vitamin E identification

Stability

The stability of the vaseline cream was monitored for 30 days at room temperature (30°C ± 2).

- Appearance: vaselin cream shows the opaque white color, odorless, smooth, homogeneous and non phase-separation.

- Uniformity: no particles were found in the survey samples.

- pH: the pH of the cream extract is about 2-4 that was showed in Figure 6.

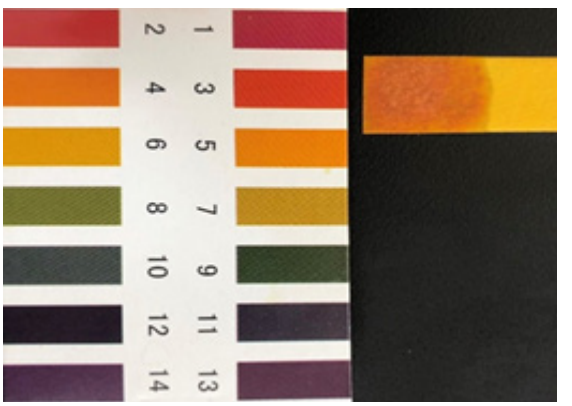


Figure 6. pH value of the extract containing vitamin C

4. DISCUSSION

In this study, vaseline had a moisturizing effect on the skin. In addition, it also has the role of forming a soft and smooth texture, creating the

ability to adhere to the skin. To complete this role, there is also the combination of other excipients such as lanolin, cetyl alcohol, propylene glycol. In a similar study, these excipients were also combined in the cream formulation [5].

Differences in ingredients and preparation methods have contributed to the forming of moisturizers cream. Result shows that formula 7 with 4% span 80 can created the stable cream.

Vitamin C and vitamin E are substances that are easily oxidized. Besides, formulas containing vitamin C is difficult for preservation because the stability of vitamin C depends on environmental temperature and pH. Dissolving vitamin C in distilled water for 60 seconds at 600 rpm is the shortest time for vitamin C to dissolve and minimize oxidation because of high temperature. Preparations containing vitamin C should be kept in sealed packaging, avoid prolonged exposure to air. Vitamin E helps soften the skin and increase the stability of vaselin cream.

It is difficult to homogenize two phase at low stirring speed (7000 rpm). Increasing the stirring speed to 8000 - 9000 rpm within 7 minutes can make the mixture homogenize. Extended homogenization times do not produce a more durable, stable emulsion. Surveys have shown that a mixing speed of 10,000 rpm for 5 minutes can create a stable and homogeneous emulsion system.

Stability of the product was preliminarily investigated for 30 days at 30 oC ± 2 because of time limited of the research. As a result, the vaseline cream was stable during this period. The skin irritation testing did not perform yet because the objective of this research is to develop a formula and preparation process. In addition, this criteria is referenced through the results of other studies. It is showed that all the exipients as well as vitamin C and vitamin E are often used in topical formulation and perform the skin protective effect [3], [6], [7].

5. CONCLUSION

This research developed a vaseline moisturizer formula containing vitamins C and E. The resulting formula meets physical requirements and quality criteria according to Vietnamese Pharmacopoeia V.

REFERENCES

1. Dąbrowska, AK, et al. The relationship between skin funformulaion, barrier properties, and body - dependent factors. Skin Research and Technology 2018;24(2):165-74.
2. Hodges, Ashley L and Walker, Deborah K. Skin care for women. Nursing for women's health 2016;20(6):609-13.
3. Huỳnh Văn Hoá, Lê Thị Thu Vân. Bào chế và sinh dược học. Tập 2. Nhà xuất bản Hà Nội, Hà Nội; 2014:55-88.
4. Nguyễn Thị Kim Liên và Chế Quang Minh. Xây dựng công thức gel nhũ tương Dầu Olive dùng ngoài. Journal of Science and Technology 2020;3(4):64-69.
5. Huỳnh Thị Mỹ Duyên, Lê Thị Minh Ngọc, Bùi Kim Ngân. Xây dựng công thức bào chế kem hỗ trợ kháng viêm từ dược liệu Trà xanh (Camellia Sinensis L., Theaceae), Ổi (Psidium Guyjava L., Myrtaceae) và Rau má (Centella Asiatiaca L,. Apiaceae). Tạp chí Y Dược học Cần Thơ 2023;số 62:57-64.
6. Dreher F, Gabard B, Schwindt DA, Maibach HI. Topical melatonin in combination with vitamins E and C protects skin from ultraviolet-induced erythema: a human study in vivo. Br J Dermatol 1998 Aug;139(2):332-9.
7. Murray JC, Burch JA, Streilein RD, Iannacchione MA, Hall RP, Pinnell SR. A topical antioxidant solution containing vitamins C and E stabilized by ferulic acid provides protection for human skin against damage caused by ultraviolet irradiation. J Am Acad Dermatol 2008 Sep;59(3):418-25.