



OPTIMIZATION OF PLACUNA PLACENTA COLLAGEN SERUM ON ADOLESCENT SKIN

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ABSTRACT

Placuna placenta has a unique character among other types of shells due to its thin and wide shell shape. The protein contained in Placuna placenta is 71% which can be used as skin nutrition. Its application to the skin can be done through collagen serum preparations. The aim of this study was to optimize the Placuna Placenta serum collagen in adolescent skin. The current research was done through an experimental study of a post-test control design in the form of a post-only controlled group design with five treatment groups with each group consisting of five skins of adolescent arms. The negative control group was given a serum base that was applied to the skin of the adolescent arm. The positive control group was given serum product x®. The test group was given Placuna Placenta shell collagen serum with the concentrations of 10%, 15% and 20%. The results showed that collagen serum can irritate the skin. In addition, the optimization of the serum collagen concentration of Placuna Placenta in adolescent skin is at a concentration of 15%. It can be summed up that optimizing the use of collagen serum on adolescent skin is a challenge in the formulation because it is beneficial for adolescent skin nutrition.

Keywords: optimization of placuna placenta collagen serum; placuna placenta collagen serum formula; youth skin moisturizer

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INTRODUCTION

Placuna placenta is a type of seasonal shellfish. Placuna placenta shell by the people around Rowosari, Kendal as waste. According to (Ariyanti et al. 2019), this inadequate use of waste can be done by researching the content and formulation of the placenta Placuna shell. The use of placenta Placuna shells can be processed into pharmaceutical preparation formulations for the skin as a source of vitamins and collagen (Fawzya et al. 2016). Placuna placenta has collagen content of approximately 30% of the total other contents (Singh, P., Benjakul, S., Maqsood, S., & Kishimura 2011). Collagen functions as a builder of tissues and organs, especially in the skin so that nutrition and skin elasticity are maintained (Lee et al., 2001). In the skin, collagen can be useful as a moisturizer and makes the skin look firmer and moisturized (Ariyanti, Ariyanti et al. 2019).

Placuna placenta collagen in this study was made into a pharmaceutical preparation in the form of a serum to facilitate application to the skin. Placuna placenta collagen serum is a preparation containing high concentrations of collagen but low viscosity. The active substance is delivered by forming a thin film on the surface of the skin. The Placuna placenta collagen

preparation formulation is suitable because it is able to penetrate the skin layers to provide a therapeutic effect to nourish the skin because it can penetrate the main components of the dermis layer of skin (the lower part of the epidermis) which is made by fibroblast cells (Ariyanti, Ariyanti et al. 2019; Chandira, R.M., Pradeep, A Pasupathi., Bhowmik, D., Chinjaranjib, B Jayakar., Tripathi, K K., Kumar 2010). The purpose of this study was to determine the optimization of each concentration when the serum was tested for moisture on adolescent skin.

METHOD

This research was conducted with an experimental design with the design of the post test only controlled group design. This design adds positive and negative control groups and 3 treatment groups. The resulting data were analyzed in one way ANOVA. The equipment used in this study included: beaker glass, oven, stirring rod, glass funnel, measuring cup, filter paper, centrifuge, analytical scales, pH meter, dropper pipette, measuring flask, skin moisture detector. The main raw material for this research is green clam shells taken from a fish auction in the Bandengan area, Kendal City. The chemicals used are NaOH, Acetic Acid, NaCl, Na EDTA, Xanthan Gum, Glycerin, Methyl Paraben, aquadest.

Research Implementation

Reagent preparation: 0.1 M NaOH; CH₃ COOH 0.75 M; NaCl 0.9 M. Preparation of the placenta Placuna shell raw material was carried out by dry and wet sorting. Collagen isolation was carried out by removing non-collagen protein (deproteinase) by cleaning and pollinating the placenta. The collagen extraction process (deacetylation) was carried out by means of collagen extraction carried out by immersion in acetic acid according to modified Muyonga et al., (2004). The sample was weighed twice, with a ratio of sample weight and solution volume of 1:10 (w / v), then given the treatment code A. Treatment A was macerated in 0.75 M acetic acid macerated for 3 days then filtered and took the filtrate. The results of the filtering of treatment A are then precipitated by salting out by adding 0.9 M NaCl. Then centrifuged for 10 minutes at a speed of 10,000 rpm to precipitate the fibers of the wet collagen residue. The results of the separation are then filtered and oven at 60oC for one day to obtain dry collagen. The dry collagen is then weighed (Nurhayati, Tazwir 2013). The results are calculated the collagen yield.

Evaluation of serum preparations

Organoleptic

The preparation was observed including odor, color and consistency of the preparation and repeated organoleptic testing for each formula five times each (Fawzya et al. 2016).

Homogeneity

The homogeneity test was carried out by means of the serum weighed \pm 0.1 g then placed on a glass object and covered with another glass object, then the serum preparation was given a load of 1 kg for 5 minutes, after which it was observed with a magnifying glass (Ariyanti et al., 2019).

Serum pH testing

The pH examination is carried out by immersing the electrode in 1 g of serum preparation diluted with distilled water up to 10 mL (Ariyanti et al., 2019).

Skin evaluation

According to Khasanah (2018), skin evaluation is an organoleptic examination including observing shape, color, smell.

Skin moisture

Measurement of humidity is using a skin moisture tester (skin detector) which is measured after giving collagen serum to the skin.

Data analysis

The test results were analyzed descriptively, unvariably and bivariately with SPSS 23.0 using ANOVA.

RESULTS

Results of Green Seashell Collagen Extraction

Placuna placenta collagen extraction yield is the ratio between the amount of final collagen and raw materials. The yield of total collagen waste from green clam shells using the maceration method can be seen in Table 1.

Evaluation Results of Green Seashell Collagen Serum

Evaluation of green clam shell collagen serum included organoleptic, homogeneity, and pH test. The results of the evaluation of green scallop shell collagen serum can be seen in table 2.

Table 1.
 Results of Placuna placenta serum collagen yield

Dry Shell	Collagen Shell	Rendemen
1000 gram	33,112 gram	3,46%

Table 2.
 Evaluation results of the physical characteristics of placenta Placuna serum collagen

Observation	Results Observation				
	Basis	F 10	F15	F20	
Organoleptic	Form	Thick	Thick	Thick	Liquid
	Color.	White	White bones	Yellowish white	Yellowish
	Smell	Typical	Typical	Typical	Typical
Homogeneity	Homogeneous	Homogeneous	Homogeneous	Homogeneous	Homogeneous
Ph	6,5	6,7	6,7	6,7	6,7

Information:

- Basis : Basis serum
- F10 : Collagen concentration formulation 10%
- F15 : Collagen concentration formulation 15%
- F20 : Collagen concentration formulation 20%

Results of Moisture Test on the Skin

This study aims to determine the moisturizing effect on the skin using placenta Placuna collagen which is made into serum preparations with concentrations of 10%, 15%, and 20%. Observations of the moisturizing effect on the skin of the arms were checked every day for 7 days using a moisture test gauge (skin detector). The results of the humidity test can be seen in table 3.

Table 3.
 Skin moisture test results

day	Average									
	Basis	±SD	F10	±SD	F15	±SD	F20	±SD	KP	±SD
day 1	10,22%	0,362	11,22%	0,351	14,56%	0,047	17,08%	0,083	22,08%	0,015
day 2	10,33%	0,361	12,65%	0,064	15,23%	0,023	18,34%	0,034	22,324%	0,070
day 3	10,33%	0,132	13,91%	00,18	16,32%	0,040	19,02%	0,096	22,82%	0,097
day 4	10,42%	0,122	14,56%	0,015	17,43%	0,059	20,17%	0,046	23,54%	0,091
day 5	10,54%	0,019	15,72%	0,049	18,45%	0,056	21,06%	0,054	24,26%	0,039
day 6	10,98%	0,021	15,88%	0,061	18,32%	0,063	21,68%	0,020	25,78%	0,097
day 7	11,21%	0,027	13,98%	0,003	18,21%	0,065	21,94%	0,078	25,84%	0,037

Information:

- F10 Collagen concentration formulation 10%
- F15 Collagen concentration formulation 15%
- F20 Collagen concentration formulation 20%
- KP Control positif (serum x®)

Results of Data Analysis

Analysis Bivariate analysis was performed using the Shapiro Willk normality test because the amount of data taken was less than 30.

Anova Test Analysis Results

ANOVA test results if the sig. > 0.05, there is no difference between treatments, if the sig. <0.05, there is a significant difference between treatments. The results of the ANOVA analysis of the skin moisture test can be seen in table 4.

Post Hoc Test Analysis Results

The post hoc test was used to determine which serum humidity test value had a significant difference. The results of the post hoc test analysis can be seen in table 5.

Table 4.
 Analysis of Anova Test

F	Significance	Description
143,589	0,000	Sig.< 0,05

Table 5.
 Analysis Results of Post Hoc Test

(I) Formulations	(J) Formulations	Sig.	95% Confidence Interval	
			Description	Conclusion
Basis	Formulations10%	0,002	Sig. < 0,05	There is a difference
	Formulations15%	0,000	Sig. < 0,05	There is a difference
	Formulations20%	0,001	Sig. < 0,05	There is a difference
	Control positif	0,000	Sig. < 0,05	There is a difference
Formulations 10%	Basis	0,001	Sig. < 0,05	There is a difference
	Formulations15%	0,001	Sig. < 0,05	There is a difference
	Formulations20%	0,000	Sig. < 0,05	There is a difference
	Control positif	0,001	Sig. < 0,05	There is a difference
Formulations 15%	Basis	0,000	Sig. < 0,05	There is a difference
	Formulations10%	0,001	Sig. < 0,05	There is a difference
	Formulations20%	0,002	Sig. < 0,05	There is a difference
	control positif	0,000	Sig. < 0,05	There is a difference
Formulations 20%	Basis	0,001	Sig. < 0,05	There is a difference
	Formulations10%	0,000	Sig. < 0,05	There is a difference
	Formulations15%	0,002	Sig. < 0,05	There is a difference
	Control positif	0,000	Sig. < 0,05	There is a difference
Control positif	Basis	0,002	Sig. < 0,05	There is a difference
	Formulations10%	0,000	Sig. < 0,05	There is a difference
	Formulations15%	0,001	Sig. < 0,05	There is a difference
	Formulations 20%	0,000	Sig. < 0,05	There is a difference

DISCUSSION

Table 1 shows the yield of placenta Placuna collagen by 3.46% w / v. This result was influenced by the type of shellfish, the type and amount of solvent used, and the immersion time. The solvent used in the immersion is acetic acid. Immersion in acids can cause the material to expand due to the entry of water in the collagen fibers. This development will damage the structure of the collagen fibers due to disruption of the non-covalent bonds so that it will dissolve collagen in acetic acid solution (Nurhayati, Tazwir 2013).

Table 2, organoleptic tests carried out observations included smell, color, shape and texture of Placuna placenta serum collagen preparations. This test is carried out to determine which serum is made according to the color and smell of the ingredients used (Kasim 2013). The organoleptic test results of Placuna placenta serum collagen showed that the serum base formula was white, had a distinctive odor and thick consistency. Formula 10 and formula 15 are bone white and yellowish white, have a distinctive odor and a slightly thick consistency. Formula 20 is yellowish in color, has a characteristic odor and a slightly thick consistency. The results of the organoleptic test showed that the serum collagen formulation of Placuna placenta had no difference in odor but differences in serum color and shape.

Table 2, the homogeneity test aims to see and determine the mixture of serum preparation ingredients (Ariyanti et al. 2017).The results showed that the serum preparation met the homogeneity requirements, namely that there were no coarse particles. The result of the research is that all formulations are made homogeneous. Table 2. Serum preparations when used must be stable in pH so that they do not irritate the skin (Muyonga 2004). If the

preparation has a low or acidic pH it can irritate the skin, and conversely if the pH of the preparation is too high it will cause the skin to become dry during use (Chandira, R.M., Pradeep, A Pasupathi., Bhowmik, D., Chinjaranjib, B Jayakar., Tripathi, K K., Kumar 2010). Topical preparations must meet these requirements, because if the pH is too alkaline it will result in the skin becoming scaly, conversely, if the skin's pH is too acidic it can trigger skin irritation (Fawzya et al. 2016). In the pH test results of each serum preparation, the bases, F10 to F20, ranged from 6.5-6.7. These results are as expected, where each Placuna placenta serum preparation formulation has a pH that matches the normal pH range of the skin, namely 4-7 (Kaya et al. 2015). The higher the concentration the higher the pH you get. The best evaluation result of the physical characteristics of Placuna placenta collagen serum is collagen serum with a concentration of 20%.

The results of the skin moisture test can be seen in Table 3, there are differences in each concentration, namely the concentration of 10%, 15% and 20%. From low to high concentrations there is an increase in moisture on the rabbit's skin, this happens because the active substance Placuna placenta collagen begins to react. The process of absorption of an active substance into the skin does not occur quickly, on day 1 the humidity level is still stable, but on days 2-5 there is a continuous increase. The increase in moisture of the arm skin occurs not only from the first day, but until the seventh day. When applying serum to the skin, the administration of serum is not measured first so the results are less than optimal. The decrease only occurred in the serum Placuna placenta formulation with the addition of collagen because when the mixing of the serum base with the placenta Placuna collagen was not bound completely, this was influenced by the limitations of the tools used to mix the preparation of serum preparations with active substances.

The decrease can also be influenced by several factors that can affect the function of collagen as a moisturizer, namely a humid environment and a dry environment. Environmental conditions with low humidity will result in a decrease in TEWL accompanied by a decrease in natural moisturizing factor (NMF), on the other hand, high humidity will increase transepidermal water loss (TEWL) (Lee, C., Singla, A., & Lee 2001). Subsequent observations were seen from the initial color and texture of the skin when testing was still pink with a slightly dry skin texture. After applying the serum on the first day, there was no apparent change, but on the second day onwards there was a change from a darker skin color to a more moist and supple skin texture. The moisture that appears on the skin is due to one of the benefits of collagen as the active substance. The higher the collagen that is absorbed by the skin, it will provide a good moisturizing effect for the skin. This is comparable to previous research which states that there is a change in the increase in moisture in the skin of mice due to the active substance, namely collagen, which has a moisturizing effect on rat skin (Lee, C., Singla, A., & Lee 2001).

Moisturizer is a topical ingredient with the primary function of preventing or treating dry skin. Moisturizers increase hydration of the stratum corneum by increasing percutaneous water absorption and decreasing transepidermal water loss (TEWL). The content in moisturizers can consist of occlusive, humectant, and emollient which can affect skin moisture (Tricaesario, C., Widayati, R. I. 2016). The mechanism of action of moisturizers for rehydration is by forming an occlusive layer to prevent water evaporation and the presence of humectants, which are substances that draw water from the skin layer under the stratum corneum (Lee, C., Singla, A., & Lee 2001).

Table 4 shows the results of the ANOVA test analysis that the total significance value is 0.000 (<0.05), it can be concluded that there is a significant difference between treatments, then the post hoc test is continued.

Table 5 The results of the post hoc test analysis on the average skin moisture test values on a serum basis, 10%, 15%, 20% formulations and a positive control had significant mean differences. So it can be concluded that the serum base, 3 formulations of placenta Placuna serum collagen and a positive control (serum x®) have an effect on moisture in the arm skin. The results obtained from serum bases, 3 formulations of placenta Placuna serum collagen and positive control in the SPSS test were significant differences, the results of the humidity test in each concentration were quite good because in each formulation the higher the concentration the higher the collagen content in serum.

CONCLUSION

Placuna placenta collagen serum can be used as a moisturizer on the skin for 7 days. The most optimal concentration in serum collagen Placuna placenta as a skin moisturizer is a 20% formulation.

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