ASIAN JOURNAL OF PHARMACOGNOSY
Asian J. Pharmacogn 4(1): 31-42

ISSN-0128-1119

Effect of Pineapple (*Ananas comosus*) Peel Viscous Extract Concentrations in The Clay Face Mask Preparation

Marissa Lailatul Maulidia[a], Farida L Darsono[a*], Sumi Wijaya[a]

[a]*Faculty of Pharmacy, Widya Mandala Catholic University, Indonesia, Jalan Kalisari Selatan No.1, Surabaya, East Java Indonesia*

*For correspondence: farida@ukwms.ac.id

Abstract: The aim of this study is to determine the concentration of pineapple peel extract (*Ananas comosus*) which gave the highest antioxidant activity and to determine the effect of increasing concentration of pineapple peel extract (*Ananas comosus*) on physical quality, effectiveness, antioxidant activity and stability on clay mask formulation. Antioxidant activity was tested using the DPPH method. Evaluation of clay mask consists of its physical quality (organoleptic, pH, homogeneity, viscosity and dispersion), the effectiveness (dry time, face mask tightness and washability), antioxidant activity, and stability (organoleptic, pH and viscosity). The results showed that the higher the concentration of pineapple peel extract, the higher the antioxidant activity, and the effect on the results of physical quality tests, the effectiveness tests and the stability tests. The concentration of pineapple peel extract which provides the best antioxidant activity is at a concentration of 20%. Increasing the concentration of pineapple peel extract (*Ananas comosus*) (10%, 15%, and 20%) affects the results of the physical quality test (pH, viscosity and spreadability), the effectiveness (dry time, mask tightness and washability) and stability (pH and viscosity).

Keywords: Ananas comosus, antioxidant, face mask, peel

INTRODUCTION

Facial skincare is needed to keep the skin young. There have been many studies on dosage formulations that are used to maintain skin youth, such as formulations of face masks, moisturizers, creams and so on that come from natural ingredients. Facial masks are used because they have the advantage of being able to tighten the skin, rejuvenate the skin, cleanse blackheads, absorb oil and dirt (Rieger, 2000). In this study a clay formulation of facial masks containing natural ingredients, pineapple peel is carried out.

Pineapple skin (*Ananas comosus*) is used in this study because pineapple skin is a waste that has several benefits for skin health, including helping to exfoliate dead skin cells (Lestari *et al.*, 2015) and having high antioxidant power (Saraswaty *et al.*, 2017; Hatam *et al.*, 2013). The active chemical compounds contained in pineapple skin are bromelain, sugar, myricetin, tannic acid, ferulic acid (Saraswaty *et al.*, 2017; Upadhyay *et al.,* 2010; Roha *et al.*, 2013), flavonoids, carotenoids, and vitamin C (Hatam *et al.*, 2013). Previous studies (Saraswaty *et al.*, 2017) have shown that pineapple skin extract has the potential as an antioxidant at concentrations of 0.05 -

ASIAN JOURNAL OF PHARMACOGNOSY
Asian J. Pharmacogn 4(1): 31-42

ISSN-0128-1119

0.8% by giving an IC_{50} value of 0.8 - 1.3 mg / mL. Previous research (Hatam *et al.*, 2013) also suggested that at a concentration of 0.3%, the ethanol extract of pineapple peel showed inhibition of free radical activity by 63.8%. Based on the literature study conducted, the concentration of pineapple skin extract used in this study began at a concentration of 0.5% (Saraswaty *et al.*, 2017).

In this study, the concentration of pineapple skin extract used was 0.5%, 1%, 5%, 10%, 15%, and 20%. The antioxidant potential of pineapple peel extract will be tested using the DPPH method. Facial skin masks made from the ethanol extract of pineapple peel (*Ananas comosus*) in clay form are the formulations made in this study with the aim of reducing the cumulative effects of oxidative damage and for removing dead skin cells (Lestari *et al.*, 2015; Saraswaty *et al.*, 2017; Hatam *et al.*, 2013). The purpose of this study was to determine the concentration of pineapple skin extract (*Ananas comosus*) which provides the highest antioxidant activity and to determine the effect of increasing concentration of pineapple skin extract (*Ananas comosus*) on physical quality, effectiveness, antioxidant activity and stability of facial mask.

MATERIALS AND METHODS

Main Material - Pineapple peel (*Ananas comosus*) obtained from Pandaan's Market, Pasuruan and determined at Technical Implementation Unit (UPT) Materia Medika, Batu City, East Java Indonesia.

Chemical Materials - Kaolin (Takehara Kagaku Kogyo Co., Ltd, Hyogo, Japan), Glyceryl monostearate (Croda Pte Ltd, Singapore, Singapore), Lanolin (Wuxi Kimrise, Jiangsu, China), Sodium lauryl sulfate (Techno Pharmchem, Delhi, India), *Veegum* (Vanderbilt Company, Inc, Norwalk, United State), Propylene glycol (Arrow Chemical Group Corp, Shandong, China), Titanium dioxide (Huntsman P & A Germany GmbH, Duisburg, Germany), Isopropyl myristate (Palm – Oleo, Kuala Lumpur, Malaysia) and Aquadest (Brataco Chemica, Surabaya, Indonesia).
Preparation of Pineapple Peel Powder (Ananas comosus) - Pineapple fruit used in this study is pineapple which has the criteria of yellowish fruit skin with a weight of 300-600 grams. The pineapple fruit is peeled, then the pineapple peel is separated from the other parts. Pineapple peel is cleaned and washed, then dried. Dried pineapple peel is crushed and sifted using mesh no. 100. Pineapple peel powder is standardized using procedures established by the Government of Indonesia (Ditjen POM RI, 2000).

Preparation of Pineapple Peel Extract (Ananas comosus) - Pineapple skin powder was extracted using the maceration method. The combination of ethanol: water (75: 25)% v / v is used as a solvent. The filtrate obtained was then concentrated using a thermostatic water bath at a temperature of ≤ 60° C. The ethanol extract obtained was then weighed and calculated against the initial weight of pineapple skin powder (*A. comosus*) used. Ethanol extract of pineapple peel is standardized using procedures established by the Government of Indonesia (Ditjen POM RI, 2000; Hajar *et al.*, 2012).

Determination of Active ingredient using TLC- Ten μL of 18 ppm pineapple peel extract, gallic acid (standard) and sample (facial mask) were spotted on *silica gel* 60 F_{254} plate and developed using the mobile phase of chloroform: methanol: formic acid (85: 15: 1) %v/v. $FeCl_3$ was used as spray reagent (Tee-ngam *et al.*, 2013).

Antioxidant Activity of Pineapple Peel Extract (Ananas comosus) - Pineapple peel extract was prepared with the concentrations of 0.5%, 1%, 5%, 10%, 15%, and 20%. One mL sample was added with 4 mL 2,2-diphenyl-1-picrylhydrazyl (DPPH) solution 0.077 mM. The mixture is then incubated

ASIAN JOURNAL OF PHARMACOGNOSY
Asian J. Pharmacogn 4(1): 31-42

ISSN-0128-1119

for 30 minutes in the dark room. Absorbance is read at a wavelength of 510 – 530 nm by spectrophotometer UV – Vis (Saraswaty *et al*., 2017).

Formulations of Face Masks of Pineapple Peel Extract (Ananas comosus) in the Form of Clay - The formulation of clay mask of pineapple peels extracts shown in Table 1. *Veegum* is weighed and placed in a porcelain cup. *Veegum* is developed with hot water, then allowed to stand for 24 hours until it expands completely (Phase I). Kaolin sieved with mesh sieved no. 100, then weighed. Titanium dioxide is levigated with propylene glycol, then kaolin is added and homogenized (Phase II). The oil phase (glyceryl monostearate, lanolin, and isopropyl myristate) was weighed, then melted in a porcelain cup (Phase III). Phase I, Phase II and Phase III are inserted in a mortar and homogenized (Phase IV). Sodium lauryl sulfate is weighed and dissolved in water, then allowed to stand for 24 hours. The pineapple peel extract is weighed and dissolved in water, then put in Phase IV and homogenized. Then a solution of sodium lauryl sulfate is added gradually and stir until homogeneous (Rieger, 2000).

Evaluation of Face Masks of Pineapple Peel Extract (Ananas comosus) in the Form of Clay:

Physical tests:

Physical test tested include organoleptic (Somwanshi *et al*., 2017; Darsika *et al*., 2015; Velasco *et al*., 2016; Aswal *et al*., 2013; Reveny *et al*., 2017), pH (Aswal *et al*., 2013), homogeneity (Darsika *et al*., 2015; Velasco *et al*., 2016), viscosity (Darsika *et al*., 2015; Velasco *et al*., 2016), and spreadability (Darsika *et al*., 2015; Velasco *et al*., 2016).

Effectiveness tests

Effectiveness tested includes drying time, mask tightness, washability and antioxidant activity (Saraswaty *et al*., 2017; Beringhs *et al*., 2013; Vieira *et al*., 2009; Velasco *et al*., 2014). Antioxidant activity was done using the 2,2-diphenyl-1-picrylhydrazyl (DPPH) method. Sample solutions with different concentrations (10%; 15% dan 20%) were prepared form clay face mask. One mL of sample was added with 4 mL DPPH solution 0.077 mM. The mixture is then incubated for 30 minutes in the darkroom. Absorbance is read at a wavelength of 510 – 530 nm by spectrophotometer UV – Vis (Saraswaty *et al*., 2017).

Stability Test

Stability test was conducted by stored the prepared formulation at room temperature for one month and organoleptic (shape, color, and odor), pH, and viscosity of the prepared formulation were observed. The observation was done every week (Somwanshi *et al*., 2017).

RESULTS AND DISCUSSION

Indonesia is the largest producer of pineapple (*Ananas comosus*). The food industry in Indonesia processes these fruits to be used as food products that will produce waste that can cause environmental problems. Pineapple fruit with a weight of 400 grams can produce 60 grams of pineapple peel waste (Saraswaty *et al*., 2013). Pineapple peel extract (*Ananas comosus*) contains ferulic acid, tannic acid, and vitamin C as a source of antioxidant compounds and also contain bromelain that can be used to exfoliate the skin. In this study, the ethanol extract of pineapple peel was formulated into a face clay mask. The standardization of thr powder form and the ethanol extract of pineapple peel can be seen in Table 2 and Table 3. The standardization process

ASIAN JOURNAL OF PHARMACOGNOSY
Asian J. Pharmacogn 4(1): 31-42

ISSN-0128-1119

for dry powder and pineapple ethanol extract needed to be done with the aim of quality and product safety can be guaranteed.

Ferulic acid, a phenolic compound found in pineapple peel, is an antioxidant that is known to affect human health. In some countries, ferulic acid has been known as a scavenger for free radicals and is used as a food additive to prevent lipid peroxidation. The ability to scavenge free radicals comes out from the hydroxy phenol group that is able to donate electrons to counteract free radicals. Thin-layer chromatography method (Vieira *et al.*, 2009) was carried out to determine the presence of ferulic acid (Figure 1).

Table 1. Formulation for Face Mask of Pineapple Peel Extract (*Ananas comosus*) in the Clay Form.

Ingredients	**Standard Formula (Rieger, 2000) (%)**	**Modification Formula**				**Material Function**
		F0 (%)	**F1 (%)**	**F2 (%)**	**F3 (%)**	
Pineapple Peel Extract	**-**	**-**	**10**	**15**	**20**	**Active ingredients**
Kaolin	10	10	10	10	10	Clay mineral
Glyceryl monostearate	3	3	3	3	3	Oil phase
Lanolin	2	2	2	2	2	Oil phase
Sodium lauryl sulfate	2	2	2	2	2	Surfactant
Veegum	8	8	8	8	8	Thickener
Propylene glycol	7	7	7	7	7	Humectant
Titanium dioxide	4	4	4	4	4	Opacifier agent
Isopropyl myristate	2	2	2	2	2	Oil phase
Aquadest ad	100	100	100	100	100	Solvent

Table 2. Standardization of Pineapple Peel Powder (*Ananas comosus*).

Type of Test	**results**
Organoleptic	
Shape	Powder
Color	Brown – yellow
Odor	Pineapple fruits
Levels of extracts soluble in water ($\bar{x}$ ± SD) (%)	61.46 ± 1,89
Levels of extracts soluble in ethanol ($\bar{x}$ ± SD) (%)	44.92 ± 0,24
Water content ($\bar{x}$ ± SD) (%)	3.33 ± 0,32
Total ash content ($\bar{x}$ ± SD) (%)	5.77 ± 0,10
Insoluble ash in acid content ($\bar{x}$ ± SD) (%)	3.03 ± 0,14
Ash soluble in water content ($\bar{x}$ ± SD) (%)	2.73 ± 0,15

Determination of antioxidant activity from pineapple skin extract was carried out in six types of concentrations (0.5%, 1%, 5%, 10%, 15%, and 20%). Three concentrations (10%, 15% and 20%) which provide the highest antioxidant activity were selected for use in the formulation. The results of determining the antioxidant activity of ethanol extract of pineapple peel (*Ananas comosus*) can be seen in Table 5 and Figure 2. These results indicate that the higher the

ASIAN JOURNAL OF PHARMACOGNOSY
Asian J. Pharmacogn 4(1): 31-42

ISSN-0128-1119

concentrations of ethanol extract of pineapple peel (*Ananas comosus*), the higher the antioxidant activity produced (Velasco *et al.*, 2014).

Table 3. Standardization of Pineapple Peel Extract (*Ananas comosus*).

Type of Test	**Observation Results**
Organoleptic	
Shape	Thick
Color	Brown
Odor	Pineapple fruits
pH	4.62 ± 0,04
Levels of extracts soluble in water ($\bar{x}$ ± SD) (%)	67.57 ± 0,58
Levels of soluble compounds in ethanol ($\bar{x}$ ± SD) (%)	51.22 ± 1,21
Water content ($\bar{x}$ ± SD) (%)	9.94 ± 0,04
Total ash content ($\bar{x}$ ± SD) (%)	7.25 ± 0,07
Insoluble ash in acid content ($\bar{x}$ ± SD) (%)	2.44 ± 0,07
Ash soluble in water content ($\bar{x}$ ± SD) (%)	4.79 ± 0,20

Table 4. Antioxidant Activity of Pineapple Peel Extract (*Ananas comosus*).

Extract Concentration (%)	**% Inhibition ($\bar{x}$ ± SD)**
0,5	89,95 ± 0,40
1	95,21 ± 0,12
5	96,54 ± 0,08
10	97,31 ± 0,24
15	97,79 ± 0,06
20	99,57 ± 0,71

Table 5. Antioxidant Activity Test Results of Pineapple Peel Extract (*Ananas comosus*) Facial Mask Preparation in the Clay Form.

Formula	**% Inhibition of preparation ($\bar{x}$ ± SD)**	**% Inhibition of extract ($\bar{x}$ ± SD)**
F1 (extract 10 %)	94,82 ± 0,15	97,31 ± 0,24
F2 (extract 15%)	95,14 ± 0,43	97,79 ± 0,06
F3 (extract 20%)	95,31 ± 0,61	99,57 ± 0,71
t_{count} (F1 = -15.450; F2 = -10.679 and FIII = -7.890) > t_{table} (2.776) which shows the data between extracts and preparations is not significantly different		

Description: F0 = Clay face mask does not contain pineapple peel extracts; F1 = 10% Clay face mask containing 10% of pineapple peel extracts; F2: Clay face mask containing 15% of pineapple peel extracts; F3 = Clay face mask containing 20% of pineapple peel extracts.

The ingredients used in the preparation of face mask preparations from Pineapple (*A. comosus*) Peel Extract in the form of the clay can be seen in Table 1. Kaolin in this formulation has a very good absorbent function, where the material absorbed by kaolin

ASIAN JOURNAL OF PHARMACOGNOSY
Asian J. Pharmacogn 4(1): 31-42

ISSN-0128-1119

can be easily removed because the ability of kaolin adsorption is limited to the surface. In addition, kaolin can absorb water and oil has a smooth consistency and is easily spread when formulated into a mask preparation (Rieger, 2000). Sodium lauryl sulfate is an anionic surfactant which has good foam and detergent properties, which is needed to remove impurities (Rieger, 2000). Veegum was chosen because it has a function as a thickener in the preparation of masks that work by contributing to the formation of dry films (Rieger, 2000). Propylene glycol was chosen because it has a function as a humectant that works by controlling the rate of drying of the mask preparation, increasing the stability of the mask preparation, in the long run, reducing cracking and separation when the preparation is stored in cold temperatures (Rieger, 2000). Titanium dioxide was chosen because it has the function of an opacifier agent by giving the mask an opaque color (Rieger, 2000). Glyceryl monostearate and lanolin are chosen because they have an emulsifying function that works by stabilizing solid emulsions or suspensions and contributing to the formation of dry films (Rieger, 2000).

Each formula was evaluated which includes physical quality testing, facial mask effectiveness, and stability test. Tests for physical quality of preparations include organoleptic (shape, color, and odor), pH, homogeneity, viscosity, and dispersion. Facial mask effectiveness tests include dry time; mask tightness and ease of cleaning. The stability test is carried out by an accelerated stability test.

The physical quality test of the ethanol extract of pineapple peel (*A. comosus*) in clay form can be seen in Table 7. The higher the concentration of ethanol extract of pineapple skin (*A. comosus*), the higher the intensity of the color produced (Figure 2), pH decreased, the viscosity increased, and spreadability decreased. This can be influenced by the pH value of the pineapple peel extract which is low at 4.62 ± 0.04, also in this study used extracts in the form of thick extract which resulted in thick consistency of the preparation and the ability of facial masks to spread to be reduced. The greater the viscosity value, the greater the pressure required by the face mask to spread (Departemen Kesehatan RI, 2008). The results of the homogeneity of facial masks (Figure 4) show the results of homogeneous preparations. If the preparation is homogeneous, it can be concluded that when the preparation is used on the face, each spread will give the same amount of active ingredient that can guarantee the effectiveness of a face mask (Somwanshi *et al*., 2017).

Dry time testing for ethanol extract of pineapple skin (*A. comosus*) in clay form can be seen in Table 6 and Figure 5. The results showed that an increase in the concentration of ethanol extract of pineapple peels affected the dry time of facial masks. This is related to the value of the viscosity produced by each formula, where the greater the value of the viscosity produced, the time needed by the face mask to dry will be faster (Somwanshi *et al*., 2017). The results of face masks for tightness can be seen in Table 6 and Figure 6. The results showed that the higher the concentration of ethanol extract of pineapple peel, the effect of mask tightening will increase. This can be caused by the content of phenolic compounds, tannins in the ethanol extract of pineapple fruit. Tannin has a function as a substance that is widely used for skin tightening (Departemen Kesehatan RI, 2008; Fidrianny *et al*., 2018).

ASIAN JOURNAL OF PHARMACOGNOSY
Asian J. Pharmacogn 4(1): 31-42

ISSN-0128-1119

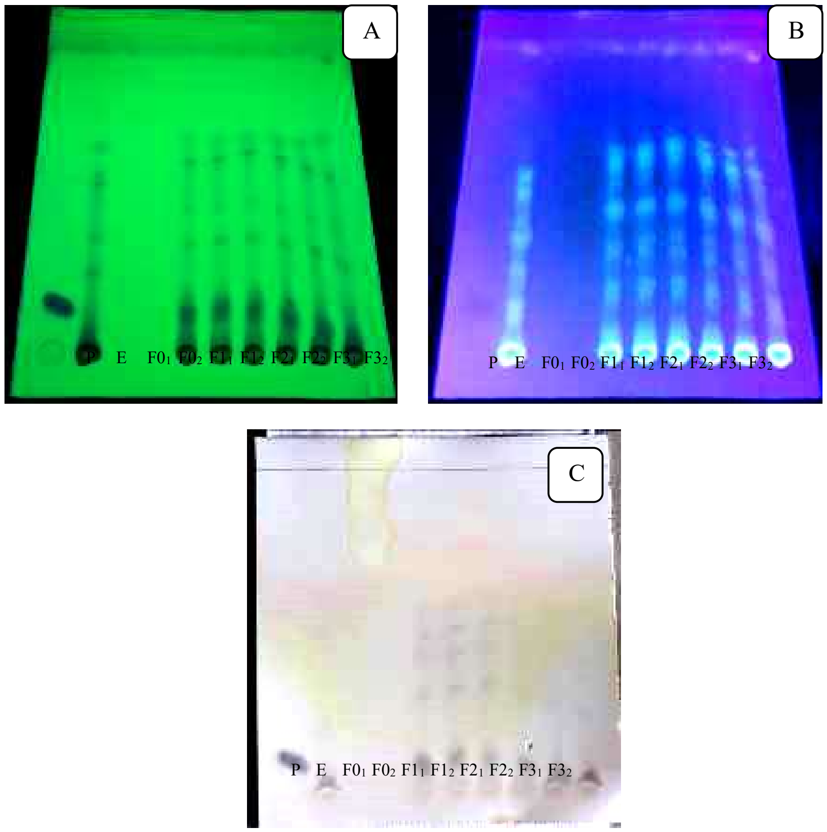


Figure 1. Thin-layer Chromatography results of gallic acid, pineapple peel extract (*Ananas comosus*) and pineapple peel extract (*Ananas comosus*) face mask on observations under UV light 254 nm (A), UV light 366 nm (B) and visible light with $FeCl_3$ (C) stain.

Description: P = Comparison of gallic acid, E = Pineapple thick extract, F01 = batch blank formula 1, F02 = batch blank formula 2, F11 = batch I Formula 1, F12 = Formula I batch 2, F21 = Formula 1 batch 1, F22 = Formula II batch 2, F31 = Formula III batch 1, F32 = Formula III batch 2

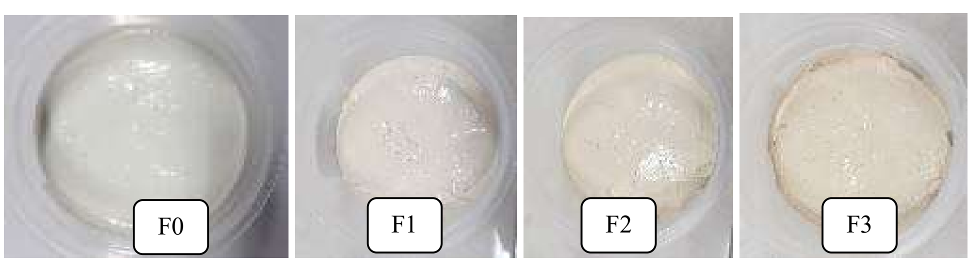


Figure 3. Face mask of pineapple peel extract (*Ananas comosus*) in clay form on various formulas.

ASIAN JOURNAL OF PHARMACOGNOSY
Asian J. Pharmacogn 4(1): 31-42

ISSN-0128-1119

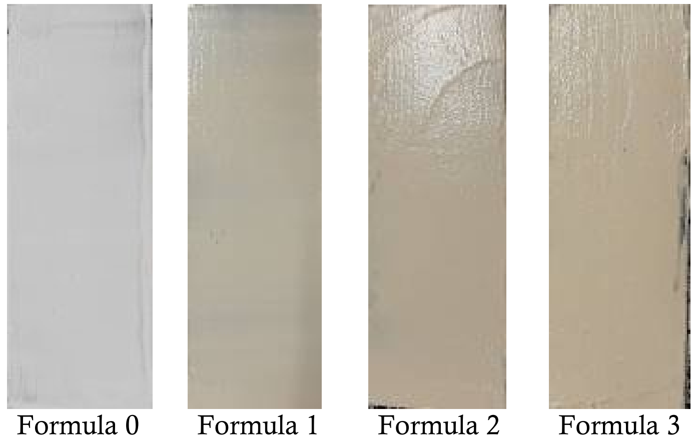


Figure 4. The homogeneity test results of face masks of pineapple peel extract (*Ananas comosus*) in the clay form on various formulas.

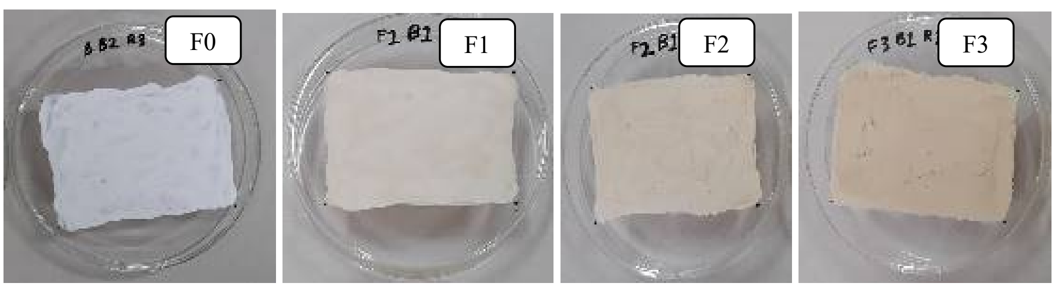


Figure 5. Dry time test results for preparations of pineapple peel extract (*Ananas comosus*) in the form of clay on various formulas.

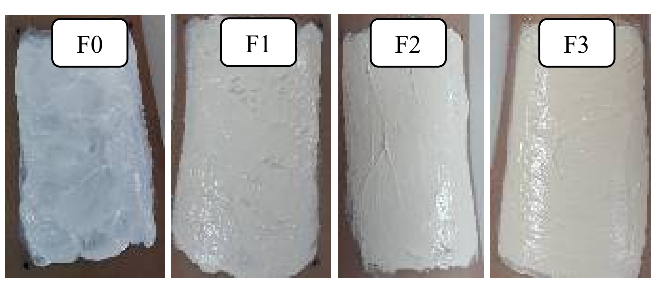


Figure 6. The results of the tightness test of the preparations of face mask of pineapple peel extract (*Ananas comosus*) in the clay form on various formulas.

ASIAN JOURNAL OF PHARMACOGNOSY
Asian J. Pharmacogn 4(1): 31-42

ISSN-0128-1119

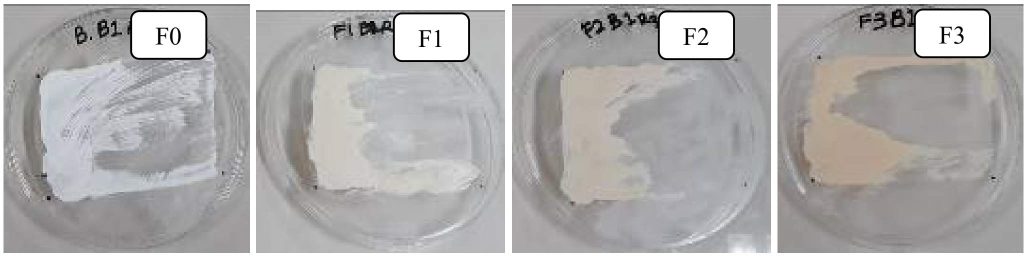


Figure 7. The washability test results of a face mask with pineapple peel extract (*Ananas comosus*) in the clay form on various formulas.

Table 6. Physical Quality Test Results, Effectiveness of Facial Mask Preparations, Antioxidant Activities, Safety, Aseptability, and Stability of Pineapple Peel Extract (*A. comosus*) Facial Mask Preparation in The Clay Form.

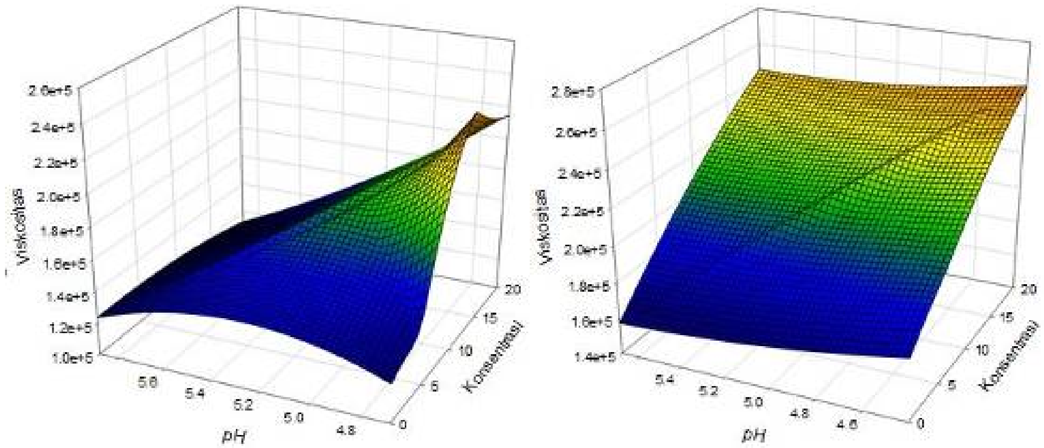
No.	Test parameters	F0	F1	F2	F3	Specification*
	Physical Quality Test					
1.	Organoleptic					
	Shape	*Clay*	*Clay*	*Clay*	*Clay*	*Clay*
	Color	White	Brown – white	Brown – white	Brown – white	Brown – white
	Odor	Typical	Typical	Typical	Typical	Typical
2.	pH	5.95 ± 0.01	5.20 ± 0.01	4.96 ± 0.01	4.80 ± 0.01	5.00 ± 1.00
3.	Homogeneity	Homogeneous	Homogeneous	Homogeneous	Homogeneous	Homogeneous
4.	Viscosity (cps)	118850.00 ± 492.95	166433.33 ± 287.52	178383.33 ± 337.14	196400.00 ± 502.00	100000 – 300000
5.	Spreadability (cm)	Very easy to spread (5.4 ± 0.4)	Easy to spread (4.1 ± 0.1)	Easy to spread (4.0 ± 0.1)	Easy to spread (3.8 ± 0.2)	Easy to spread 3.0 – 5.0
	The effectiveness of Facial Mask					
1.	Dry time (minutes)	Long drying (23.20 ± 0.02)	Quick drying (19.52 ± 0.02)	Quick drying (18.42 ± 0.03)	Quick drying (16.28 ± 0.03)	Quick drying (15 – 20 minutes)
2.	Mask tightness	Tight	Tight	Tight	Tight	Tight
3.	Washability	Difficult to clean	Easy to clean	Easy to clean	Easy to clean	Easy to clean (masks can be cleaned up to ½ of the area applied)
	Antioxidant Activity Test					
1.	Antioxidant Activity (%)	0.00 ± 0.00	94.82 ± 0.15	95.14 ± 0.43	95.31 ± 0.61	Not significantly different from the antioxidant activity of the extract
	Stability Test					
1.	Organoleptic	Stable	Stable	Stable	Stable	
2.	pH	Stable	Stable	Stable	Stable	Stable
3.	Viscosity	Stable	Stable	Stable	Stable	

Description: F0 = Clay face mask does not contain pineapple peel extracts; F1 = 10% Clay face mask containing 10% of pineapple peel extracts; F2: Clay face mask containing 15% of pineapple peel extracts; F3 = Clay face mask containing 20% of pineapple peel extracts.
* Darsika *et al.*, 2015; Velasco *et al.*, 2016; Reveny *et al.*, 2017; Beringh *et al.*, 2013; Vieira *et al.*, 2009

ASIAN JOURNAL OF PHARMACOGNOSY
Asian J. Pharmacogn 4(1): 31-42

ISSN-0128-1119

The washability result of face masks can be seen in Table 6 and Figure 7. The results showed that an increase in the concentration of ethanol extract of pineapple peels affected the ease of cleaning. This is related to the solubility of the ethanol extract of pineapple peels which are soluble in water so that easily can be cleaned with water.



Week 1 Week 4

Figure 8. Sigma plots that show the relationship between pH stability and viscosity stability of pineapple peel extracts (*Ananas comosus*) in the clay face mask on various formulas.

The profile of active substances in clay face masks was carried out using the thin-layer chromatography (TLC) method. Tests were carried out on extracts, standard (gallic acid), and sample (clay face masks). The profile of the active ingredient in clay face masks with thin layer chromatography can be seen in Figure 1. The blank formula does not produce any stains. The results showed that phenolic compounds were found in Formulas I, II, and III. FeCl3 is used as a spray reagent, and the results show the presence of blackish-blue stains which are referred to as phenolic compounds.

The results of antioxidant activity in clay face masks can be seen in Table 5. The test results showed that the antioxidant activity of face masks in the form of clay was not significantly different from the antioxidant activity of the ethanol extract of pineapple peel. The results showed that an increase in the concentration of the ethanol extract of pineapple peel from 10%, 15%, and 20% can increase the antioxidant activity of clay face masks.

The stability test results of face masks in the clay form can be seen in Table 6 and Figure 8. The results of organoleptic stability testing, pH, and viscosity for all four formulas showed that the face clay mask was stable during the storage period. The results of the analysis show that during the storage period, pH decreases, and viscosity increases, but the pH and viscosity value still in the range of the clay mask specification. This decrease in pH can be caused by the ethanol extract of pineapple skin (*A. comosus*) containing acidic compounds and during the storage period, the interaction between active compounds contained in the face masks can happen. Increased viscosity is caused by the presence of kaolin in the clay form of face mask preparations which has properties as absorbent and has the advantage of being able to absorb water when formulated into mask preparations (Indrawati, T. and Zissakina, 2011; Upadhyay *et al.*, 2010) so that the higher the concentration of extract used, the lower the water content.

ASIAN JOURNAL OF PHARMACOGNOSY
Asian J. Pharmacogn 4(1): 31-42

ISSN-0128-1119

CONCLUSION

The concentration of pineapple peel extract (*A. comosus*) which provides the best antioxidant activity is 20% with the results of antioxidant activity of 99.57 ± 0.71%. The increasing concentration of pineapple peel extract (*A. comosus*) (10, 15, and 20%) significantly affected pH, viscosity, spreadability, dry time, mask tightness, ease of cleaning, and the stability of pH and viscosity during storage periods. In further research it is recommended to make the modifications to the clay face mask formulation using pineapple peel extract with a concentration of 20% using Design Expert method to optimize the formulation of clay face mask.

DECLARATION OF CONFLICT OF INTEREST

No conflict of interest associated with this work.

REFERENCES

Aswal, A., Kalra, M. and Rout, A. (2013) Preparation and evaluation of polyherbal cosmetic cream. *Scholars Research Library*. 5(1): 83–88.

Darsika, C., Somya, K.V., Suganya, K., Grace, X.F. and Shanmuganathan, S. (2015) Preparation and evaluation of herbal peel off face mask. *American Journal of Pharmtech Research*. 5(4).

Departemen Kesehatan Republik Indonesia. (2008) *Farmakope Herbal Indonesia*. Edition I. Jakarta: Departemen Kesehatan Republik Indonesia. The original one is an Indonesian version.

Ditjen POM. (2000) *Parameter Standar Umum Ekstrak Tumbuhan Obat*. Jakarta: departemen kesehatan Republik Indonesia. The original one is an Indonesian version.

Fidrianny, I., Virna, V. and Insanu, M. (2018) Antioxidant potential of different parts of bogor pineapple (*Ananas comosus* [L.] Merr. Var. Queen) cultivated in West Java-Indonesia. *Asian Journal of Pharmaceutical and Clinical Research*. 11(1): 129–133. doi: 10.22159/ajpcr.2018.v11i1.22022. The original one is an Indonesian version.

Hajar, N., Zainal, S., Nadzirah, K.Z., Roha, S.A., Atikah, M.O. and Elida, T.T.Z.M. (2012) Physicochemical properties analysis of three indexes pineapple (*Ananas comosus*) peel extract variety N36. *APCBEE Procedia*. 4. 115 – 121.

Hatam, S.F., Suryanto, E. and Abidjulu, J. (2013) Aktivitas antioksidan dari ekstrak kulit Nanas (*Ananas comosus* (L) Merr). *PHARMACON Jurnal Ilmiah Farmasi*. 2(01). pp. 7–12 (2013). The original one is an Indonesian version.

Indrawati, T. dan Zissakina, F. (2011) Formulasi Gel Pengelupas Sel Kulit Mati yang Mengandung Sari Buah Nanas (*Ananas comosus* L) antara 17 sampai 78%. *Jurnal Ilmu Kefarmasian Indonesia*. 9(2): 104-109. The original one is an Indonesian version.

Lestari, P.M., Sutyasningsih and Fadila, M. (2015) Carbomer 980 dalam masker gel peel - off sari buah Nanas (*Ananas comosus* L. Merr). *Farmasains*. 2(6). The original one is an Indonesian version.

Rieger, M.M. (2000) *Harry's Cosmeticology*. 8th Edition. New York: Chemical Publishing Company.

Roha, S.A.M., Zainal, S., Noriham, A. and Nadzirah, K.Z. (2013) Determination of sugar content in pineapple waste variety N36. *International Food Research Journal*. 20(4):1941–1943.

Saraswaty V., Risdian, C., Primadona, I., Andriyani, R.,, Andayani, D.G.S., and Mozef, T., (2013) Pineapple peel wastes as a potential source of antioxidant compounds, IOP Conference Series: Earth and Environmental Science, Volume 60, conference 1.

Saraswaty, V., Risdian, C., Primadona, I., Andriyani, R., Andayani, D.G.S. and Mozef, T. (2017) Pineapple peel wastes as a potential source of antioxidant compounds. *IOP Conf. Series: Earth and Environmental Science*. doi: 10.1088/1755-1315/60/1/012013.

ASIAN JOURNAL OF PHARMACOGNOSY
Asian J. Pharmacogn 4(1): 31-42

ISSN-0128-1119

Somwanshi, S.B., Kudale, K.S., Dolas, R.T. and Kotade, K.B. (2017) Formulation and evaluation of cosmetic herbal face pack for glowing skin, *Int. J. Res. Ayurveda Pharm.* 8(Suppl 3): 199–203. doi: 10.7897/2277-4343.083199.

Tee-ngam, P., Nunant, N., Rattanarat, P., Siangproh, W. and Chailapakul, O. (2013) Simple and Rapid Determination of ferulic acid levels in food and cosmetic samples using paper-based platforms. *Sensors*. 13. pp. 13039–13053. doi: 10.3390/s131013039.

Upadhyay, A., Lama, J.P. and Tawata, S. (2010) Utilization of pineapple waste A Review. *Journal Food Science and Technology*. 6: 10-18.

Velasco, M.V.R., Zague, V., Dario, M.F., Nishikawa, D.O., Pinto, C.A.S.O., Almeida, M.M., Trossini, G.H.G., Coelho, A.C.V. and Baby, A.R. (2016) Characterization and short-term clinical study of clay facial mask. *Journal Of Basic and Applied Pharmaceutical Sciences*. 37(1): 1–6.

Reveny, J., Tanuwijaya, J. and Stanley, M. (2017) Formulation and evaluating anti-aging effect of vitamin E in biocellulose sheet mask. *International Journal of ChemTech Research*. 10(1): 322–330.

Beringhs, A.O., Rosa, J.M., Stulzer, H.K., Budal, R.M. and Sonaglio, D. (2013) Green clay and *Aloe vera* peel-off facial masks: Response surface methodology applied to the formulation design. *AAPS Pharmacy Science Technology*. Vol. 14. No. 1. DOI: 10.1208/s12249-013-9930-8.

Vieira, R.P., Fernandes, A.R., Kaneko, T.M., Consiglieri, V.O., Pinto, C.A.S.O., Pereira, C.S.C.P., Baby, A.R. and Velasco, M.V.R. (2009) Physical and physicochemical stability evaluation of cosmetic formulations containing soybean extract fermented by *Bifidobacterium animalis*. *Brazilian Journal of Pharmaceutical Sciences*. 45(3): 515–525.

Velasco, M.V.R., Vieira, R.P., Fernandes, A.R., Dario, M.F., Pinto, C.A.S.O., Pedriali, C.A., Kaneko, T.M. and Baby, A.R. (2014) Short-term clinical of peel-off facial mask moisturizers. *International Journal of Cosmetic Science*. 36: 355–360. doi: 10.1111/ics.12133.