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# Peel-Off Mask from Ethanol Extract of Purple Sweet Potato Peel (*Ipomoea batatas* L.) for Blackhead Treatment

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## Abstract

Acne vulgaris or acne, also known as acne, is a chronic obstructive and inflammatory skin disease in the pilosebaceous unit that often occurs in adolescence. The prevalence of acne in adolescence is quite high, ranges between 47-90%. Acne mostly occurs on the face, characterized by the presence of inflammatory lesions and non-inflammatory lesions, namely blackheads. Blackheads can be in the form of open blackheads that occur due to melanin oxidation, or closed blackheads (whitehead comedones). Skin from purple sweet potato (*Ipomoea batatas* L.) has been reported to have antioxidants activity and have the ability to against free radicals from pollution and UV radiation from carotenoid compounds. Carotenoids are one of the compounds that can eliminate the appearance of blackheads from the skin of the face. Currently, treatment with chemicals is the first choice. However, the innovation for this product is needed. Treatment based on natural ingredients and formed as cosmetic products can be an alternative to treat facial skin and prevent blackheads from occurring puberty in adolescents. Mask is one of the facial care products that are loved by adolescents and becoming a trend nowadays. The advantages of this form are easy to use and relatively cheap, made this is the main choice for adolescents. A practice and suitable mask product are needed for adolescents, so a peel-off mask is a good choice for it.

## Keywords

*anthocyanin, carotenoid, comedones, peel-off mask, purple sweet potato extract*

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## 1. Introduction

Acne vulgaris or acne is one kind of obstructive skin diseases which causes skin inflammation that often occurs in adolescents. Acne is often referred to as a sign of puberty in adolescents. The prevalence of acne in adolescents is quite high, around 47-90%. Among Asians, the incidence of acne in female adolescents is around 30%. It is generally suffered by the young age group, which ranges from 14-19 years old [1].

Acne vulgaris can be clinically identified as blackheads, papules, pustules, nodes, and scar tissue. Blackheads begin with the formation of microcomedones when the sebaceous canal is filled with a mixture of sebum, bacteria, and keratinized cells. When this mixture accumulates and clogs the sebaceous tract, comedones are formed and considered to be closed forms or can be known as whiteheads. If the clogging load on the sebaceous canal increases, ceratin that builds up on the surface of the skin will be exposed and produce open comedones, also known as blackheads. Comedones also can be caused by squalene oxidation, the specific lipid in human skin [2].

Generally, there are several treatments taken to treat acne vulgaris, depends on the severity of acne. For the treatment of blackheads, topical preparations that have anti-comedogenic activity ingredients are widely used, such as isotretinoin, tretinoin, salicylic acid, and antibiotics like clindamycin and erythromycin. However, it turns out that the

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active ingredients have some side effects [3].

Herbal medicine is an alternative that can be chosen as a treatment for various diseases, including skin problems. Herbal medicines have several advantages, one of which is easy to be obtained and to be processed at home [4]. Lately, the use of herbal medicines is increasing due to the lack of therapy using modern drugs in the treatment of certain diseases and the ease of access to information about herbal medicine [5].

Sweet potato can be fertile-cultivated in Indonesia. Its usage has been limited to food because of the high carbohydrate content in the plant. However, the sweet potato's skin always thrown away as if cannot be utilized while the sweet potato's skin contains pigment anthocyanin, especially on sweet potato with a purple colour [6]. The high anthocyanin content in purple sweet potato showed higher anthocyanin stability. Research results of the Balitbang Agriculture Food Crops Research and Development Center show that anthocyanins are beneficial for health because they can function as antioxidants. Anthocyanin is also capable of blocking the rate of free radical cell destruction due to nicotine, air pollution, and other chemicals. Anthocyanin can be used for blackhead treatments as topical products.

Facial masks are a very popular skincare product to improve skin quality [7]. Facial mask with natural ingredients causes less irritation and side effects. In addition, products made from natural ingredients are cheaper, safer, and do not cause harmful side effects to the skin [8]. A peel-off face mask is one type of face mask which is easier to be removed like an elastic membrane [9]. In addition, peel-off face masks can increase skin hydration probably due to occlusion [10]. Beside of activity of the ingredients, a peel-off mask is also effective in removing dead skin cells, blackheads, excess oil, and blockages in the pores. The ideal characteristic of peel-off face masks is there is no rough particle, easy to use, non-toxic, cause less irritation and pain and can clean the skin [11].

Preparation of peel-off face masks for blackheads is an alternative that can be developed by the industries considering the ease of use and the power to attract blackheads stronger than clay mask or water gel mask.

## 2. Method

The method used in this study is a qualitative analysis based on the study of literature at various sources. Sources are obtained through the google scholar index using the keywords *Ocimum basilicum*, leaves basil, dengue fever, larvicidal activity, mosquito repellent and mat electric repellent. The analysis starts by identifying the problem based on existing data, analyzing the root of the problem and finding the best solution from the analysis that has been done.

### *Materials*

Materials used as the formulation of a peel-off mask are purple sweet potato skin extract, ethanol 96%, 3% citric acid, PVA, carbomer 940, aquadest, TEA, HPMC, propylene glycol, nipagin, 70% alcohol, and *Oleum Rosae*.

### *Extracting purple sweet potato peel*

50 g of *simplicia* powder of purple sweet potato peel is macerated with 400 mL of solvent ethanol 96%: HCl 1N (85:15 v / v), stirred constantly with shaker speed of 150 rpm for 24 hours. Macerates are centrifuged for 1 hour at 1800 rpm. The supernatant part is taken by filtering and then evaporated at 40°C

### *The process of making peel off masks*

For the making of peel-off masks from purple sweet potato ethanol extract, there are some steps. Polyvinyl alcohol (PVA) and aquadest (1:4) are heated in a goblet, stirred until the colour is clear and homogeneous. Carbomer 940 was sprinkled into the mixture and left 24 hours so that the carbomer 940 expanded well, then added 5 drops of TEA to adjust pH at 5-6. HPMC was developed with aquadest, left for 30 minutes. Combine all three times in the mortar, mix homogeneously. Propylene glycol and nipagin which has been dissolved in 70% alcohol are added, mix until a homogeneous mass is formed. Purple sweet potato peel extract dissolved with the remaining aquadest, crushed then add

the base gradually grind. Add 5 drops of oleum rosae and stir until homogeneous.

### 3. Result and Discussion

Oxidation of squalene, a lipid that is specific to human skin, has several consequences for the skin. From the skin aspect, the oxidation of squalene can have cytotoxic, pro-inflammatory and cause immunological events, and may accelerate the skin ageing process. Squalene which is oxidized to squalene peroxide has the potential to be comedogenic so that it becomes a key factor in the formation of acne, a special skin disorder in humans [2]. In short, the oxidation process of squalene can form molecules that can negatively affect tissue and cellular physiology. To protect squalene from these events, dermatological or cosmetic products that contain antioxidants can be used topically applied.

Purple sweet potato has a high carbohydrate content, and also contains several vitamins such as vitamins A, B1, B2, B6, C and E. Purple sweet potatoes also contain minerals that are good for the body like phosphorus, calcium, manganese and iron [12]. Based on research conducted by Suda [13], purple sweet potato ethanol extract inhibit the activity of the tyrosinase enzyme by 5.4%. Phytochemical content in *Ipomoea batatas* is triterpenes or steroids, alkaloids, saponins, tannins, phenolic acids, and flavonoids [14].

**Table 1.** Phytochemical compound of purple sweet potato

No.	Compound group	Compound name
1	Alkaloid	Calystgine B1
2	Flavonoid	Anthocyanine
3	Terpenoid	6-myoporol
4	Vitamin	Vitamin A, vitamin C

In purple sweet potato, there are several antioxidant compounds, among of them are anthocyanin and beta carotene. Purple sweet potatoes contain large amounts of anthocyanin pigments. This colour is obtained from the flesh and skin. The high acylated anthocyanin content in purple sweet potato causes higher anthocyanin stability than anthocyanin from other sources. Beta carotene (a precursor of vitamin A) in sweet potatoes can act as an antioxidant that protects cells from damage caused by free radicals. The color stability of anthocyanin compounds after exposure to heat and ultraviolet light is affected by the number of acylated anthocyanin compounds. Purple sweet potato has a very large amount of acylated anthocyanin compound so that anthocyanin in purple sweet potato has high stability against heat and ultraviolet light. Anthocyanin in purple sweet potato is more stable than anthocyanin in strawberries, raspberries, apples, grapefruit skin which has low-yielded anthocyanin content [13].

Based from experiment by Paramita [15], purple sweet potato peel extract has antibacterial activity to inhibit *P. acnes* growth at concentrations of 1000 and 2000 mg/mL. The response from purple sweet potato peel extract to inhibit *P. acnes* is still in the resistant category. *P. acnes* bacteria are anaerobic gram-positive bacteria. The antibacterial activity of purple sweet potato skin extract against other gram-positive bacteria was reported by Rath [16], where purple sweet potato extract has the ability to inhibit gram-positive *Staphylococcus aureus* bacteria at a concentration of 200mg / ml with a barrier zone value of  $10.8 \pm 0.28$  (resistance category). The result of purple sweet potato extract activity shown below.

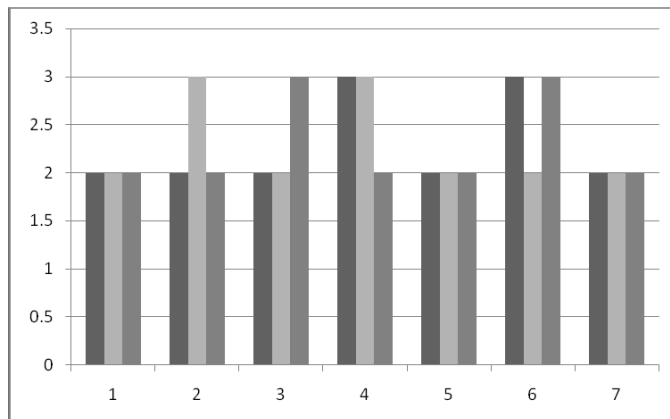
**Table 2.** Result from antibacterial activity against *P. acnes* bacteria

Sample concentration (mg/ml)	Inhibition zone (mm)
250	Nd
500	Nd
1000	$10.3^* \pm 0.03$
2000	$11.3^* \pm 0.06$

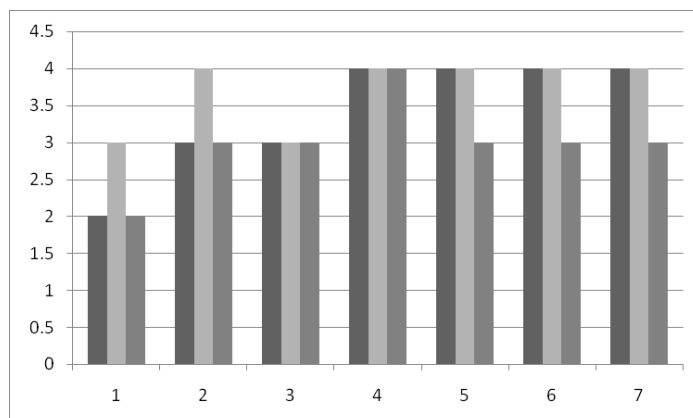
Doxycycline 30 µg/disk (positive control)	27.4*** ± 1.06
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Purple sweet potato peel extract was obtained from the maceration process. This method was chosen because the process is simple, effective enough to attract the desired substance, and there is no heating process so that damage to substances due to high temperatures can be avoided. Purple sweet potato skin is soaked for 1 day using 96% ethanol. The reason for choosing ethanol 96% as a solvent is not toxic, can prevent the growth of bacteria and fungi, and because the sample used is a fresh sample. Maceration of the sample is done in addition to 3% citric acid because the stability of the anthocyanin is in an acidic atmosphere. 3% of citric acid is not corrosive able to produce a greater total anthocyanin level. This is in line with the study [17] that 3% of citric acid is the best type of acid extractor in anthocyanin extraction. The maceration process is carried out for 1 day. The macerate is then filtered first with a flannel cloth to prevent the introduction of impurities, then evaporated with a rotary evaporator to obtain a thick extract of purple sweet potato skin.

Based on research by Sari [18], the results showed that the gambir peel off mask had the effect of treating black skin. In the study, treatment was carried out for 7 days, and then the results were seen and given a scale score of 1-5 according to the level of reduction in the number of blackheads. Number 1 states that blackheads are not much reduced while 5 states are greatly reduced. In this study, comedone skin that was given gambir peel off mask had a value in the range of 3-4, which meant a lot reduced. This proves that the peel off mask can be used in blackhead skin care. Data related to the research are explained in the table below.



Graphic shown average score for blackhead treatment without peel off mask



Graphic shown average score for blackhead treatment with peel off mask in 7 days

The preparation is chosen in the form of a peel-off mask because it is considered more effective and efficient both in terms of use and effect. Where the preparation in the form of a peel-off mask has a gel-like consistency that is easy to use by applying it on the face and left to dry and form a thin, transparent and elastic film layer so that it is easy to remove without washing processes like other forms of masks in general. In terms of the effect of the preparation besides being able to give an effect that is in accordance with the active substance contained in it, the peel off mask is also very effective in removing dead skin cells, blackheads, excess oil, and blockages in the pores [19].

The peel-off mask is made using a base component of PVA + Carbomer 940 + HPMC where the use of this base is combined aiming to produce an ideal preparation. PVA is used as a gelling agent which will produce a gel that can form a thin, transparent and elastic film layer so that it is easy to release. The addition of HPMC and carbomer 940 in the formula aims to form a gel that is more ideal so that it can increase the viscosity and elasticity of the preparation. Carbomer is a gel base whose gel formation depends on pH [20]. Carbomer developed in water is acidic. In an acidic state, the carboxyl group of the carbomer polymer is partially broken down. Whereas in an alkaline state with the addition of TEA in this formula it will increase the termination of the carboxyl group causing the resisting force between the carboxyl groups, the hydrogen bonds in the carboxyl group stretch so that there is an increase in viscosity [21]. Addition of alcohol can reduce the viscosity and clarity of carbomers. With the addition of TEA, it can be overcome, and TEA can also change the pH of the gel [20]. In addition, propylene glycol also functions as a plasticizer, and emollients and humectants have the ability to draw water so that the preparation remains moist and not dry, here propylene glycol can also increase the viscosity of the preparation, which is expected to be thick enough to be applied to facial skin. To extend the storage life of preparations on a base also added preservatives, nipagin. As a solvent, 70% ethanol is used and distilled water is used. Ethanol will give a cold when the mask is applied to the skin of the face so that it can cause a sense of comfort and can accelerate the drying process of the mask. Oleum rosae is added to cover the aroma of the preparation. In addition, oleum rosae is also selected as a flavouring agent according to preparations that are reddish purple like roses.

## 4. Conclusion

Based on the statement above, it can be concluded several things :

- a. Purple sweet potato peel can be used as a skin care blackheads because it contains anthocyanin and beta carotene which function as antioxidants that prevent oxidation of comedogenic compounds on the skin.
- b. Peel off masks has several advantages compared to other forms so that they become the preferred dosage form from the other products.
- c. Formulation of peel off mask using materials such as PVA + HPMC + Carbomer, TEA, alcohol, nipagin, aquades, and oleum rosae can support the function and make the dosage can be used properly.

Based on the statement above, some suggestions needed for further research related to the stability and effectiveness of the peel off mask with the material of purple sweet potato skin ethanol extract. In addition, modifications of the formulations that have been designed can also to improve the effectiveness, stability, and ease of using these masks. If possible, a combination of active ingredients and a mask from the ethanol extract of purple sweet potato skin can be carried out, so that consideration can be given to future industrial scale production.

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