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Research Article

Comparison of physical properties and effectiveness of facial wash gel nipah shell (*Nypa fruticans* Wurmb.) activated charcoal with palm shell (*Elaeis guineensis* Jacq.) activated charcoal as a facial cleanser

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ABSTRACT

Activated charcoal is an amorphous carbon that has a high absorption capacity and can be made using plantation waste such as nipah shell and palm shell. Activated charcoal from nipah shell and palm shell have high absorption when used to absorb dirt and oil on the face by being formulated as a facial wash in the form of a gel. This study was conducted to compare the physical properties and effectiveness of facial wash gel with activated charcoal nipah shell and activated charcoal palm shell with a concentration of 4% of each activated charcoal and determine which facial wash gel has better physical properties and effectiveness than the control positive namely Biore Men Charcoal. The physical properties tested included: organoleptic observation, homogeneity, spreadability, pH, foaming ability, cycling test, irritation test, moisture and oil test using a skin analyzer and dirt absorption effectiveness test using a digital microscope. The results showed that facial wash gel activated charcoal palm shell had physical properties closer to control (+) and better effectiveness, with an average oil reduction percentage of 17% compared to facial wash gel activated charcoal nipah shell, which was 15%. From these results, it can be concluded that facial wash gel activated charcoal palm shell has better physical properties and is more effective in cleaning oil and dirt on the face compared to facial wash gel activated charcoal nipah shell.

1. INTRODUCTION

Nipah and oil palm plant parts are currently widely used by the community, but nipah shells (*Nypa fruticans* Wurmb.) and oil palm shells (*Elaeis guineensis* Jacq.) have not been widely used as activated charcoal. This activated charcoal has good activity as an absorbent or adsorbent, this is due to the presence of very large micropores and creates a capillary gap that has adsorption power (Yustinah & Hartini, 2011).

According to Lestari, Farid and Fudholi (2019), palm shell activated charcoal has a greater absorption capacity than coconut shell activated charcoal. Based on the analysis results, the absorption of iodine produced by palm shell activated charcoal was 766,443 mg/g. In comparison, the absorption capacity of palm shell activated charcoal was 1,253,452 mg/g. This value meets the Badan Standar Nasional Indonesia [BSN] (1995) 06-3730-1995, which is a minimum of 750 mg/g when compared with the absorption of coconut shell activated charcoal is 460.30 mg/g (Safariyanti, Rahmalia, & Shofiyani, 2018).

Based on the above, the value of iodine absorption on its ability as an adsorbent, the activated charcoal of nipah shells and palm shells can be used in the field of cosmetic technology to clean the skin such as facial wash gels, scrubs, masks, scrubs, toothpaste, shampoo, bath soap, and facial soap (Tranggono & Latifa, 2007). Activated charcoal from palm kernel shells and palm shells will be formulated into a facial cleansing soap in the form of a gel or facial wash gel intended to treat facial skin from oil and dirt.

Skincare properly and correctly can minimize the occurrence of skin disorders such as dull and oily skin. One of the factors that cause a dull face is daily activities outside the room. Outdoor activities allow the face to be exposed to pollution such as dust, or smoke that is released in the air attached to and into the face's pores (Lestari, Syamsurizal, & Handayani, 2020[a]). Meanwhile, disruption of oil gland production can cause excess oil on the face so that it can cause blockage of hair follicle channels and facial pores (Djuanda, Hamzah & Aisah, 2007). As a first step in facial skin health care, facial wash is used, a type of cleanser to clean dead skin cells, dirt, oil, and cosmetics which consists of various forms such as liquid, solid, and semi-solid facial wash. Semi-solid facial wash such as gel is preferred because it is more practical with good spread and absorption on the skin.

By utilizing their absorption ability, the active charcoal of *N. fruticans* and palm shells *E. guineensis* are formulated as facial wash gels with the aim of overcoming various problems on facial skin such as oily and dull skin caused by excess oil and sebum. pollution exposure. Therefore, a study will be conducted to compare facial wash gel's physical properties and effectiveness of *N. fruticans activated charcoal* and *E. guineensis* activated charcoal as a cleanser for oil and dirt on the face.

2. METHOD

Materials

The materials used for this study were activated charchoal of *N. fruticans* and *E. guineensis* shells, carbopol 940, sodium lauryl sulfate, TEA, methyl paraben, propylparaben, propylene glycol, and aqua destilata.

Equipments

The tools used were a furnace, vacuum rotary evaporator, water bath, oven, incubator, laminar airflow (LAF), autoclave, digital microscope, micropipette, erlenmeyer, beaker glass, measuring cup, test tube, hot plate, petri dish, object-glass, stirring rod, porcelain cup, funnel, analytical balance, magnetic stirrer, pH meter, mortar, and stamper.

Volunteers

Testing the effectiveness of the emollient test, irritation test, and dirt absorption test was carried out on tem panelists in the category of women aged 25-30 years old based on the ethical clearance certificate No B/560/UN21.8/PT.2020.

Formula Design

The preparation is made by heating 35 mL of water until it boils and CO_2 is liberated. 2 g of carbopol 940 was developed by dispersing carbopol in heated water and grinding slowly (mass A). TEA was dissolved with the remaining water until homogeneous to be added into mass A. Crushed propylene glycol, propylparaben, and methylparaben until homogeneous (mass B). Add mass B slowly to mass A while grinding slowly. The homogeneous base was then added with SLS (sodium lauryl sulfate) and stirred slowly to not to form foam during grinding. Then put in the activated charcoal of the *N. fruticans* shell little by little accompanied by stirring slowly. Then add fragrance and stir again slowly (Rodriques, Matias, Ferreira, Amaral & Oliveira, 2016).

Evaluation of the Preparation of Facial Wash Gel Activated Charcoal of *N. fruticans* Shells

Organoleptic test

Includes inspection of color, odor, and texture of each preparation. Observations were made visually.

Homogeneity test

0.1 g of the preparation is applied to the slide. Observed the arrangement of coarse particles or inhomogeneities, then recorded. Gels are generally clear with semisolid concentrations (Septiani, Wathoni, & Mita, 2012).

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pH test

The pH test is done by dipping the electrode from the pH meter into each formula, waiting for the pH meter screen to show a stable number. A facial wash that is well received by the skin has a pH value range between 4.5-6.5 (Noor & Nurdyastuti, 2009).

Foaming ability test

1 g of the preparation is dissolved in 10 mL of water. Then put into a test tube, closed and shaken by turning the test tube regularly for 20 seconds. Then the height of the foam formed was measured. According to Wilkinson and Moore (1982), a good foam requirement is 1.3 - 22 cm.

Spreadability test

0.5 g of the preparation was placed on a petri dish that had been given a millimeter block of paper then covered with another pertri dish and given a load of 50 g and the diameter of the four corner points was measured after being left for 1 minute and the diameter of the gel spread was recorded. Good gel dispersion is 3 -7 cm (Garg, Aggarwal, Garg & Singla, 2002).

Stability test

The physical stability of the facial wash gel preparation was tested using the freeze-thaw cycling method. The freeze-thaw cycling method was used to determine the stability of the preparation at high temperatures (melting) and low temperatures (freezing). The test was carried out by storing the preparation at a temperature of 40 and 4 °C for 24 hours (1 cycle). The test was carried out for six cycles and the physical changes of the gel were observed. Then compared the preparation condition before and after testing (Butler,2000).

Irritation Test

Performed by the patch test method, by attaching facial wash gel to the skin with Wattman paper coated with polyethylene film diameter 2 cm. The patch test is carried out on the skin behind the body for 24 hours, after which it is removed and marked. Results are assessed 25-30 minutes during lifting. Observed for an irritant reaction in the form of heat, itching or stinging, then noted. Irritation test was carried out on 5 panelists (Lestari, Syamsurizal & Farid, 2021)

Hedonic test

The test is done by looking at the level of preference called the hedonic scale, namely very like (5), like (4), somewhat like (3), dislike (2), and very dislike (1) on color, aroma, and skin sensation. The level of preference for the product or preparation is carried out by 10 panelists (Lestari et al., 2021)

Skin Moisture Test (moisture content and oil content)

The test was carried out on the face before and after using the facial wash gel using a Skin Analyzer by observing the percent water/moisture and oil content in 10 respondents. Tests were also carried out on 1 respondent using control preparations (-) and control preparations (+). Recorded and observed skin moisture before and after use. Then compared with control (-) and control (+) (Lestari, Asra & Yusnelti, 2020[c])

Table 1. Facial wash gel formulation

Nipah Shell Activated Charcoal Face Wash Gel	Formula (g)	Palm Shell Activated Charcoal Face Wash Gel	Formula (g)
Activated charcoal	4	Activated charcoal	4
Carbopol 940	2	Carbopol 940	2
Sodium lauryl sulfate	2,5	Sodium lauryl sulfate	2,5
Propylene glycol	2,5	Propylene glycol	2,5
Triethanolamine	2	Triethanolamine	2
Propyl paraben	0,18	Propyl paraben	0,18
Methyl paraben	0,02	Methyl paraben	0,02
Green tea	0,01	Green tea	0,01
Aqua destilla ad	100	Aqua destilla ad	100

Skin brightness test

The test was carried out by comparing the respondent's facial skin color before and after the use of facial wash gel activated charcoal of *N. fruticans* shell, control (-) and control (+). Skin brightness is measured using 18 skin tone scales (Lestari et al., 2020[c])

3. RESULTS AND DISCUSSION

Based on the results of the physical properties test of palm shell activated charcoal facial wash gel and palm shell activated charcoal facial wash gel in the form of organoleptic, homogeneity, pH, foaming ability, spreadability, stability, hedonic, skin moisture, skin brightness, irritation, and effectiveness in cleaning dirt and oil using a digital microscope. The results of the recapitulation of the physical properties and effectiveness of the facial wash gel can be seen in the **Table 2**.

Physical Properties Test Facial Wash gel

Organoleptic test

The results of organoleptic observations of the two facial wash gels were both black in color, this was due to the use of activated charcoal from *N. fruticans* and *E. guineensis* shells which were both black with the control (+). Both facial washes' gel form and texture were the same as the control (+). Both facial washes, activated charcoal of *N. fruticans* and *E. guineensis* shells have the same aroma, which is green tea, while the control (+) has a distinctive aroma.

Homogeneity test

The experimental results on each facial wash gel have the same color and show that all the particles in the preparation are evenly dispersed so that it can be concluded that the preparation is homogeneous. These results

Table 2. Recapitulation of physical properties of facial wash gel

Category	*N. fruticans* shell Activated Charcoal	*E. guineensis* Shell Activated Charcoal	Control (+)	Control (-)		Parameter
				N. fruticans Shell Activated Charcoal	*E. guineensis* Shell Activated Charcoal	
Before cycling test						
Organoleptic	Black color, green tea aroma, gel form	Black color, green tea aroma, gel form	Black color, distinctive aromatic aroma, gel form	Colorless, green tea aroma, gel form	Colorless, green tea aroma, gel form	Stable, no change in color, odor, and dosage form (Depkes RI,1979)
Homogeneity	Homogeneous	Homogeneous	Homogeneous	Homogeneous	Homogeneous	Homogeneous (Kuncari et al., 2014)
pH	5.10	5.20	8.00	5.30	4.80	The pH value is 4.5-6.5 (BSN, 1996).
Foam height (mm)	88.0	82.0	88.0	89.0	53.0	13-220 mm (BSN, 1996)
Spreadability (cm)	4.50	4.30	4.60	4.50	4.40	3-7 cm (Garg et al., 2002)
After Cycling test						
Organoleptic	Black color, green tea aroma, gel form	Black color, green tea aroma, gel form	Black color, green tea aroma, gel form	Colorless, green tea aroma, gel form	Colorless, green tea aroma, gel form	Stable, no change in color, odor, and dosage form (Depkes RI, 1979)
Homogeneity	Homogeneous	Homogeneous	Homogeneous	Homogeneous	Homogeneous	Homogeneous (Kuncari et al., 2014)
pH	5.30	5.80	7.9	4.80	5.10	The pH value is 4.5-6.5 (BSN, 1996)
Foam height (mm)	81.0	80.0	100.0	69.0	97.0	13-220 mm (BSN, 1996)
Spreadability (cm)	4.30	4.10	4.80	4.40	4.50	3-7 cm (Garg et al., 2002)

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show the same results in the study by Lestari, Syamsurizal and Septima (2020[b]), the facial wash gel preparation produces a homogeneous form and does not form agglomerates of particles in the preparation, and can be seen from the homogeneous solution form seen on the slide.

pH test

The results of the two facial wash gels have a pH value in the normal pH range of the skin, namely 4.5-6.5 (Tranggono and Fatma, 2007) to provide comfort when used and do not irritate the skin.

Foam height test

Measurement of foam height indicates the ability of a facial wash gel to produce foam. The foam height requirements are 13-220 mm (BSN, 1996). The two facial washes did not meet the requirements, this was because the use of SLS in a small concentration of 2.5% was aimed at avoiding irritation if used in large quantities. The concentration of SLS used is very small because the facial wash gel of activated charcoal of *N. fruticans* and *E. guineensis* shells are made for the purpose of cleaning dirt and oil, if a large concentration of SLS is used it can affect the effectiveness of the cleanser because SLS also has an effect as a cleansing power.

Spreadability test

The spreadability measurement is intended to determine the ability to spread the facial wash gel when applied to the face. Dispersion is an important characteristic, as it affects the transfer of the active ingredient to the target at the correct dose, ease of use, the pressure required to exit the package, and acceptance by the consumer. Based on the results of observations of the spread of facial wash gel, activated charcoal of *N. fruticans* and *E. guineensis* shells meet the requirements of 3-7 cm (Garg et al., 2002).

Stability test

The results of organoleptic examination and homogeneity after the cycle test, both facial wash gels remained stable, there was no change in color, odor or clarity in the preparation, based on organoleptic observations, the stability of the preparation during storage for six cycles was also due to good and airtight packaging so that the preparation was maintained (Wasitadmaja, 1997).

The pH of the facial wash gel preparation was measured at the beginning and end of the cycle. The results of the initial pH measurement have increased, an increase in pH in storage is likely due to the influence of the additional ingredients used which are alkaline (Rowe, Sheskey & Quinn, 2009).

The results of the examination of foam height and dispersion after the cycle test, both facial wash gels decreased, this was due to the effect of the addition of acidic carbophol, if heating occurs it will affect the foam height as well as the spreadability (Rowe et al., 2009).

Table 3. Recapitulation of the Effectiveness Test of facial wash gel

Category	***N. fruticans* shell Activated Charcoal**		***E. guineensis* Shell Activated Charcoal**		**Positive Control**	
	Before	After	Before	After	Before	After
Water content	35,33%	47,33%	34,44%	49,33%*	34,33%	48,67%
Oil Level	36,33%	21,33%	33,00%	20,00%*	37,00%	20,00%
Irrittion	-	not irritating	-	not irritating	-	not irritating
Dirt absorption	Yes	No*	Yes	No *	Yes	No
Hedonic	-	Suka	-	Sangat suka*	-	Sangat suka
Brightness	7	5	6	2*	5	2

Table 4. Irritation test results

Formula	**Volunteer**									
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Face wash gel activated charcoal shell nipah	-	-	-	-	-	-	-	-	-	-
Palm shell activated charcoal face wash gel	-	-	-	-	-	-	-	-	-	-

Keterangan : - = tidak terjadi iritasi

Figure 1. Skin brightness level

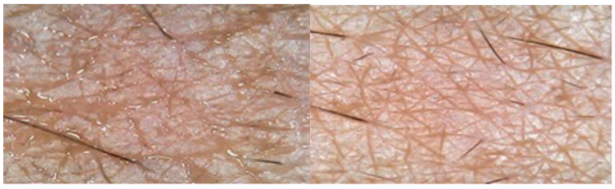

Figure 2. Facial skin using facial wash gel, activated charcoal, nipah shells

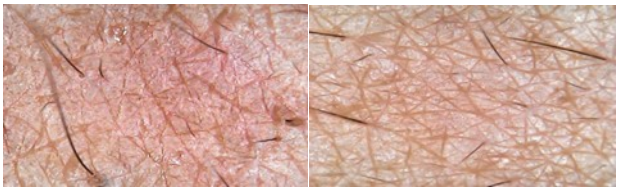

Figure 3. Facial skin using facial wash gel activated charcoal nipah shell

Irritation test

The results of the test on ten panelists showed that the two facial wash gels (**Table 4**), activated charcoal activated charcoal of *N. fruticans* and *E. guineensis* shells showed negative results that did not irritate the skin. Characterized by not causing itching, red and hot at the time of testing. So it can be concluded that both facial wash gels can be used on the skin safely (Shimizu, 2007).

4. CONCLUSION

The data produced descriptively stated that *N. fruticans* shell activated charcoal facial wash gel had better physical properties and was more effective in cleaning oil and dirt on the face compared to *E. guineensis* shell activated charcoal facial wash gel.

5. REFERENCE

Badan Standar Nasional Indonesia. (1995). *Standar Bahan Bakar Padat, SNI 06-3730-1995*. Jakarta, Indonesia: Authors.

Badan Standar Nasional Indonesia. (1996). *Standar Mutu Sabun Mandi Cair, SNI 06-4085-1996*. Jakarta, Indonesia: Authors.

Badan Standar Nasional Indonesia. (1996). *Standar Pembersih Kulit Muka, SNI 16-4380-1996*. Jakarta, Indonesia: Authors.

Badan Standar Nasional Indonesia. (2016). *Standar Mutu Sabun Mandi Padat, SNI 3532-2016*. Jakarta, Indonesia: Authors.

Butler, H. (2000). *Poacher's Parfumes, Cosmetics and Soaps*, 10th ed. London, UK: Kluwer Academics Publishers.

Depkes RI. (1979). *Farmakope Indonesia Edisi III*. Jakarta, Indonesia: Authors.

Djuanda A., Hamzah M., & Aisah, A. (2007). *Ilmu Penyakit Kulit dan Kelamin*, 5th ed. Jakarta, Indonesia: UI Press.

Garg, A., Aggarwal, D., Garg, S., & Singla, A. K. (2002). Spreading of semisolid formulations: an update. *Pharmaceutical Technology North America, 26*(9), 84-84.

Lestari, U., Syamsurizal, S., & Handayani, W. T. (2020[a]). Formulasi dan Uji Efektivitas Daya Bersih Sabun Padat Kombinasi Arang Aktif Cangkang Sawit dan Sodium Lauril Sulfat. *JPSCR: Journal of Pharmaceutical Science and Clinical Research, 5*(2), 136-150.

Lestari, U., Syamsurizal., Septima, N. R. (2020[b]). Uji Aktivitas Pasta Gigi Arang Aktif Cangkang Sawit (*Elaeis guineensis*) Antiplak Pada Perokok Secara Invitro. *SCIENTIA Jurnal Farmasi dan Kesehatan, 10*(2), 177-186.

Lestari, U., Asra, R., & Yusnelti, Y. (2020[C]). Formulation and Characterisation of Jernang Resin (*Daemonorops draco* (Willd.) Blume) Sunscreen Creams. *Journal of Pharmacy & Bioallied Sciences, 12*(2020 Supplement), 868.

Lestari, U., Farid, F., & Fudholi, A. (2019). Formulation and effectivity test of deodorant from activated charcoal of palm shell as excessive sweat adsorbent on body. *Asian Journal of Pharmaceutical and Clinical Research, 12*(10), 193-196.

Lastari, U., Syamsurizal, S., & Farid, F. (2021). Irritation Test and Effectiveness of The Clean Power Activated Charcoal Palm Shells (*Elaeis guineensis* Jacg) as Adsorbent Dirt on The Hair. *Indonesian Journal of Pharmaceutical Research, 1*(1), 13-18.

Noor, S. U., & Nurdyastuti, D. (2009). Lauret-7-Sitrat sebagai Detergensia dan Peningkat Busa pada Sabun Cair Wajah *Glysine soja* (Sieb.) Zucc. *Jurnal Ilmu Kefarmasian Indonesia, 7*(1), 39-47.

Kuncari, E. S., Iskandarsyah, I., & Praptiwi, P. (2014). Evaluasi, uji stabilitas fisik dan sineresis sediaan gel yang mengandung minoksidil, apigenin dan perasan herba seledri (*Apium graveolens* L.). *Indonesian Bulletin of Health Research, 42*(4), 213-222.

Rodrigues, F., Matias, R., Ferreira, M., Amaral, M. H., & Oliveira, M. B. P. (2016). In vitro and in vivo comparative study of cosmetic ingredients Coffee silverskin and hyaluronic acid. *Experimental dermatology, 25*(7), 572-574.

Rowe, R. C., Sheskey, P. J., & Quinn, M. E. (2009). *Handbook of Pharmaceutical Excipients*, 6th ed. London, UK: Pharmaceutical Press.

Safariyanti, S. J., Rahmalia, W., & Shofiyani, A. (2018). Sintesis dan Karakterisasi Karbon aktif dari Tempurung Buah Nipah (*Nypa fruticans*) Menggunakan Aktivator Asam Klorida. *Jurnal Kimia Khatulistiwa, 7*(2), 41-46.

Shimizu, H. (2007). Shimizu's Textbook of Dermatology. Hokkaido, Japan: Nakayama Shoten Publisher.

Septiani, S., Wathoni, N., & Mita, S. R. (2012). Formulasi sediaan masker gel antioksidan dari ekstrak etanol biji melinjo (*Gnetun gnemon* Linn.). *Students e-Journal, 1*(1), 1-27.

Tranggono, R. I., & Fatma, L. (2007). *Buku Pengangan Ilmu Pengetahuan Kosmetik*. Jakarta, Indonesia: PT. Gramedia Pustaka Utama.

Wasitaatmadja, S. M. (1997). *Penuntun Ilmu Kosmetik Medik*. Jakarta, Indonesia: UI Press.

Wilkinson, J.B., & Moore, R. J. (1982). *Harry's Cosmeticology*, 7th Ed. London, UK: George Godwin.

Yustinah., & Hartini. (2011). Adsorbsi Minyak Goreng Bekas Menggunakan Arang Aktif dari Sabut Kelapa. I Siswanti (Ed.), *Pengembangan Teknologi Kimia untuk Pengolahan Sumber Daya Alam Indonesia*. Proceedings of the Prosiding Seminar Nasional Teknik Kimia "Kejuangan" (pp. B05 1-5). Yogyakarta, Indonesia.