Antibacterial Activity From Cucumber (*Cucumis sativus* .L) Ethanol Extract In Deodorant Roll On Dosage Form

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Abstrak
Bau badan manusia biasanya terjadi akibat adanya produksi berlebih dari kelenjar keringat dan adanya bakteri. Bahan aktif untuk mencegah bau badan adalah bahan kimia dari tawas atau natrium, tetapi memiliki efek negatif seperti iritasi kulit, penyakit Alzheimer, kanker prostat dan kanker payudara. Teknologi bahan alami untuk mengatasi bau badan telah dikembangkan sebagai bahan aktif dengan menggunakan ketimun (*Cucumis sativus* .L). Tujuan dari penelitian ini adalah untuk menghasilkan deodoran yang stabil dan berkualitas secara fisik dan juga mengembangkan penggunaan ekstrak ketimun sebagai antibakteri *Staphylococcus epidermidis*. Ekstraksi ketimun telah dilakukan dengan maserasi menggunakan etanol 70% selama 4 hari dan kemudian dibagi menjadi tiga formulasi ekstrak (5%, 10%, dan 20% (b / v)). Semua formulasi telah diuji zona penghambatan, organoleptik, homogenitas, pH, viskositas dan uji iritasi. Hasilnya, semua formulasi memenuhi persyaratan mutu fisik formulasi ekstrak dengan formulasi terbaik adalah kandungan ekstrak 20% yang mampu menghambat bakteri dengan zona hambat terbesar yaitu 26 mm. Selain itu, stabilitas dipercepat deodoran diuji selama 35 hari pada suhu kamar (28° C) dan 40° C. Hasil pengujian menunjukkan bahwa kestabilan ekstrak 10% memenuhi syarat kualitas fisik selama penyimpanan pada suhu kamar (28°C) dan suhu tinggi (40°C) selama 35 hari. Sedangkan pada ekstrak 20%, pada suhu tinggi (40°C) terjadi perubahan fisik yang ditandai dengan pengendapan.

Kata kunci: ketimun, deodoran, antibakteri

Abstract
Body odor of human skin usually occur due to excessive production of sweat glands couples with the presence of bacteria. The active ingredient to prevent body odor are chemicals materials from alum or sodium in order to have negative effects such as skin irritation, Alzheimer disease, prostate and breast cancer. Natural materials technology has been development as an active agent by using cucumber (*Cucumis sativus* .L). The purpose of this research to conduct a deodorant roll on a stable and qualified physical quality and also develop the use of extract cucumber as an antibacterial *Staphylococcus epidermidis*. Cucumber extraction has been done by maceration with ethanol 70% for 4 days and then divided into three formulation extract (5%, 10%, and 20% (b/v)). All of the formulations has been tested by zone inhibition, organoleptic, homogenity, pH, viscosity and irritation test. The results given that all of the formulations meet the quality requirements of physical and the best formulation extract 20% able to inhibit bacterial by 26 mm as a largest diameter of the inhibitory zone. In addition the stability of deodorant roll on form were performed accelerated stability test for 35 days at room temperature (28°C) and 40°C. The test results indicate that the stability of the extract 10% qualified physical quality during storage at room temperature (28°C) and high temperature (40°C) for 35 days. While in the extract 20% at high temperature (40^{o}C) physical changes characterized by the deposition.

Keyword : cucumber, deodorant roll on, antibacteria

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Introduction

Sweat glands in the human eccrine and apocrine glands are always carrying out its functions the body to sweat when the heat began to whack. Parts of the body that have these glands are the armpit, back of the neck, legs, and other body folds. Excessive sweating will cause the surface of the skin and hair that grows around the area becomes moist, the course will grow bacteria. The excessive amount of sweat that will be broken down by bacteria into acidic compounds that cause body odor. Factors that affect not only the body odor of bacterial activity, but could be due to genetic factors, emotional state, dietary factors, and diseases [1]. Nevertheless, the sweat and the activity of bacteria is believed to have an important role causing body odor. Some bacteria are often present that cause body odor is *Corynebacteria sp, Streptococcus sp, Staphylococcus sp* and *Propionibacteria sp* [2].Various ways can be done to reduce the body odor by preventing the activity of bacteria, one with a cosmetic preparation in the form of deodorant.

Deodorant preparations usually liquid, aerosol, ointment, gel, powder and sticks but the most common form of aerosol and liquid [3]. In general, the active ingredient in deodorant is a chemical compound derived from alum, chlorine and sodium. Although these chemical compounds believed to inhibit bacterial activity, but the use of a chemical compound applied to the skin for long periods can cause some side effects that irritate the skin, the symptoms of Alzheimer's, prostate cancer and breast cancer. In 2005, Darbre et al., published works indicating a link between the use of underarm cosmetics such as aluminium-based antiperspirants and breast cancer. Results reported here demonstrate that aluminium in the form of aluminium chloride or aluminium chlorhydrate can interfere with the function of oestrogen receptors of MCF7 human breast cancer cells both in terms of ligand binding and in terms of oestrogen-regulated reporter gene expression.

On the basis of this background, the researchers are encouraged to make deodorant cosmetic preparation using herbal-based active substances. The use of herbal ingredients because Indonesia is a country rich in medicinal plants and has a high efficacy and low side effects. One of the plants is efficacious as an antibacterial that can be used as an active ingredient in the preparation of deodorant is cucumber. Cucumber contains saponin which is antibacterial, antiinflammatory, anti tumor [4].

Saponin is a surface-active compounds that are like soap and has antimicrobial power. Saponins same function as flavonoids and phenolic compounds that have the ability to inhibit the action of the enzyme, because the compound inhibits the action of an enzyme that causes the enzyme permease can not function properly, so that the transport process can not take place. This resulted in the transport of nutrients does not take place, so that bacterial cells can not grow [5].

Some researchers have reported the active substance saponin as an anti-bacterial, the peels and pulp of cucumber in phospate buffer saline extracts demonstrated antibacterial activity specifically against gram positive *Staphylococcus aureus* and gram negative *Klebsiella pneumonia* (Ni Foong et al., 2015). The chloroform fraction of the crude methanol extract of cucumber (Cucumis sativus L.) stems are detected as (2S,3S,4R,10E)-2-[(2'R)-2-hydroxytetra-cosanoylamino]-1,3,4-octadecanetriol-10-ene,1-O-b-D-glucopyranosyl(2S,3S,4R,10E)-2-[(2'R)-2-hydroxy-tetracosanoylamino]-1,3,octadecanetriol-10-ene and soya-cerebrosidposses antimicrobial activity [6].

In this study, the researchers made preparations in the form of roll on deodorant with cucumber extract as active substances against on bacteria *Staphyloccocus epidermidis*. The background of this

preparation election to the ease and efficiency during use. Excellence deodorant roll on contains a large amount of alcohol (ethanol 96%) that give the sensation of cold that cooling the skin, and also to keep the clothes stay dry after application preparation without the need to wait too long because the ethanol contained in the preparation will soon evaporate at room temperature.

The optimum formulation results from the manufacture of deodorant roll on to test the homogeneity, organoleptic test, measuring pH, viscosity, density, irritation test, hedonic test, stability test and test of inhibition against the bacteria *Staphylococcus epidermidis* and accelerated stability test for 35 days at a storage temperature 28˚C and 40˚C.

Materials and Methods

Materials

Materials used are bacteria *Staphylococcus epidermidis*, Mueller Hinton agar medium, distilled water, sodium metabisulfite, aluminum foil, paper towels, propylene glycol, HPCM, oleum rosae. The tools used are incubators, stirrer, scales, pH meters digital, glass tools, pycnometer, sterile petri dish, viscometer Hooke, paper disc, forceps, rotary evaporator, ose needle sterile autoclave, oven, sterile cotton, plastic bottles, deodorant roll on bottle, boron silica spheres. Determination of plants was conducted in Labotatorium Botany Department of Biology, University of Lampung.

Table 1. The Evaluation Organoleptic of Deodorant Roll On

Formulation	Organoleptic	
	Color	**Smell**
Blanko	Clear	Rosae
1	Clear Yellow	Rosae
2	Light Yellow	Rosae
3	Yellow	Rosae

Preparation of Simplisia

Cucumbers were randomly selected from the local farm in Lampung with the characteristics of green fruit skin and white flesh. They were throughly washed and scrubbed, then left to dried in the sun with black layer.

Preparation of Cucumber Extract

Cucumber extract were made in the following manner : 262 grams of simplisia were weighed and then macerated for 4 days with 70% ethanol while stirring often squeezed then filtered and washed with 70% ethanol, and so on until the active ingredients in botanicals maximum filtered. Then, extract carried evaporation using a rotary evaporator until all the ethanol separately.

Preparations Deodorant Roll On From Cucumber Extract

Formulations. Deodorant roll on formulations made with cucumber extract three concentration of the 5, 10 and 20% w/v as formulation 1, formulation 2 and formulation 3, respectively. In previous study, Yusvaneli (2008) has been test bacterial inhibition cucumber extract against *Staphylococcus epidermidis* at concentrations of 5%. [7].

Each concentration cucumber extract supplemented with hidroxypropil celullose medium (HPCM) 2% w/v, propylene glycol 15% w/v, sodium bisulfite 0.1% w/v, perfume and o oleum rosae 5 drops of distilled water to 100 mL. The same treatment is given to formula blank.

Table 2. The Evaluation pH of Deodorant Roll On

Formulation	pH
Blanko	5,49
1	5,50
2	5,50
3	5,59

Table 3. The Evaluation Viscosities of Deodorant Roll On

Formulation	Viscosities (cps)
Blanko	180,009
1	80,211
2	171,642
3	187,123

Table 4. The Evaluation Iritation Test of Deodorant Roll On

Formulation	Score									
	Female					Male				
Blanko	-	-	-	-	-	-	-	-	-	-
1	-	-	-	-	-	-	-	-	-	-
2	-	-	-	-	-	-	-	-	-	-
3	-	-	-	-	-	-	-	-	-	-

Note: (-) : does not appear irritation

Stirring speed optimization. HPCM developed with some of the water is then mixed with cucumber extract and additional materials then homogenized with a stirrer on a stirring speed of 100, 200, 300 rpm with a stirring for 20 minutes and then allowed to stand. Deodorant roll on formulations homogeneous indicates optimum speeds.

Stirring time optimization. The optimum stirring speed that has been obtained is used to find the optimum stirring time. With the same composition, the sample was stirred at optimum speed at in the stirring time 10, 20 and 30 minutes, and then sample allowed to stand. The optimum stirring time is the time that can be obtained from the sample in a homogeneous state.

Procedure. Deodorant roll on samples made using a formula that has been determined the optimum time and optimum speed with the following steps : weighed materials be required, developed HPCM insome of the water and let stand for 24 hours and then added propylene glycol to the HPCM which has been developed in some of the water and mix until homogeneous. Sodium metabisulfite dissolved in some of the water, then mix with extracts cucumber with the amount of 5, 10, and 20 grams as formulation 1, formulation 2 and formulation 3, respectively. Then added oleum rosae 5 drops, stir homogeneous then added with distilled water until 100 ml. Then put it into container of bottles with a ball inserted into the neck of the bottle (± 1 cm from the top surface of the bottle) to discharge.

Accelerated Stability Test

Deodorant roll on samples that have been made at the optimum condition to do accelerated stability testing include organoleptic evaluation, homogeneity, pH, viscosity and flow properties. The sample were kept at different storage temperature i.e. ±28-30^{o}C and 40^{o}C in the oven with stability chambers and observed for 35 days. Both of the storage temperature, the sample was observed for 5 weeks and then to do the physical evaluation every 1 week. [8].

Results and Discussion

Results of determination cucumber

Table 5. The Evaluation Hedonic Test of Deodorant Roll On

Formulation	Score										Total	Average
	Female					Male						
Blanko	3	2	1	1	2	3	2	2	2	1	19	1,9
1	2	2	1	2	2	2	2	2	2	2	19	1,9
2	4	2	3	3	2	5	4	4	4	3	30	3,0
3	5	3	4	4	3	5	3	3	3	3	36	3,6

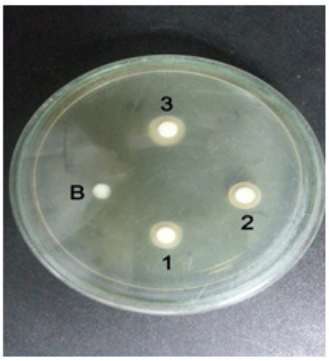

Figure 1. Test Results of Inhibition by Paper Disc

Table 6. Evaluation of Inhibition Test

Formulation	Zone Inhibition diameter (mm)
Blanko	-
1	16
2	18
3	26

plants were conducted at the Laboratory Botany Department of Biology, University of Lampung. Determination cucumber plants showed that the plants belonging to the species *Cucumis sativus* L.

Based on the results of the optimization stirring speed sample showed that the homogeneity of sample at a speed of 300 rpm, and the optimization results in 20 minutes stirring time indicates the sample has been homogenized during 24 hours. These results indicate that the higher rotational speed per minute, and the longer time given during the mixing process provides homogeneous sample with a good level.

The results of organoleptic examination visually indicates that the negative control, formulations 1, 2, and 3 deodorant roll on show variations in color are shown in Table 1. The color ranging from clear, light yellow to yellow due to different concentrations of extracts of cucumber and produces the smell of roses for use oleum rosae as a perfume in the preparation.

The evaluation of pH indicate that formulation negative control, 1, 2, and 3 is not significantly different. This results indicates that the higher concentration of cucumber fruit extract used, the pH will increase. The evaluation of pH are shown in Table 2.

Evaluation of deodorant roll on the viscosity of the sample showed that the variation of cucumber fruit extract concentrations produce different viscosities as shown in Table 3.

The viscosity is highest on the formulation 3 at 187.123 cps and the lowest viscosity formulation 1 at 80.211 cps. The

Table 7. Evaluation Organoleptic Accelerated Stability Test

Formulation	Temperature	Organoleptic (color, smell) at week-				
		1	2	3	4	5
Blanko	±28-30°C	Clear rosae	Clear rosae	Clear rosae	Clear rosae	Clear rosae
	40°C	Clear rosae	Clear rosae	Clear rosae	Clear rosae	Clear rosae
1	±28-30°C	Clear yellow, rosae	Clear yellow, rosae	Clear yellow, rosae	Clear yellow, rosae	Clear yellow, rosae
	40°C	Clear yellow, rosae	Clear yellow, rosae	Clear yellow, rosae	Clear yellow, rosae	Clear yellow, rosae
2	±28-30°C	Light yellow, rosae	Light yellow, rosae	Light yellow, rosae	Light yellow, rosae	Light yellow, rosae
	40°C	Light yellow, rosae	Light yellow, rosae	Light yellow, rosae	Light yellow, rosae	Light yellow, rosae
3	±28-30°C	Yellow, rosae	Yellow, rosae	Yellow, rosae	Yellow, rosae	Yellow, rosae
	40°C	Yellow, rosae	Yellow, rosae	Yellow, rosae	Yellow, rosae	Yellow, rosae

Table 8. Evaluation Homogeneity Accelerated Stability Test

Formulation	Temperature	Homogeneity at week-				
		1	2	3	4	5
Blanko	±28-30°C	H	H	H	H	H
	40°C	H	H	H	H	H
1	±28-30°C	H	H	H	H	H
	40°C	H	H	H	H	H
2	±28-30°C	H	H	H	H	H
	40°C	H	H	H	H	H
3	±28-30°C	H	H	H	H	H
	40°C	NH	NH	NH	NH	NH

Note: H = Homogeneous, NH = No Homogeneous

viscosity difference is probably influenced by the concentration difference cucumber extract added. Evaluation of flow properties of roll on deodorant preparations have good flow properties because they are within the standard range of the viscometer flow time of 20 to 400 second.

The result of irritation test for 10 panelists (5 female and 5 male panelists) showed that there was no statement of complaint skin irritation after using deodorant roll on are applied directly to the armpit. Therefore, roll on deodorant preparation is safe for use in the armpit. The result shown in Table 4.

Hedonic test evaluation results indicate that deodorant roll on formulation 3 has an average value of 3.6 is the highest are in the range of 3-4, it is because the scent of deodorant roll on preferred by the panelists for aroma possibility oleum rosae and cucumbers produce aromas tasty. The Result shown in Table 5.

Deodorant roll on samples that have been made at the optimum condition to test the antibacterial activity against *Staphylococcus epidermidis* using Mueller Hinton medium which had been sterilized. Antibacterial inhibition against *Staphylococcus epidermidiscan* be seen in the figure 1 and Table 6.

Based on the fig. 1 and Table 6 shows that the formulation 3 has a large diameter of the inhibitory zone with cucumber extract concentration of 20%. This is probably due to saponins in the cucumber so that the higher the concentration of extracts of cucumber, the higher the inhibitory power against *Staphylococcus epidermidis* bacteria.

Accelerated stability test were conducted for 35 days with temperature 28^{o}C and 40^{o}C, and the evaluation is done

Table 9. Evaluation pH Accelerated Stability Test

Formulation	Temperature	pH at week-				
		1	2	3	4	5
Blanko	±28-30°C	5,49	5,49	5,48	5,48	5,47
	40°C	5,46	5,44	5,43	5,42	5,40
1	±28-30°C	5,50	5,49	5,47	5,46	5,44
	40°C	5,49	5,49	5,48	5,47	5,47
2	±28-30°C	5,55	5,55	5,54	5,53	5,53
	40°C	5,55	5,54	5,54	5,53	5,51
3	±28-30°C	5,59	5,58	5,58	5,57	5,56
	40°C	5,57	5,56	5,55	5,53	5,51

Table 10. Evaluation Viscosity Accelerated Stability Test

Formulation	Temperature	Viscosity (centipoise) at week-				
		1	2	3	4	5
Blanko	±28-30°C	180,009	180,004	179,574	179,574	179,014
	40°C	170,014	179,014	178,684	178,684	177,688
1	±28-30°C	80,211	80,211	79,695	79,695	79,710
	40°C	79,710	79,740	79,238	79,268	78,765
2	±28-30°C	172,206	171,706	171,706	171,143	170,611
	40°C	171,143	170,611	170,240	169,708	169,708
3	±28-30°C	187,619	187,619	187,193	187,193	187,128
	40°C	187,228	187,264	186,802	186,837	186,375

every single week (1 cycle). Observations organoleptic deodorant roll on sample showed that formulation blanko, 1, 2, and 3 formulation is stable at room temperature 28^{o}C and high temperature 40^{o}C. The smell of perfume and color preparation does not change from week 1 to 5. The result shown in Table 7 below.

The homogeneity stability evaluation has shown that all samples showed high homogeneity at room temperature up to ±28-30^{o}C from the week 1 to week 5, while there is a low degree of homogeneity at high temperatures 40^{o}C to produce a precipitate since the first week. This results indicates that the sample deodorant roll on unstable at high temperatures as shown in Table 8.

The results of the measurement of pH stability in sample showed that the pH in the formulation blanko, 1, 2, and 3 at room temperature ±28-30^{o}C and high temperature 40^{o}C decreased pH insignificat. pH measurement on the sample were observed for 35 days ranged from 5.40 to 5.59 still within the normal pH range of underarm skin which is pH 4-7. It means sample deodorant roll on does not irritate the skin when applied to the skin as shown in Table 9.

Evaluation of viscosity stability preparation deodorant roll on the formulation negative control, 1, 2, and 3 formulation at room temperature 28^{o}C and high temperature 40^{o}C from week 1 to week 5 decreased viscosity every week so that sample deodorant roll on to be a litte bit watery. It happen because thickening agent HPCM incompatible with the phenol derivative contained in extract cucumber so that the viscosity decrease during the period storage. This decreases the viscosity according to the Arrhenius law said that all preparations stored for certain period of time will reduction viscosity [9]. The results of an accelerated stability viscosity are shown in Table 10.

Conclusions

Based on the dosage formulation research deodorant roll on extracts of cucumber (*Cucumis sativus* L.) can be concluded that extract the cucumber can be made deodorant roll on, and it can be inhibit the growth of *Staphylococcus epidermidis* which is the cause of body odor. Deodorant from cucumber extract relatively safer to use because of natural materials. The best results of this formulation is formula 2 with cucumber extract concentration of 10% that have the most qualified physical quality, and also provided minimum inhibitory zone of 16 mm. Further research is needed to examine the effect of extracts of cucumber in the form of deodorant roll on against underarm odor-causing bacteria such as *Staphylococcus aureus*.

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