

# Antibacterial Activity Roll On Deodorant With *Pluchea indica* (L.) Leaf Extract Against *Staphylococcus epidermidis* in-Vitro

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**Abstract.** *Pluchea indica* L. is a medicinal plant that is often used to eliminate body odor. This research aims to test effectiveness Roll on deodorant as an antibacterial against *Staphylococcus epidermidis* and it's stability test. Antibacterial activity test used dilution method. Phytochemical analysis are carried out qualitatively. Roll on Deodorant test for 4 types stored at 28-30<sup>0</sup> C for 8 weeks includes observation of the color, odour and homogeneity, irritation test, pH test, viscosity and specific gravity. The results showed *Pluchea indica* (L.) leaf extract's Roll On Deodorant have antibacterial effect against *Staphylococcus epidermidis*. *Pluchea indica* L. Leaf extract have compounds consisting of flavonoids, saponins, tannin and alcaloid. Roll On Deodorant stored on 28-30<sup>0</sup> C for 8 weeks showed stable for color, odour and homogeneity. Deodorant roll on have a pH of 4.52 - 5.53, viscosity 331.8 - 340.8 cP, specific gravity 1.0107 - 1.0397 g / ml, and is not cause irritation.

**Keywords:** Antibacterial, deodorant roll on, *Pluchea indica* L

## Introduction

Leather continuous contact with the surrounding environment so easily exposed to microorganisms, some of the microorganisms commonly found on the skin is *Staphylococcus epidermidis*, *S. aureus*, *Sarcina* sp., *Mycobacterium* and *Acinetobacter*. The bacteria that can cause body odor as *Staphylococcus epidermidis*, *S. aureus*, *S. pyogenes*, *C. acne* (difteroid), and *Pseudomonas aeruginosa*. *Staphylococcus epidermidis* is a normal flora of bacteria are dominant on the skin, especially underarm skin that cause body odor (Baron et al., 1990). Deodorant used to eliminate body odor. Cosmetics deodorant ingredient is the substance or mixture of substances that can be used to eliminate or reduce the unpleasant body odor. Generally, the deodorant is often used the liquid form (liquid), for example the form of roll on. Deodorants generally contain antibacterial active substances can be derived from natural or synthetic materials. *Pluchea indica* L. (Srimoon and Suchanya, 2015) is a source of phytochemical compounds, and antioxidants that can protect and prevent damage to cells against free radicals. The main antioxidants in *Pluchea indica* L. (Ahemd and Kamel, 2013) are tannin, terpenes, lignin glycosides, triterpenoids, including some flavonoid polyphenols, quersetin, quinik acid and derivatives eudesmane. *Pluchea indica* L. widely

grown in Indonesia. This study aimed to test effectiveness Roll on deodorant as an antibacterial against *Staphylococcus epidermidis* and its stability test.

### Material and Methods

The macerated condensed extract with 96% ethanol solvent was analyzed qualitatively phytochemical and used for the manufacture of *roll on* deodorant. Phytochemical analysis conducted to know saponin, Flavonoids, and Alkaloids (Harbone, 1998), Tannins (Tiwari, 2011). *Roll on* deodorant was made with four formulas (table 1) using extracts with different concentrations, as shown in 'figure 1'. *Staphylococcus epidermidis* obtain from the Laboratory of Microbiology, Faculty of Medicine, University of Indonesia. The Antibacterial activity determined by dilution method 'figure 2'. Bacteria from culture media dissolved in 5 ml 0.9% physiological NaCl, turbidity is measured using nefrometer diagnostic in accordance with the standard 0.5 McFarland (Danchaivijitr et al. 2007). Incubated for 24 hours at a temperature of 35-37°C. The growth of bacteria observed.

1 Evaluation of *Roll On* deodorant based on antibacterial activity test. Test of Irritation by means of patch test approximately 0.1 g to the inner sleeve with a diameter of 2 cm, and then covered with gauze (Ministry of health Republic of Indonesia, 1985). After 24 hours observed symptoms. The organoleptic tests include color, odor, and homogeneity, observed for 8 weeks. Test of the pH used a pH meter. Viscosity used a Brookfield viscometer. Specific gravity of *roll on* deodorant is determined by pycnometer.

### Result and Discussion

The average *Pluchea indica* L. powder water content of 4.725%, and the average of ash content 7.5%. Water content and ash simplisia adjusted to Regulation of Ministry of health Republic of Indonesia (2000). Result of phytochemicals leaf extract *Pluchea indica* L is in table 2. Based on the results of research conducted at a concentration of 0.5%, 1%, 2%, 3%, 4%, 5%, 10%, 15%, 20% and 25%, above concentrations 3% of *Pluchea indica* L. leaf extract showed inhibition that is characterized by the absence of bacterial growth. *Pluchea indica* L. leaf extract has antibacterial activity agains *E faecalis* and *F. nucleatum* with strong-moderate effect (Pargaputri et al, 2016). So that the Minimum Inhibitory Concentration (MIC) of ethanol extract of *Pluchea indica* L leaf to *Staphylococcus epidermidis* is concentration 3%. There are 4 formulas of *roll on* deodorant of *Pluchea indica* L. leaf extract of 0% (F1), 3% (F2), 4% (F3), 5% (F4), as shown in 'figure 1'. The results of the four formulas showing there is relationship between concentration of the extract with color, the higher the concentration of extract (active ingredient), the color increasingly green. As shown in 'figure 1'.

The observation shows that *roll on* deodorant containing extracts of *Pluchea indica* L leaves 3% (F 2), 4% (F 3) and 5% (F 4) no bacterial growth, based on this results deodorants have effect antibacterial against *Staphylococcus epidermidis*. While formula 1 which does not contain extracts of *Pluchea indica* L. leaves overgrown with bacteria *Staphylococcus epidermidis* 'figure 2'. The results showed that the *roll on* deodorant does not cause skin irritation in both men and women.

The colors of each *roll on* deodorant which is studied from week 0 untill eight week was relatively stable does not change color. Aroma of deodorant which are stored for up to 8 weeks of relatively stable is aroma green apples. Homogeneity of *Roll on* deodorant Formula 1, Formula 2, Formula 3 and Formula 4 from start untill to 8 week which stored at room temperature (28-30°C) remained stable, there was no separation among components. During the storage period eight weeks of deodorant pH which was observed at room temperature (28-30°C) ranged from 4.52 till 5.53, which means that the pH of *roll on* deodorant *Pluchea indica* leaf extract still in underarm

skin pH range is 4.0 till 6.8 so it can be safely used. Viscosity of *roll on* deodorant ranges from 331.8 to 340.8 cP. Results the evaluation of the viscosity formula 1, 2, 3 and 4 decreased every week but this is not too significant, this showed that *roll on* deodorant has a good and stable condition. There is increase and decrease in specific gravity but values decrease or increase is not much different from the range 1 g / ml, so that it can be concluded the measurement result specific gravity *Roll on* deodorant during storage 8 weeks relatively stable.

Based on these research that *Pluchea indica* L. leaf extract can be made deodorant have antibacterial activity against *Staphylococcus epidermidis*. The ethanol extract 96% more potent in inhibiting bacteria than water extract. If ethanol, hexane and methanol is used as a solvent to extract the plant, mostly from the extraction may indicate an inhibitory effect on gram-positive and gram-negative (Palombo and Semple, 2001). Many studies *Pluchea indica* L. leaves have activity against *Entamoeba* (Biswas et al, 2007) against *E. coli* ATCC 25922 and *K. pneumoniae* ATCC 10031 in urinary tract infections (Sittiwet, 2009). Saponin, tannins, flavonoids and alkaloids compound are the source anti-oxidants and antibacterial (Danchaivijitr, 2007). Flavonoids in *Pluchea indica* L. leaves have antibacterial activity against *Staphylococcus* sp, *Propionibacterium* and *Corynebacterium* sp. Flavonoid contains a phenol compound is an acidic alcohol also known as carboic acid. Most the structure of the bacterial cell wall is protein and fat, presence flavonoids in plant can damage protein and damage of cell membrane so antibacterial of *Pluchea indica* L. leaves can penetrate into bacterial cells *Staphylococcus epidermidis*. Ekstrak of *Pluchea indica* L. leaves can be made *Roll On* deodorant. *Roll on* Deodorant containing extracts leaves *Pluchea indica* L. 3% (F2), 4% (F 3) and 5% F 4) no bacterial growth, based on this result proven that deodorant have function effective as antibacterial against *Staphylococcus epidermidis*. Flavonoid compounds in ethanol extract of *Pluchea indica* L. leaves a have function antibacterial because flavonoids contains a phenol compound which is an acidic alcohol that is also called carboic acid. Bacterial cell growth may be interrupted because a phenol compound contained in the ethanol extract of the leaves *Pluchea indica* L. The presence of phenol in acidic conditions can affect the growth of *Staphylococcus epidermidis*. Phenol has the ability to damage protein and cell membrane, phenol binds to the protein through hydrogen bonding resulting protein structure becomes damaged. Instability of the cell wall and the cytoplasmic membrane of bacteria cause the function selective permeability, active transport function, controlling the proteins composition from bacterial cells to be disrupted. Cytoplasmic integrity disruption resulted macromolecules and ions from the cell, the bacteria become lost its shape and lysis (Pelczar and Chan, 1998). Bacterial cell death means the loss of the ability of bacteria to reproduce (grow and divide). On media there is not colony *Staphylococcus epidermidis* growth showed that the ethanol extract of the *Pluchea indica* L. leaves Deodorant *Roll On* can to be bakteriside. It is not cause irritation to the men and women who were tested. The color of each formula is stable from week 0 - week 8 does not change. Aroma Apple Deodorant *Roll On* are stored for up to 8 weeks at room temperature (28-30°C) relatively stable, homogeneous remained stable there was no separation between the components. During the storage period of eight weeks the pH the deodorant at room temperature (28-30°C) ranged from 4.52 - 5.53, that the pH deodorant *roll on Pluchea indica* L. leaf extract still in underarm skin pH range is 4.0 - 6.8 so it can safely to used (Jellineck, 1970) . Viscosity Deodorant *Roll on* ranges from 331.8 - 340.8cP. The results evaluation of the viscosity formula 1, 2, 3 and 4 decreased which is not too significant every week, this happens because of thickening agent used in the formula HPC-m incompatible with derivatives of phenols contained in the extract of *Pluchea indica* L. leaves so that the viscosity gradually decreased during storage. This decreases the viscosity in accordance with the Arrhenius law says that if a material were stored for a certain period of time it will decrease the viscosity so the longer the shelf life of the material will the more dilute. Decrease of viscosity was not significant indicates that deodorant has a good and stable condition. Specific gravity of deodorant during storage of 8 weeks relatively stable.

## Conclusion

Formula 2 Roll on deodorant with the addition of 3% *Pluchea indica* L. leaf extract is a formula that is most excellent and effective against *Staphylococcus epidermidis* than the other formula to overcome the problem of body odor.

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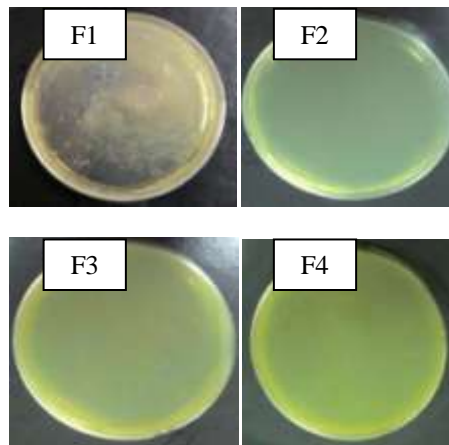
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**Figure 1. Deodorant Roll On Leaf Extract *Pluchea indica* L**  
Description: F1 = 0% Extract, F2 = 3% Extract ,  
F3 = 4% Extract, F4 = 5% Extract



**Figure 2. Test Results Minimum Inhibitory Concentration (MIC)  
Deodorant Roll On Leaf Extract *Pluchea indica* L.**

Note : F1= There is bacterial growth  
F2 = 3% Extract & F3=4% Extract & F4=5% Extract  
no bacterial growth

**Table 1. Formulation Deodorant Roll on**

Material	Formula (%)			
	F1 (blank)	F2	F3	F4
<i>Pluchea indica L. leaf extract</i>	0	3*	4*	5*
HPC-m (hydroxy propyl cellulose-medium)	3	3	3	3
Propylene Glycol	15	15	15	15
BHT (Butylated hydroxy toluene)	0,1	0,1	0,1	0,1
Sodium metabi-sulfite	0,1	0,1	0,1	0,1
Ethanol 96%	40	40	40	40
Perfume (Aroma Apples)	0,5	0,5	0,5	0,5
Distilled water ad	100	10 0	10 0	100

\* Note: The extract is added to the formula is a value and upper of the Minimum Inhibitory Concentration (MIC) of the extract.

**Table 2. Phytochemicals Leaf Extract *Pluchea indica L* Results**

Identification of Compounds		Parameter	Results of analysis	Conclusion
Saponin		stable foam	stable foam	+
Tanin		white precipitate	white precipitate	+
Flavonoids		Red-purple / yellow orange	yellow orange	+
Alkaloids	Bou-chardat	precipitate Dark brown	precipitate Dark brown	+
	Mayer	White precipitate / yellow late	White precipitate	+
	Drag-endorf	precipitate Orange brown	precipitate Orange brown	+

Note: (+) there is compound, (-) No compound