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Antibacterial Activity of Ethanol Extract of Papaya leaves (*Carica papaya* L.) Gel against *P.acnes*

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Abstract. Papaya plants (*Carica papaya L.*) besides being a food ingredient are also believed to have medicinal properties and are used traditionally, one of which is in dealing with acne problems. The purpose of this study was to formulate papaya leaf extract in the form of a gel preparation and test its antibacterial activity against the *Propionibacterium acnes* bacteria. The preparation of the ethanol extract of papaya leaves was made in three concentrations namely 5, 10 and 15%, then tested for antibacterial activity and compared with negative controls (blank gel) and positive control (erythromycin). The results showed that the papaya extract ethanol extract of 10 and 15% leaves had significantly different activities to the negative controls, but the 5% gel formula did not show any different activity towards negative controls. The conclusion of this study is that active papaya leaf ethanol extract gel inhibits bacterial growth at concentrations of 10 and 15%.

Keywords: *Carica papaya* L., gel formula, antibaterial activity, *Propionibacterium acnes*

Abstrak. *Tanaman Pepaya (Carica papaya L.)selain sebagai bahan pangan juga dipercaya memiliki khasiat obat dan digunakan secara tradisional, salah satunya dalam mengatasi masalah jerawat. Tujuan dalam penelitian ini adalah untuk memformulasikan ekstrak daun pepaya dalam bentuk sediaan gel dan menguji aktivitas antibakterinya terhadap bakteri Propinibacterium acnes. Sediaan gel ekstrak etanol daun pepaya dibuat dalam tiga konsentrasi yaitu 5, 10 dan 15%, kemudian diujikan aktivitas antibakterinya dan dibandingkan dengankontrol negatif (blanko gel) dan kontrol positif (eritromisin). Hasil penelitian menunjukkan bahwa gel ekstrak etanol daun pepaya konsentrasi 10 dan 15% memiliki aktivitas yang berbeda secara signifikan terhadap kontrol negatif, namun formula gel 5% tidak menunjukkan adanya aktivitas yang berbeda terhadap kontrol negatif. Kesimpulan dari penelitian ini adalah gel ekstrak etanol daun pepaya aktiv menghambat pertumbuhan bakteri pada konsentrasi 10 dan 15%.*

Kata kunci: *Carica papaya L., formula gel, aktivitas antibakteri, Propinibacterium acne*

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1. Introduction

Indonesia is one of the countries that has various kinds of natural wealth including the main one is the variety of plants including plants which are used as traditional medicine.Traditional treatment of using herbs is still very high in Indonesia because it is related to the level of understanding of the people in medicine. Traditional medicine in Indonesia is called Jamu.Jamu is and will remain an integral part of the Indonesian healthcare system. The in vitro, in vivo and clinical studies on medicinal plants that are used in jamu have in part scientifically proved their claimed biological activities [1,2,3].

Papaya is commonly known for its food and nutritional values throughout the world. The properties of papaya fruit and other parts of the plant are also well known in traditional system of medicine. During the last few decades considerable progress has been achieved regarding the biological activity and medicinal application of papaya and now it is considered as valuable nutraceutical fruit plant [4,5].

Antibacterial activity of *Carica papaya L.* has been widely carried out including *Staphylococcus aureus, Bacillus cereus, Escherichia coli, Pseudomonas aeruginosa and Shigella flexneri* [6,7]. *Carica papaya L.* leaf extract has also been studied related to its activity in dealing with zits, where the ethanol extract of the leaves and seeds of the active *Carica papaya L.* inhibits the growth of *Propionibacterium acnes* bacteria, and has been formulated in the form of a gel mask and observed its ability to treat zits [8,9].
Based on the description of the background, an antibacterial activity test of the ethanol extract gel *Carica papaya L.* leaves was tested against *Propiobacterium acnes* bacteria.

2. Method

This research was carried out by an experimental method, in which the preparation of ethanol extract of papaya leaves was made in various concentrations, namely 5, 10 and 15%, then tested the antibacterial activity against *Propionibacterium acnes*. In addition to active tests, gel preparations were evaluated organoleptically, homogenity, pH, and spread of preparation.

2.1 Extraction

Papaya leaves are collected and dried using a drying cabinet until the simplicia is obtained in accordance with the standard, which has a moisture content below 10%. Dry simplicia was pollinated and soaked for 3 days using 70% ethanol as much as 7.5 times the weight of simplicia. The extract and pulp from the soaking process are separated by filtering, then the pulp is rinsed using the same solvent then filtered until the extract obtained is 10 times the weight of the simplicia. The extract is left to stand for 1 day so that the sediment is formed, separate the

clear sediment and extract by slowly pouring it. The clear extract solution was concentrated using a rotary evaporator at a temperature of 50 °C so that thick extract was obtained [10].

2.2 Formulation of Gel

The gel is made of 100 grams where the composition can be seen in table 1.

Table 1. The composition of the dosage formulas for ethanol extract of papaya leaves

No	Composition	Quantity (gram)		
		Formula 1	**Formula 2**	**Formula 3**
1	Papaya Leaves Ethanol Extract	5	10	15
2	Carabomer 934	0.95	0.9	0.85
3	Methyl Paraben	0.19	0.18	0.17
4	Glycerin	4.75	4.5	4.25
5	Triethanolamine	0.95	0.9	0.85
6	Aquadest	88.16	83.52	78.88

2.3 Evaluation of Gel

The preparation of ethanol extract of papaya leaves was evaluated by organoleptic test, homogeneity, pH, and dispersion. Organoleptic tests are seen through sensing and judged by the shape, color and smell of the gel. The homogeneity test was carried out by means of the sample being applied to a piece of transparent glass then the homogeneity was observed. The pH test uses a universal pH device. Spread test is carried out by means of 0.5 grams of sample placed on the glass then overwritten with a cover glass that is given a weight of 150 grams, then let stand for 1 minute, then measured the distribution of the formed preparation.

2.4 Antibacterial Activity of Papaya Leaves Gel

Before testing the antibacterial activity it is necessary to prepare everything needed, including the materials and tools used that have been sterilized, nutrient media to be prepared, bacteria have been cultured and made in the form of suspension with turbidity according to Mc Farland standards [11,12]. The positive control used in this study was erythromycin which was dissolved with aqua pro injection with a concentration of 25 mg/L (0,005%). Antibacterial activity tests were carried out by means of 0.1 ml of bacterial suspension put into sterilized petri dishes. Add agar nutrient media as much as 20 ml, stir until homogeneous and let it solidify. After the media is solidified, a well hole of samples and controls is needed to be tested, then enter the 50 mg gel preparation, then incubate for 24 hours at a temperature of 35-37 °C. After 24 hours the diameter of the inhibition zone is measured (clear zone).

2.5 Data Analysis

The diameter of the inhibitory zone formed was analyzed and compared with the one way analysis of variants. The data obtained were then compared with negative controls with parameters $p \leq 0.05$.

3. Result and Discussion

3.1 Evaluation of Gel Formulation

The results of the organoleptics test and homogeneity of the papaya ethanol extract gel can be seen in table 2 and the results of the evaluation of pH values and dispersion can be seen in table 3.

Table 2. The results of the organoleptics and homogeneity tests

No	Formula	Organoleptis			Homogeneity
		Consistency	Color	Flavor	
1	F0 (gel base)	Soft	transparent	no smell	Homogenous
2	F1 (5%)	Soft	light brown	smell of plant extracts	Homogenous
3	F2 (10%)	Soft	Brown	smell of plant extracts	Homogenous
4	F3 (15%)	Soft	dark brown	smell of plant extracts	Homogenous

Table 3. The result of pH values and dispersion

No	Formula	pH values	Dispersion
1	F0 (gel base)	6	6.3
2	F1 (5%)	6	6.2
3	F2 (10%)	6	6.5
4	F3 (15%)	6	6.7

The evaluation results of the papaya ethanol extract gel formula showed no significant differences from the various test parameters carried out except only on the color and smell of the preparation. Gel with extract content has a light brown to dark brown color depending on the concentration of extract contained in it. The greater the concentration of the more concentrated brown color produced. Likewise with odor, gel preparations containing extracts have a characteristic odor extract which is not owned by a blank or gel base.

3.2 The Result of Antibacterial Activity

The results of the antibacterial activity test from the papaya ethanol extract gel formula can be seen in table 4.

Table 4. Antibacterial Activity

No	Formula	Inhibitory Diameter±Std Error
1	Negative control (gel base)	0.000 ± 0.000
2	Positive control (erythromycin 0.0025%)	20.400 ± 0.451*
3	F1 (extract 5%)	3.767 ± 1.883
4	F2 (extract 10%)	6.050 ± 0.029*
5	F3 (extract15%)	6.800 ± 0.351*

* significant to negative control ($p \leq 0.05$)

Based on the results of the antibacterial activity test performed there was a significant difference between the positive control formula, 10% extract and 15% against the negative control, whereas there was no significant difference with 5% extract. When compared between the

positive control formula for the extract, there is a very significant difference, where the inhibitory zone produced by erythromycin is very large.

Traditionally leaves have been used for treatment of a wide range of ailments, like in treatment of malaria, dengue, jaundice, immunomodulatory and antiviral activity. Young leaves are rich in flavonoids (kaempferol and myricetin), alkaloids (carpaine, pseudocarpaine, dehydrocarpaine I and II), phenolic compounds (ferulic acid, caffeic acid, chlorogenic acid), the cynogenetic compounds (benzylglucosinolate) found in leaves [4,13,14].

4. Conclusion

The antibacterial activity of the ethanol extract of papaya leaves gel inhibited the growth of *P. acnes* at concentrations of 10 and 15%.

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REFERENCES

[1] KV Rintelen, E Arida , Chäuse, ”A review of biodiversity-related issues and challenges in megadiverse Indonesia and other Southeast Asian countries”,*Research Ideas and Outcomes*,vol. 3, no. E20860, pp. 1-16. 2017.

[2] Nurhayati,Lucie Widowati, “The use of traditional health care among Indonesian Family,”*Health Science Journal of Indonesia*, vol 8, no. 1, pp. 30-35. 2017.

[3] Elfahmi, H.J. Woerdenbag, O. Kayser, “Jamu: Indonesian traditional herbal medicine towards rational phytopharmacological use,”*Journal of Herbal Medicine*, vol. 4, no. 2, pp. 51-73. 2014.

[4] V.Yogiraj, P.K. Goyal, C.S. Chauhan, A. Goyal, B. Vyas, “Carica papaya Linn: An Overview,”*International Journal of Herbal Medicine*, vol 2, no. 5, pp. 01-08. 2014.

[5] T. Vij, Y. Prashar, “A Review on Medicinal Properties of Carica papaya Linn,”*Asian Pacific Journal of Tropical Disease*,vol 5, no. 1, pp. 1-6. 2015.

[6] Anibijuwon II, A.O Udeze”, Antimicrobial Activity of Carica Papaya (Pawpaw Leaf)on Some Pathoenic Organisms of Clinical Origin from South-Western Nigeria,” *Ethnobotanical Leaflets*, vol. 7, no. 4, pp. 850-864. 2009.

[7] A.C. Emeruwa, “Antibacterial Subbstance From Carica papaya Fruit Extract,”*Journal of Natural Products*, vol. 45, no. 2, pp. 123-127. 1982.

[8] R.S. Syarifah, “Formulation of Papaya Leaf Extract (Carica Papaya L.) Peel-Off Gel Antibacterial Activity on *Propionibacterium Acnes*. Thesis. Bandung Islamic University. 2015.

[9] F.F. Renita, “Antibacterial Activity of Ethanol Extract of Seeds and Leaves of Papaya (*Carica papaya* L.) on *Propionibacterium acnes* Causes of Acne. Thesis. University of Sumatera Utara. 2017.

[10] N.N. Azwanida, “A Review on the Extraction MethodsUse in Medicinal Plants, Principlle, Strength and Limitation,”*Med Aromat Plants*, vol. 4, no. 3, pp. 1-6. 2015.

[11] A. Zapata, S. Ramirez-Arcos, “A Comparative Study of McFarland Turbidity Standards and the Densimat Photometer to Determine Bacterial Cell Density,”*Current Microbiology*, vol. 70, no. 6, pp. 907-909. 2015.

[12] J.A. Washington, E. Warren, A.G Karlson. “Stability of Barium Sulfate Turbidity Standards,”*Applied Microbiology*, vol. 24, no. 6, pp. 1013. 1972.

[13] K. Suresh, P. Deepa, R. Harisaranraj and A.V Vaira, "Antimicrobial and Phytochemical Investigation of the Leaves of Carica papaya L.,Cynodon dactylon(L.) Pers., Euphorbia hirta L., Melia azedarach L. and Psidiumguajava L,"*Ethnobotanical Leaflets*, vol. 12, pp. 1184-1191. 2008.

[14] N. Nirosha and R. Mangalanayaki, "Antibacterial Activity of Leaves and Stem Extract of Carica papaya L,"*IJAPBC*, vol. 2, no. 3, pp. 473-476. 2013.