Available online at www.derpharmachemica.com

ISSN 0975-413X
CODEN (USA): PCHHAX

Der Pharma Chemica, 2017, 9(10):105-108
(http://www.derpharmachemica.com/archive.html)

Antibacterial and Antifungal Activity of Lantanilic Acid Isolated from *Lantana camara* Linn

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ABSTRACT

In this study antimicrobial and antifungal activities test have established by disk diffusion method. Antibacterial activity was tested againts Staphylococcus aureus and Staphylococcus epidermis as a gram positive bacteria, Escherichia coli and Pseudomonas aeruginosa as a gram negative bacteria and antifungal activity againts Candida albicans which thrive in the mouth. The research that has been done shows that lantanilic acid is active againts Staphylococcus aureus bacteria and very active againts Candida albicans fungus but inactive againts Escherichia coli, Pseudomonas aeruginosa, and Staphylococcus epidermis bacterial.

Keywords: Lantanilic acid, *Lantana Camara* L. leaves, Antimicrobial, Antifungal

INTRODUCTION

Traditionally *Lantana camara* L. has several uses as a drug to cure ulcers, malaria, influenza, tumors, swelling, fever, abdominal pain, toothache and as an antiseptic [1]. The contents of secondary metabolites from this plant have been reported such as alisol A, lantanilic acid, 3β-hiydroxystigmast-5-en-7-one, and sitosterol [2] and also from the leaves contain secondary metabolites that was reported lantanilic acid which is the main content from the leaves of this plant [3].

In the previous research Ediruslan, have been reported lantanilic acid from *Lantana camara* Linn leaves isolated from ethyl acetate extract. Againts lantanilic acid isolation results have been tested by the BSLT method cytotoxic activity which showed very strong activity, with the value of LC_{50}=27.9 mg/mL [4]. According to Suryati, IC_{50} value of ethyl acetat extract of *Lantana amara* L. was found to be 36.18 µg/mL with a total phenolic content was 2419.6 GAE [5]. Several previous reports have discribed nematocidal activity [6] and high antimutagenic in mouse activity of lantanilic acid which was isolated from *Lantana camara* Linn [7]. Extracts leaves from this plant have been reported to have antifungal, antiproliferative, antibacterial, nematicidal, termicidal, anthelmintic, and anticancer activities [8].

Some phytoconstituents such as terpenoids, proanthocyanidins from *Lantana camara* leaves Bhakta et al., and sesquiterpenes are effective antimicrobial compounds againts a wide range of microorganism Shah et al., [9,10]. According to Hatice oxygenated terpenoids such as alcoholic terpenes have more antimicrobial activity than the other constituents. Oxygenated terpenoids show characteristic and distinct activity patterns towards microorganisms; terpenoids that contain alcohols possess higher activity than the corresponding carbonyl compounds [11]. Lantanilic acid has a cluster of prenyl which exhibited strong antimicrobial activity because the lipophilic group can rapidly damage membrane and cell wall function [12]. Antibacterial natural products can be classified according to a general biogenetic source, such as terpenoids, alkaloids, flavonoids and simple phenols. One of the most active compounds is the triterpenoids, which comprises different types of compounds which can be further divided into more important chemical structure groups. The main groups of triterpenoids are represented by tetracyclic and pentacyclic derivatives [13]. Related with lantanilic acid is a triterpenoid compund and the structure that has a cluster of prenyl, this research will be tested antibacterial and antifungal activity (Figure 1).

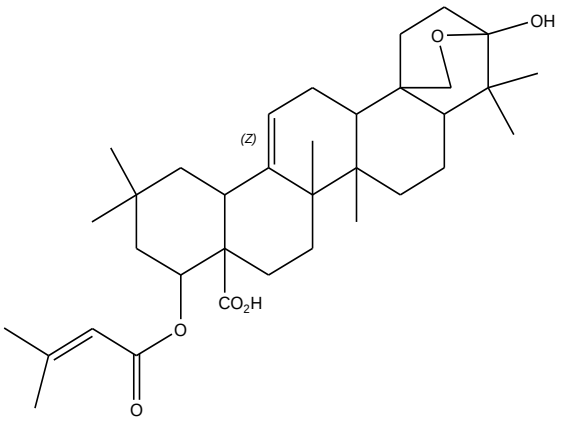

Figure 1: Lantanilic acid

Antibacterial and antifungal activity was tested by agar diffusion method by determining the area of bacterial and fungal growth inhibition. This study used a gram-positive bacteria (*Staphylococcus aureus* and *Staphylococcus epidermis*), gram-negative bacteria (*Escherichia coli* and *Pseudomonas aeruginosa*) and fungi *Candida albicans*.

MATERIALS AND METHODS

The chemicals, instrument and tools

Sample is lantanilic acid from *Lantana camara* Linn leaves. The chemicals that have been used in antibacteria and antifungi activity are bacteria bred from pure bacteria *Staphylococcus Aureus, Staphylococcus Epidermis, Escherichia Coli* and *Pseudomonas Aeruginosa*, fungi bred from pure fungi *Candida albicans*, medium Blood Agar Plate (BAP), Potato Dextrose Agar (PDA), Mannitol Salt Agar (MSA) that are commonly taken from UPTD. Laboratory of Dinas Kesehatan West Sumatera Province, aquabides, standar solvent *Mac Farland*, filter paper (Whatman No. 40) as disk, ethyl acetate as negative control, amoxicillin as positive control for bacteria and ketoconazole as positive control for fungi.

The tools which have been used are petri dish, ose needle, autoclave, incubator and other glasswares which were commonly used in organic chemistry laboratory.

Research procedure

Antibacterial and antifungi activity

a. Synthesis of test solution

Test test solution is made by dissolving 5 mg of the lantanilic acid with ethyl acetate in a 10 mL volumetric flask, obtained mother liquor concentration of 500 mg/mL. Further dilution of the solution storied 500 mg/mL to 250, 125, and 62, 5 µg/mL.

b. Synthesis of control (+) solution

Test control solution is made by dissolving 5 mg of the amoxicillin and ketoconazole with aquabidest in a 10 mL volumetric flask, obtained mother liquor concentration of 500 mg/mL. Further dilution of the solution storied 500 mg/mL to 250, 125, and 62,5 µg/mL.

c. Antibacterial and antifungi activity test

Bacteria and fungi that have been rejuvenated etched using ose needle on growth media Blood To Plate (BAP), Potato Dextrose Agar (PDA) and Mannitol Salt Agar (MSA) which has been prepared. Paper Whatman No. 40 (diameter 0.5 cm) is dipped into the sample, the control (+) and control (-) then placed on a petri dish containing bacterial and fungal growth media. Then the growth medium is incubated for 1 × 24 h (for bacteria) and 3 × 24 h (for mushrooms) at a temperature of 37ºC. After an incubation period of observation and measurement of clear zone that occurs.

RESULTS AND DISCUSSION

Antibacteria and antifungi actvity of lantanilic acid

Antibacterial and antifungal activity of lantanilic acid is determined by measuring the clear zone formed on a paper disc after were incubated for 24 h for bacteria and 72 h fungi. Antibacterial activity test results are listed in Table 1 while the antifungal activity assay results are listed in Table 2.

Table 1: Antibacterial activity of lantanilic acid

Bacterial	Diameter Clear Zone (mm) on the Variation of the Concentration			
	Concentration (µg/mL)	Control (+)	Control (-)	Lantanilic acid
Staphylococcus aureus	500	7.3	-	1.7
	250	6.3	-	-
	125	5.3	-	-
	62.5	5	-	-
Escherichia coli	500	5	-	-
	250	2.7	-	-
	125	1.7	-	-
	62.5	1	-	-
Staphylococcus epidermis	500	15	-	-
	250	12	-	-
	125	9.5	-	-
	62.5	6.5	-	-
Pseudomonas aeruginosa	500	-	-	-
	250	-	-	-
	125	-	-	-
	62.5	-	-	-

Control + : Amoxicillin
Control - : Ethyl acetate

From the data clear zone growth of bacteria can be seen that lantanilic acid show no activity againts the bacteria *Escherichia coli, Pseudomonas aeruginosa,* and *Staphylococcus epidermis* but showed activity againts to *Staphylococcus aureus* with the value of clear zone of 1.7 mm at concentration 500 µg/mL. *Amoxicillin* can not inhibit the growth of *Pseudomonas aeruginosa* because *Pseudomonas aeruginosa* is naturally resistant to a significant number of antibiotics such as *amoxicillin, amoxicillin/clavulanate, ampicillin, cefotexime, trimethroprim, nalicidix acid* [14]. Mechanism tterpenoids, as an antimicrobial is membrane disruption by lipophilic compound [15,16]. Differences diameter clear zone can be caused by gram-negative and gram-positive have a different chemical composition of their cell wall. It possibly be due the presence of high lipid content in the gram negative's cell walls, but gram positive have a teichoic acid in the peptidoglycan layer that can be inhibited by lantanilic acid [17]. In addition, the outer membrane of gram-negative bacteria are known to present a barrier to the penetration of some antibiotics molecules, and periplasmic space contains enzymes, which can break down foreign molecules introduced from the outside so as to provide greater resistance to them [18].

Table 2: Antifungi activity of lantanilic acid

Fungi	Diameter Clear Zone (mm) on the Variation of the Concentration			
	Concentration (µg/mL)	Control (+)	Control (-)	Lantanilic acid
Candida albicans	500	25.3	-	9.3
	250	21.7	-	8.3
	125	16.3	-	4.6
	62,5	16	-	-

Control + : Ketoconazole
Control - : Ethyl acetate

From the data clear zone growth of *Candida albicans* can be seen that the lantanilic acid showed excellent activity against *Candida albicans* fungus with the value of clear zone of 9.3, 8.3, and 4.6 mm at concentrations 500, 250 and 125 µg/mL, respectively.

CONCLUSION

Based on the experimental data that have been found can be concluded that the lantanilic acid is active as an antibacterial against bacteria *Staphylococcus aureus* as well as very active against the fungus *Candida albicans*, but lantanilic acid is inactive against bacteria *Escherichia coli, Pseudomonas aeruginosa,* and *Staphylococcus epidermis.*

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