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THE ANTIMICROBIAL PROPERTY OF THE SEMI-PURIFIED TANNIN EXTRACT OF MAHOGANY (*SWIETENIA MACROPHYLLA)* LEAVES

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ABSTRACT
Mahogany (*Swietenia macrophylla)* also known as Big leaf mahogany from the family of Meliaceae is a deciduous, erect tree growing to a height of 10 meters, with a heavy, dark-green, and dense crown growing in Los Banos and Manila. Its activity considered to be astringent, antipyretic, abortifacient and depurative. There are studies that it can be used as an anticoagulant, antioxidant, antimicrobial, antidiabetic, antiprotozoal, anthelmintic, cytotoxic, gastroprotective and hepatoprotective properties. This study aimed to determine and evaluate the antimicrobial activity of the tannin extract from the leaves of Mahogany (*Swietenia macrophylla)*. The mahogany leaves were macerated in 20% ethanol then isolated using separatory funnel that contains Diethyl Ether to get the tannin extract. Afterwards, the tannin extract solution was placed on a tared beaker, and was evaporated to incipient drynessover a water bath to remove other constituents of the sample. The antimicrobial activity of the tannin extracted and isolated from Mahogany was tested on three microbial strains, *Candida albicans, Escherichia coli, and Staphylococcus aureus* by agar well diffusion method. In the biological assay, the tannin concentrations of 250mg/mL, 500 mg/mL, and 1000 mg/mL obtained a zone of inhibition of more than 19mm on the three microbial strains, indicating an active antimicrobial activity. The antimicrobial activity of the tannin extract was compared to the standard antibiotic (Cefepime HCl) and antifungal (Nystatin) drugs. As the concentration increases the effectivity also increases. Based on the result gathered, it shows that it has a potential antifungal effect rather than antibacterial effect.

KEYWORDS: *Swientenia macrophylla, Antimicrobial, Tannins.*

INTRODUCTION
According to the World Health Organization (WHO) skin and subcutaneous infections like carbuncles, acne, boils, rashes, impetigo, ringworms, athlete's foot and candidiasis is one of the leading globaldisease because of having a poor hygiene. Therefore, keeping a good standard of hygiene helps to prevent the development and spread of infections, illnesses and bad odors.

Natural products play an important role function in the discovery and development of new products. Lately, there are a lot of improvements on the science and technology in the medical field to enhance the health quality of human. According to the World Health Organization medicinal plants would be the excellent source to acquire a variety of healthcare products and medicine.

Mahogany is a native plant of the West Indies and each part of this plant has many uses and beneficial to humans especially as medicine. It has been widely used in the common folks' communities and traditionally used to cure malaria, anemia, diarrhea, fever, dysentery, hypertension, intestinal parasitism and anti-ulcer activity. Therefore, the researchers chose this plant to be their subject, exploring its antimicrobial activity, specifically the tannins obtained from its leaves.

OBJECTIVES
This study aimed to determine the antimicrobial property of semi-purified tannin extract from Mahogany leaves and to formulate soap.

Specifically, it sought to answer the following objectives

1. To characterize tannins from the leaves of Mahogany
2. To determine the concentration of tannin extract that exhibited antimicrobial property
3. To compare the antimicrobial property from the tannins of Mahogany leaves with its standard drug such as Cefepime Hydrochloride and Nystatin as positive control.

METHODS AND PROCEDURES

Collection and Identification of Plant Materials

The Mahogany leaves were collected from the City of Antipolo in July 2017. The plant samples were identified by the National Museum-Botany Division.

Preparation and Extraction of Plant Sample

100 grams of powdered leaf sample was macerated for about 24-48 hours with 20% ethyl alcohol and placed in an Erlenmeyer flask and filtered using a muslin cloth and series of filter papers. The filtrate was collected, and residue was discarded. The 50 mL filtrate was placed in a separatory funnel, and 15 mL of diethyl ether was added. The mixture was agitated and allowed to stand for five minutes until immiscible layer was formed. The lower layer was collected, and the upper layer was discarded. Afterwards, the tannin extract solution was placed on a tared beaker and evaporated to incipient dryness to remove traces of moisture. The residue was weighed in the analytical balance to calculate the percent yield of the 100g of powdered leaf sample.

Biological Assay

About 25 mL of Mueller-Hinton Agar was poured in sixteen Petri Dishes and was allowed to solidify. Cultured *Staphylococcus aureus* and *Escherichia coli* were aseptically inoculated on the surface of Mueller-Hinton Agar plates by spreading using sterile cotton swab in three directions, to ensure complete plate coverage. 25 mL of Sabouraud Dextrose Agar was poured in ten Petri dishes and was allowed to solidify. Culture *Candida albicans* was aseptically inoculated on the surface of the Sabouraud Dextrose Agar plates by spreading using sterile cotton swab in three directions, to ensure complete plate coverage.

The hole was made in each petri plates with the use of sterilized cork borer then using a micropipet, equivalent amount of concentration of the extract was placed. The plates were placed in the incubator at 37°C for 24 hours. After incubation, zone of inhibition was recorded in millimeter and organisms were indicated whether it was sensitive or susceptible, intermediate or resistant based on the values.

RESULTS AND DISCUSSION

The confirmatory test was performed to determine the presence of tannins in the leaves of Mahogany (*Swietenia macrophylla*) positive results were observed in Ferric Chloride, Bromine, Gelatin, and Copper Sulfate.

The 250 mg/mL, 500 mg/mL, and 1000 mg/mL concentrations of tannins were used in the antimicrobial determination of the leaf extract. These concentrations exhibited a potential antibacterial activity with a zone of inhibition greater than 19 mm. The 1000 mg/mL concentration had the highest inhibition to the three microorganisms.

Results of the Zone of Inhibition of Tannin Extract against *Staphylococcus aureus*

Dose	Data	Interpretation
Negative Control (Sterile Water)	Mean= 10 N= 6 SD= 0	Inactive
Positive Control (Cefepime HCl)	Mean= 40 N= 6 SD= 4.47	Very Active
250 mg/mL Tannin Extract	Mean= 17.78 N= 6 SD= 0.80	Active
500 mg/mL Tannin Extract	Mean= 15.3 N= 6 SD= 0.5	Active
1000 mg/mL Tannin Extract	Mean= 17.09 N= 6 SD= 1.94	Active

The Tannin Extracts with the concentration of 250 mg/mL, 500 mg/mL and 1000 mg/mL were active against *Staphylococcus aureus* as compared with Cefepime HCl.

Results of the Zone of Inhibition of Tannin Extract against *Escherichia coli*

Negative Control (Sterile Water)	Mean= 10 N= 6 SD= 0	Inactive
Positive Control (Cefepime HCl)	Mean= 39.12 N= 6 SD= 3.76	Very Active
250 mg/mL Tannin Extract	Mean= 12.75 N= 6 SD= 1.07	Partially Active
500 mg/mL Tannin Extract	Mean= 14.87 N= 6 SD= 1.24	Active
1000 mg/mL Tannin Extract	Mean= 16.97 N= 6 SD= 2.51	Active

The Tannin Extracts with the concentration of 250 mg/mL, 500 mg/mL and 1000 mg/mL were active against *Escherichia coli* as compared with Cefepime HCl.

Results of the Zone of Inhibition of Tannin Extract against *Candida albicans*

Negative Control (Sterile Water)	Mean= 10 N= 6 SD= 0	Inactive
Positive Control (Nystatin)	Mean= 17.07 N= 6 SD= 2.99	Active
250 mg/mL Tannin Extract	Mean= 14.23 N= 6 SD= 2.21	Active
500 mg/mL Tannin Extract	Mean= 16.34 N= 6 SD= 1.30	Active
1000 mg/mL Tannin Extract	Mean= 19.58 N= 6 SD= 1.88	Very Active

Tannin Extracts with the concentration of 250 mg/mL, 500 mg/mL and 1000 mg/mL were active against *Candida albicans* as compared with Nystatin.

Comparison of Zone of Inhibition of Tannin Extract against *Staphylococcus aureus* against the Positive Control

DOSE	F.VALUE	SIGNIFICANCE	REMARKS
Negative Control (Sterile Water)	F= 10.178	P=0.21 Means are significantly different	Negative to Negative
Positive Control (cefepime)			Positive to Positive
250 mg/mL tannin extract			Positive to 250mg/mL
500 mg/mL Tannin Extract			Positive to 500mg/mL
1000 mg/mL Tannin Extract			Positive to 1000mg/mL

There is no significant difference result of the zone of inhibition in *Staphylococcus aureus* between the positive control and tannin extract from mahogany leaves at 250 mg/mL, 500 mg/mL, and 1000 mg/mL shows comparable result which means that tannin extract from Mahogany leaves exhibits antibacterial property.

Comparison of Zone of Inhibition of Tannin Extract against *Escherechiacoli* against the Positive Control

DOSE	F.VALUE	SIGNIFICANCE	REMARKS
Negative Control (Sterile Water)	F= 4.637	P=0.003 Means are significantly different	Negative to Negative
Positive Control (cefepime)			Positive to Positive
250 mg/mL tannin extract			Positive to 250mg/mL
500 mg/mL Tannin Extract			Positive to 500mg/mL
1000 mg/mL Tannin Extract			Positive to 1000mg/mL

There is no significant difference result of the zone of inhibition in *Escherichia coli* between the positive control and tannin extract from Mahogany leaves at 250 mg/mL, 500 mg/mL, and 1000 mg/mL shows comparable result which means that tannin extract from Mahogany leaves exhibits antibacterial property.

Comparison of Zone of Inhibition of Tannin Extract against *Candida albicans* against the Positive Control

DOSE	F.VALUE	SIGNIFICANCE	REMARKS
Negative Control (Sterile Water)	F= 26.730	P=0.001 Means are significantly different	Negative Negative
Positive Control (cefepime)			Positive to P
250 mg/mL tannin extract			Positive 250mg/mL
500 mg/mL Tannin Extract			Positive 500mg/mL
1000 mg/mL Tannin Extract			Positive 1000mg/mL

There is no significant difference result of the zone of inhibition in *Candida albicans* between the positive control and tannin extract from Mahogany leaves at 250 mg/mL, 500 mg/mL, and 1000 mg/mL shows comparable result which means that tannin extract from Mahogany leaves exhibits antibacterial property.

CONCLUSION

Based on the results obtained from the biological tests, the researchers concluded that the tannin extract of mahogany *(Swietenia macrophylla)* at different doses exhibit potential antimicrobial property.

Recommendations

Based on the results from the study of the antimicrobial property of the semi- purified tannins from *Swietenia macrophylla*, the following recommendations were presented for researchers:

1. Determine antimicrobial property of the plant sample using other plant parts.
2. Determine the antimicrobial property of *Swietenia macrophylla* using other constituents present in the plant like alkaloids, saponins, flavonoid, etc.
3. Determine other properties of tannins and of other constituents present in the plant sample.
4. Formulate a suitable dosage form using the tannin extract obtained from the mahogany leaves.

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