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The Medicinal Prospects of Makahiya (Mimosa Pudica Linn) Plant

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Abstract The purpose of the current investigation is to determine the medicinal prospects of the plant Mimosa pudica Linn. To accomplish this goal, the researcher qualitatively determined the phytochemicals present in the plant. The potency of the plant extract to inhibit the growth of three strains of microorganisms namely Staphyloccusaureus, Bacillus subtilis and Candida albicans was analysed. The antioxidant property of the plant was also qualitatively determined. Based on the results of this study conducted on makahiya (Mimosa pudica Linn) plant, it was found out that 1) Makahiya extract contains the phytochemicals alkaloids, flavonoids, saponins and triterpenes; 2) Makahiya plant extract has strong antimicrobial activity against Staphylococcus aureus and Bacillus subtilis but has negative activity against Candida albicans; and 3)Makahiya extract exhibits antioxidant property. It is therefore concluded that Makahiya (Mimosa pudica Linn) plant has pharmaceutical potentials due to the presence of phytochemicals like alkaloids, flavonoids, saponins and triterpenes, its great microbial activity against Staphylococcus aureus and Bacillus subtilis and the antioxidant property it exhibited.

Keywords Medicinal prospects, Makahiya (Mimosa pudica Linn), Phytochemicals, antimicrobial analysis, Antioxidant, Philippines

1. Introduction

Since time immemorial, people had been using herbal medicines. With the advent of modern medicine and the development of new drugs, people had switched to the use of commercial medicines. These medicines had been manufactured from the flora and fauna that abound. However, the availability and abundance of some of these sources had declined due to some natural and anthropogenic factors like deforestation. So, in developing a new medicine, the abundance of the plant or the animal from where it is extracted should be considered.

In addition to this, there are still a lot of people who rely on alternative medicine because of the escalating prices of medicine. In the Philippines, many people still resort to herbal medicine.

In the ancient and medieval times, almost all medicines came from plants. Plants were used to ease pain, heal wounds and cure fever. Today, a lot of people still rely on medicinal plants to meet the medicinal needs of a population (Fuller, 1970).

The Philippines is endowed with many different flora and fauna which have medicinal potentials. In the Philippines, specifically in Ilocos Sur, a plant called makahiya, having a scientific name of Mimosa pudica Linn.isvery common and abundant. This plant is just regarded as a menace in gardens, hence being uprooted and discarded. Makahiya thrives in any kind of soil even without receiving special care. When the plant is still young, its stem is erect but as the plant grows with age, the stem becomes creeping or trailing. The stem is slender, branching and sparsely to densely prickly, growing to a length of 1.5 meter. The leaves are bipinnately compound, with one or two pinnae pairs having 10-26 leaflets per pinna. The petioles are also prickly. Pediculate (stalked) pale pink or purple flower heads arise from the leaf axils. The globes are 8-10 mm in diameter (excluding the stamens. On close examination, it is seen that the floret petals are red in their upper part and the filaments are pink to lavender. The fruits consist of 2-8 pods from 1-2 cm long each. The flowers are pollinated by the wind and insects.

Since this plant is very common in the researcher's area, this aroused her interest to make a study on the medicinal prospects of this plant. Hence, in this study, the phytochemical screening and the antimicrobial properties were conducted in the hope that the initial findings of this study will serve as a basis for future investigations on the medicinal prospects of this plantmakahiya and for the discovery of new therapeutic agents from this plant.

2. Objective

The purpose of the current investigation is to determine the medicinal prospects of the plant Mimosapudica Linn. To

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accomplish this goal, the researcher qualitatively determined the phytochemicals present in the plant. The potency of the plant extract to inhibit the growth of three strains of microorganisms namely Staphylococcusaureus, Bacillus subtilis and Candida albicans was analysed. The antioxidant property of the plant was also qualitatively determined.

3. Scope and Delimitation

This study was delimited to the determination of phytochemicals, microbiological screening and determination of the antioxidant property of the leaves of Mimosa pudica Linn.

The microbiological screening was determined in terms of the diameters of growth inhibition in terms of the following test organisms namely Staphylococcus aureus, Bacillus subtillis and Candida albicans. Pure cultures of these test organisms were used.

The antioxidant property of the plant was determined qualitatively by using a peeled sliceapple as the test material. A slice of the apple was soakedin the plant extract and another invit C which is an antioxidant. The antioxidant property of the plant extract was determined by theamount of time it took for the peeled apple to decolorize.

4. Methodology

The presence of the phytochemicals of the plant Mimosa pudica Linn was conducted following the standard procedures from the Chemistry and Pharmacological Division, Department of Science and Technology, Bicutan, Taguig, Metro Manila.

For the determination of the antimicrobial activity of the plant, the Kirby-Bauer Disk Diffusion method was used. The procedure was adopted from the Manual on Extraction Procedures and Microbial Assay of Medicinal Plants by Capal, et al (1998) and the Guide Book to Plant Screening: Phytochemical and Biological by Guevarra (2005).

The determination of the antioxidant property of the plant extract was adapted from www.youtube.com/watch?V=ZwU8xy5VnQK. The antioxidant property of the plant extract was determined by soaking the peeled slices of apple in the extract, positive control, Vit C solution which is a known antioxidant and negative control, for a minute. The slices of apple was then exposed to air, allowing it to react with the oxygen. The time it takes for the apple to decolorize was recorded.

5. Results and Discussion

Phytochemical Analysis

The plant extract was subjected to phytochemical analysis and the results of the experiment are shown in table 1.

Alkaloids have a wide range of pharmacological activities including antimalarial, antiasthma, anticancer, antibacterial and antihyperglycemic activities (https:/en.wikipedia.org/wiki/Alkaloid). The presence of alkaloids in the plant extract indicates that the plant has a pharmaceutical potential for the treatment of malaria, asthma, cancer and even diabetes.

It can also be deduced that the plant could be a potential source of many important drugs because of the presence of flavonoids in the plant extract. Flavonoids possess antioxidant, radical scavenger, anti-leukemic and vasodilatoractivity. These may be useful for improving blood circulation in brain and in Alzheimer disease. Flavonoids also show anticancer, anti-ageing and antibacterial properties (Sharma, 2006).

Saponins are a great group of naturally occurring plant glycosides, characterized by their strong foam-forming properties in aqueous solution. The presence of saponins had been reported in more than 100 families of plants out of which at least 150 kinds of natural saponins have been found to possess significant anti-cancer properties (Man, S, et al, 2010). The nonsugar part of saponins have also a direct antioxidant activity which may result in other beneficial effects on blood cholesterol levels, and stimulation of immune system. The phytochemical screening of the plant extract yielded positive with glycosides and saponinshence it can also be construed that it could be a potential source of medicine for cancer and heart ailment. There is also potential in the plant extract as stimulant of the immune system. Saponinsbind with bile salt and cholesterol in the internal tract. Bile salts form small micelles with cholesterol facilitating its absorption. Saponins cause a reduction of blood cholesterol by preventing its reabsorption.

Table 1. Phytochemical analysis of the Mimosa pudica Linn extract

Phytochemical	Chemical Test	Result (Presence or Absence)	Descriptive Results
Alkaloids	Mayer's Test	+	Formation of slight opaqueness
Flavonoids	Bate-Smith and Metcalf Test	+	Formation of magenta red color
Saponins	Froth Test	+	Formation of froth
Tannins	Ferric chloride test	-	No blue black or brownish green color formed
Sterols	LeibermannBurchard Test	-	No formation of blue color
Triterpenes	LeibermanBurchard Test	+	Formation of red color

Triterpenes are a subclass of terpenes which are anti-oxidants that have the ability to trap and neutralize benzopyrene, cancer-inducing compounds found in cigarette smoke, car exhaust fumes and charcoal grill smoke (www.caasn.com/terpenes-and-triterpenes). The triterpene constituent of the extract could be an indication that the plant has anti-oxidant property.

Antimicrobial Activity of Mimosa pudica Linn

The antimicrobial activity of the makahiya plant (Mimosa pudica Linn) is presented in table 2.

The figure below shows the antimicrobial activity of makahiya plant extract against three test organisms: Staphylcoccusaureus, Bacillus subtilis and Candida albicans.

The figure below shows that the makahiya plant extract has a strong antimicrobial activity against Staphylococcus aureus and Bacillus subtilis but showed negative antimicrobial activity against Candida albicans. The strong antimicrobial activity of the plant extract against S aureus and B. subtilismaybe due to the presence of flavonoids as earlier detected.

Table 2. The Antimicrobial Activity of Makahiya (Mimosa pudica Linn) Extract against Three Test Organisms

Test Organism	Replication	Trial per Replication	Diameter of Inhibition, mm	Mean	Grand Mean	Microbial Activity
Staphyloccocusaureus	1	1	24	22.7	21.8	+++ Strong
		2	22			
		3	22			
		C	10			
	2	1	19	21.7		
		2	22			
		3	24			
		C	8			
	3	1	20	21		
		2	21			
		3	22			
		C	8			
Bacillus subtilis	1	1	22	21	23.5	+++ Strong
		2	20			
		3	21			
		C	6			
	2	1	24	25.7		
		2	28			
		3	25			
		C	7			
	3	1	24	23.7		
		2	23			
		3	24			
		C	6			
Candida albicans	1	1	7	6.3	6.1	- Negative
		2	6			
		3	6			
		C	6			
	2	1	6	6		
		2	6			
		3	6			
		C	6			
	3	1	6	6		
		2	6			
		3	6			
		C	6			

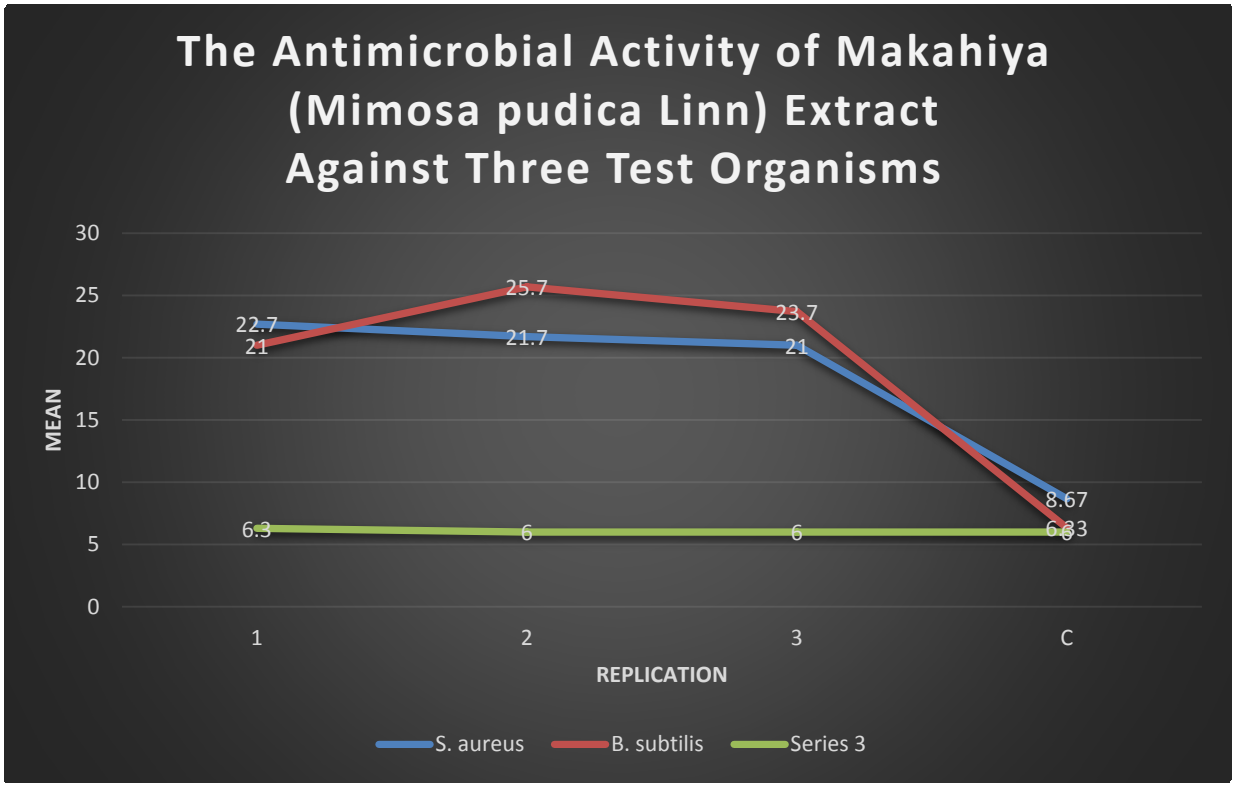

Figure 1. The antimicrobial activity of makahiya extract against three test organisms

Staphylococcus aureus is a gram-positive coccal bacterium and is frequently found in the respiratory tract and on the skin. It is often positive for catalase and nitrate reduction. Although S. aureusis not always pathogenic, it is a common source of skin infections such as abscesses, respiratory infections such as sinusitis and food poisoning. Pathogenic strains often promote infections by producing potent protein toxins and expressing cell-surface proteins that bind and inactivate antibodies. The emergence of antibiotic resistant forms of S. aureus such as MRSA is a worldwide problem in clinical medicine (https://en.wikipedia.org/wiki/Staphylococcus-aureus).

The makahiya extract was also found to have a strong antimicrobial activity against Bacillus subtilis. Bacillus subtilis is not a frank human pathogen but has on several occasions been isolated from human infections. Infections attributed to B. subtilis include bacteraemia, endocarditis, pneumonia and septicaemia. However, these infections were found in patients in compromised immune states. Although B. subtilis is not considered toxigenic, it does produce the extracellular enzyme subtilisin that has been reported to cause allergic or hypersensitivity reactions in individuals repeatedly exposed to it (www.epa.gov/biotech_rule/pubs/fra/fra009.htm).

Candida albicans was found to be resistant to the makahiya plant extract as the extract showed negative activity against this microorganism.

Antioxidant property

Free radicals occur normally in the body's metabolism. However, some environmental factors such as pollution, energy from the sun and cigarette smoke to name a few would result to the destruction of millions of molecules in the body in a process called oxidation. This would cause arthritis, premature ageing, edema, artery hardening and even cancer susceptibility (www.youtube.cm/watch?V=ZwU8xy5VnQK). So to prevent oxidative stress, antioxidants are needed.

Oxidation of cells can be illustrated with the browning of a cut apple. When the apple is cut, the cells are damaged and oxygen can get inside and allows the phenolase to change to molecules of melanin, making the apple brown. This process is called oxidation. To inactivate the phenolase enzyme so that oxidation will be retarded, antioxidants are needed.

The antioxidant property of makahiya plant extract is shown in the table below.

Table 3. The oxidation of apple

Oxidation description	Time of oxidation, min		
	Plain	Positive Control	Plant extract
1	7	22	21
2	45	150	125
3	138	360	300

The time it takes for the plant extract to inactivate the phenolase enzyme thus retarding the oxidation process is comparable to the positive control, Vit C solution which is a known antioxidant. This signifies that the plant extract has an antioxidant property. Earlier findings had shown that the plant extract contains flavonoids, saponins and triterpenes. The presence of these substances might have given the antioxidant property of the plant.

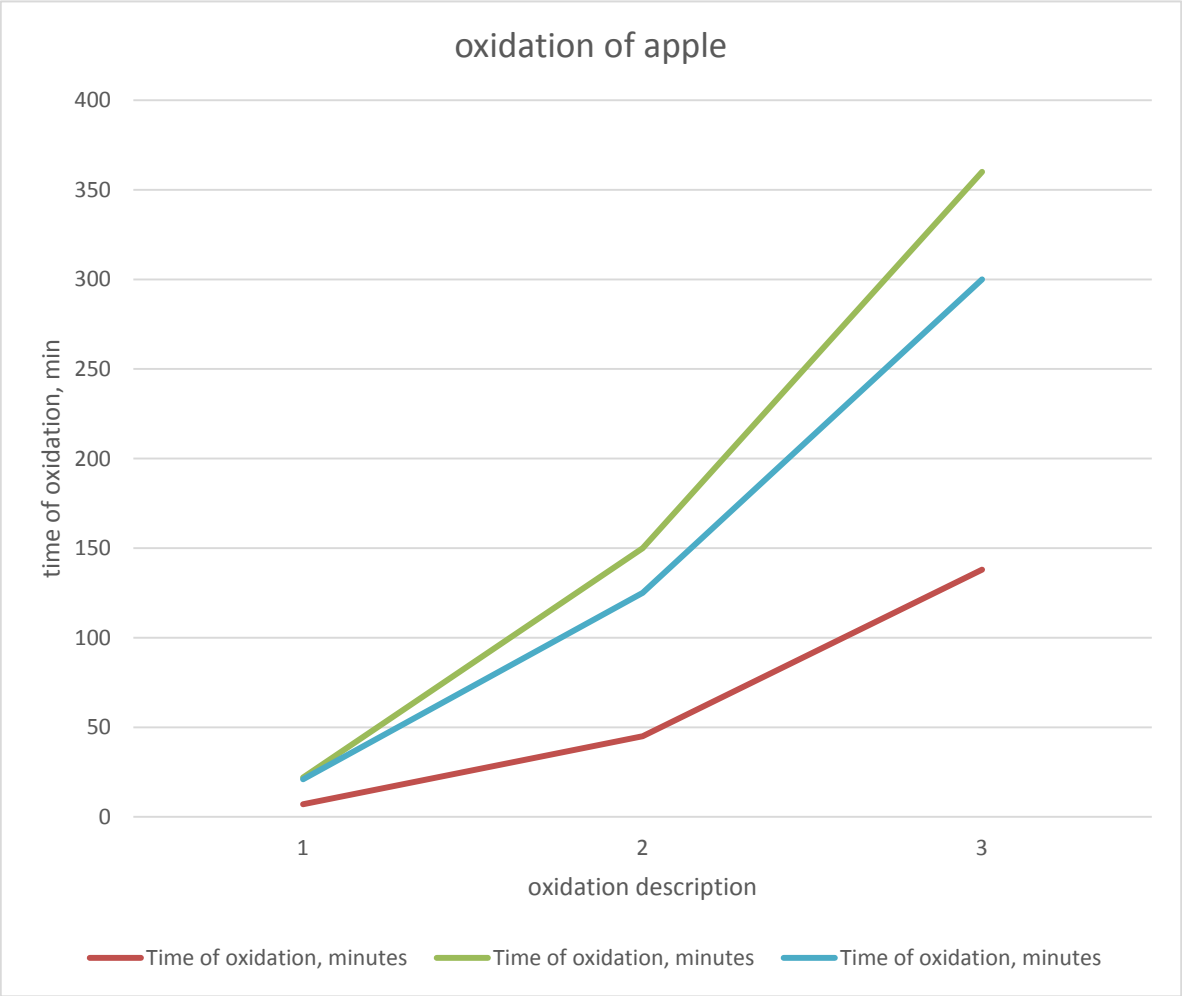

Figure 2. The oxidation of apple

The figure above further illustrates the comparison of the antioxidant property between and among the positive control and the plant extract to that of the apple just exposed to air.

Based on the figure above, it takes a longer time for the apple soaked with the plant extract to oxidize compared to the apple not soaked. This is an indication that the plant extract exhibits antioxidant property. When its activity is compared with a known antioxidant which is used as the positive control, there is just a slight difference in time for oxidation to occur. Hence, the antioxidant property of the plant is comparable with the positive control.

6. Findings

Based on the results of this study conducted on makahiya (Mimosa pudica Linn) plant, it was found out that

1. Makahiya extract contains the phytochemicals alkaloids, flavonoids, saponins and triterpenes.
2. Makahiya plant extract has strong antimicrobial activity against Staphylococcus aureus and Bacillus subtilis but has negative activity against Candida albicans.
3. Makahiya extract exhibits antioxidant property.

7. Conclusions

Makahiya (Mimosa pudica Linn) plant has pharmaceutical potentials due to the presence of phytochemicals like alkaloids, flavonoids, saponins and triterpenes, its great microbial activity against Staphylococcus aureus and Bacillus subtilis and the antioxidant property it exhibited.

8. Recommendations

1. Since all tests conducted were qualitative in nature, it is highly recommended that quantitative analysis should be conducted to establish the identity and specific amount of the phytochemicals present.
2. The microbial activity of the plant extract on more strains of microorganism should be conducted.
3. A more intensive study should be done which will lead to the establishment of its antioxidant property.

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