

Roots of *Mimosa pudica* Linn “Makahiya” as an alternative treatment against urinary tract infections

Winston D. Balag-ey & Leonora E. Ngilangil

Don Mariano Marcos Memorial State University - Open University

City of San Fernando, La Union

Corresponding author: leonora_ngilangil@yahoo.com

Abstract

*This determined the presence of phytochemicals in *Mimosa pudica* Linn and assessed the therapeutic effect of its roots against urinary tract infections (UTI). Ten patients were the subjects of the treatment and were classified into experimental and control groups. They were coded based on their urinalysis results and the assessment of medical doctors. Decoated roots of *Mimosa pudica* Linn and a commercial drug (Cotrimaxazole) were administered to the treatment groups. The changes in the physical, chemical and microbiological examinations of the patient's urine after 1, 3, 5, and 7 days were monitored and the clinical progress of the patients were noted. Results revealed that the decoated roots of *Mimosa pudica* Linn is comparable to the effect of the commercial drug in the treatment of urinary tract infections.*

Key words: *decoated roots, *Mimosa pudica* Linn, phytochemicals, urinary tract infections, therapeutic effect, treatment groups*

Herbal medicine in the 21st century draws from a huge wealth of traditional knowledge, along with the updated research available on herbal constituents and plant extracts. In the late 20th century, herbal medicine made a comeback as people began to seek alternatives to modern pharmaceuticals because some of these drugs have unwanted side effects, and mainly because of the spiralling costs of pharmaceuticals. The poverty-stricken countryside, where residents do not have adequate access to modern health care services and facilities, was the center of the revival effort.

The creation of the Philippine Institute of Traditional and Alternative Health Care (PITACH) through Republic Act 8423 also known as the Traditional and Alternative Medicine of 1997, supports researches on alternative medicines. The law is expected to promote and develop the country's traditional folk knowledge and medicinal practices. It is also believed that this legislation will not only tap the country's rich resources of medicinal cures but also protect the time tested efficacy of indigenous remedies and treatments developed by traditional Filipino healers.

Urinary tract infections (UTI) are common health problems affecting millions of people. Women are especially prone to UTI where one in five women develops a urinary tract infection during her lifetime (Conforth, n.d.). Simple UTI can be treated with a three-day course of antibiotics, although women who are pregnant or who have diseases such as diabetes that suppress the immune system are usually treated with antibiotics a little longer (Harvard Medical School, n.d.).

Mimosa pudica Linn, known as "makahiya" in Filipino, and "Babain" in Iloko is a popular ornamental plant, as its leaves fold up when stimulated by touch, heat or wind. The seeds and other parts of the *Mimosa pudica* Linn plant contain mimosine, and extracts of the plant have been shown in scientific trials to be a moderate diuretic, can depress duodenal contractions similar to atrophine sulphone, can promote regeneration of nerves, and reduce menorrhagia. The roots and leaves are commonly used in treatment. The roots are bitter, astringent, acrid, cooling, vulnerary, alexipharmic, resolvent, diuretic, antispasmodic, emetic, constipating, and febrifuge. They are useful in vitiated conditions of *pitta*, leucoderma, vaginopathy, metropathy, ulcers, dysentery, inflammations, burning sensation, hemorrhoids, jaundice, asthma, fistula, small pox, strangury, spasmodic, affections and fevers (Pande and Pathak, 2010). Root extracts are reported to be a strong emetic. Decoction or infusion of leaves is used in asthma, expectorant, urinary complaints, glandular swelling, sore throat and hoarseness (Estrella, 1983). Some studies indicate that the roots are in homeopathic treatments for many illnesses such as urinary and vaginal infections, asthma, inflammations, and diarrhea, skin rash, neurological disorders, and the symptoms of rheumatoid arthritis (Miley, n.d.). Studies on the therapeutic effects of the roots of *Mimosa pudica* Linn are being done in China, India, Trinidad, Panama, Haiti, Venezuela and other Southeast

Asian countries. In the Philippines, indigenous remedies and treatments using the roots of the plants are observed particularly in La Union and its vicinity in treatment of UTI.

According to the study conducted by Pande and Pathak (2010), the roots of *Mimosa pudica* Linn are found to have great medicinal value. Their findings were based on the results of the pharmacognostic and phytochemical studies including qualitative chemical examinations on the roots of the plant. Results of the chemical tests indicated presence of flavonoids, phytosterol, alkaloids, amino acids, tannins, glycoside, and fatty acids.

This study aims to determine the presence of crude medicinal ingredients or phytochemicals in *Mimosa pudica* Linn and to assess the therapeutic effect of the decocted roots of the plant as compared to a control drug against UTI. The results should contribute towards the systematic validation of the plant’s potential as a remedy for UTI.

Research Design and Methods

The study made use of the descriptive – experimental method. It was conducted at Bessang Pass Memorial Hospital, Cervantes, Ilocos Sur.

The matured roots of the plant were gathered, washed and oven dried before grounding. Extraction was made by shaking the grounded plant material with ethyl alcohol at a ratio of 1:10 w/v for three days. The extract was filtered through three layers of cheesecloth to remove debris and through Whatman No. 1 filter paper. Phytochemical test was performed using the Department of Science and Technology (DOST) procedure to determine the presence of the following phytochemicals: alkaloids, flavonoids, glycosides, organic acids, saponins, sterols, tannins, and triterpenes. The test for alkaloids used Mayer’s reagent and 1 % HCl to give a cream-colored precipitate. The changes from the initial brown color to the final product would indicate the amount of alkaloids present. The test for organic acids was done by adding aqueous sodium carbonate to boiled aqueous plant extract. The production of stable and dense broth indicates the presence of free acids (stearic acid, dipertene and dicarboxylic acids). The test for triterpenes (Salkowski Test) used

chloroform, acetic acid anhydride, and concentrated sulphuric acid wherein several milligram of the dried alcoholic extract were dissolved in chloroform to shaking and treated with 1 or 2 drops of concentrated sulphuric acid. A yellow color gradually becoming red to deep red shows positive result.

The following legend was used in the interpretation of the results of the phytochemical analysis of the dried roots of *Mimosa pudica* Linn alcoholic extract.

Table 1. Legend of the phytochemical analysis

Characteristics	Interpretation
Light color change with small precipitate formed	+ “trace”
Dark color change with more precipitate formed	++ “in moderate amounts”
Very dark color change with plenty of precipitate formed	+++ “abundant”
No change in color	- “Negative”

The result of the phytochemical analysis was the basis in conducting the actual trial medication to patients suffering from UTI. Ten individuals were identified based on the assessment of a doctor and the urinalysis result. The patients were divided into two groups: the first five were the experimental group and the next five were the control group. Consent forms were explained and signed by the patients stating their willingness to participate in the study. Six medical doctors were involved in the assessment, monitoring, and rating the progress of the patients while they underwent the seven day-treatment. The urine samples of patients were analyzed by a registered medical technologist from day 0, 1, 3, 5 and 7 to find out changes and/or improvements in the patient’s condition. Urinalyses include physical, microscopic and chemical examination.

The experimental group (patients administered with decocted roots of *Mimosa pudica* Linn) were advised to take their meal one hour before drinking one cup of decocted roots for seven days. The mode of treatment was twice a day or every 12 hours. The patients were also advised to avoid drinking liquor and taking other medications while under *Mimosa*

medications to gain more beneficial effects. The control group (patients administered with Cotrimaxazole, 800 mg/160 mg) were advised to take their meal one hour before taking the drug for twice a day or every 12 hours for seven days.

To guide the medical doctors in the assessment particularly on the therapeutic effect of the decocted roots of *Mimosa pudica* and the control drug (Cotrimaxazole) to patients suffering from UTI from day 1, 3, 5 and 7, the following rating scale was used:

Point Value	Statistical Range	Descriptive Equivalent Rating
5	4.51-5.0	Excellent improvement
4	3.51-4.50	Very good improvement
3	2.51-3.50	Good improvement
2	1.51-2.50	Fair improvement
1	0.51-1.50	Poor improvement
0	0.0-0.50	No improvement

Student’s T–test at 0.01 level of significance was utilized in determining the difference between the therapeutic effects of decocted roots of *Mimosa pudica* and Cotrimaxazole.

Results and Discussion

Table 2 presents the result of the phytochemical analysis of the dried roots of *Mimosa pudica* Linn crude extract.

Table 2. Phytochemical analysis of the crude extract of *Mimosa pudica* Linn dried roots

Medicinal ingredients	Initial color	Final product	Result
Alkaloids	Brownish	Dark brown color with more cream ppt	++ (moderate)
Flavonoids	Brownish	Light tinge red with small precipitate	+ (trace)
Glycosides	Brownish	Light red with small Brick precipitate	+ (trace)
Organic Acids	Brownish	Brownish	- (negative)
Saponins	Brownish	Blue-violet with more precipitate	++ (moderate)
Sterols	Brownish	Blue color with more precipitate	++ (moderate)
Tannins	Brownish	Blue color with small Precipitate	+ (trace)
Triterpenes	Brownish	Brownish	- (negative)

Numerous studies suggest that the medicinal value of plants lie in the bioactive phytochemicals present in the plants. In the phytochemical screening conducted by Gandhiraja et al. (2009), the active phytochemicals of *Mimosa pudica* showed the presence of bioactive components like Terpenoids, Flavonoids, Glycosides, Alkaloids, Quinines, Phenols, Tannins, Saponins and Coumarin. They further tested the antimicrobial activity of the plant extract against three potentially pathogenic microorganisms *Aspergillus fumigatus*, *Citrobacter diversens* and *Klebsiella pneumonia* at different concentrations of the extract. The results of the antimicrobial assay of the methanolic extract of *Mimosa pudica* indicated that the plant exhibited antimicrobial activity against the tested microorganisms at three different concentrations of 50, 100 and 200µg/disc.

In this study, phytochemical analysis of the dried roots of *Mimosa pudica* gave moderate amounts of alkaloids, saponins and sterols which jibed with the study conducted by Pande and Pathak (2010) and Gandhiraja et al. (2009). Alkaloids which are usually extracted

by dissolving the dried roots with dilute acid are amines (nitrogen-containing compounds). Morphine and codeine are examples of alkaloids used in medicines to relieve pain. Cocaine, also an alkaloid, is used as a local anesthetic. Mimosine is the alkaloid present in the plant being studied.

Flavonoids and glycosides in the roots of the plant were found in “trace” amounts. Flavonoids usually have profound effects on the function of immune and inflammatory cells (Middleton et al., n.d.). Some flavonoids function as anti-inflammatory, antihistaminic, and antiviral agents (Oana, 2009). Flavonoids have the ability to respond to a wide array of microbial microorganisms which could be attributed to their ability to form a complex with extra-cellular and soluble proteins which bind to bacterial cell wall (Tsuchiya, 1999 as cited by Oana, 2009).

Organic acids and triterpenes were found “negative” which means that there were no acids detected in the roots and did not confirm other research results. The inability of the researcher to detect these phytochemicals may be attributed to equipment limitation.

Table 3 shows the results of physical and chemical examination of urine from patients with UTI.

The physical and chemical examinations of urine from patients with UTI were performed to determine the degree of seriousness of the ailment. The color of urine in normal conditions is yellow while dark yellow indicates that the patients are dehydrated and the urine contains small amount of water and large amounts of chemicals (CuvIELLO, 2002; Strasinger and Di Lorenzo, 2008). The results show that all urine samples in both experimental and control patients were turbid (abnormal transparency). The transparency of the urine sample is a factor to consider in patients suffering from UTI. Since sugar is negative in the urine samples of UTI patients, this means that sugar in urine is in normal amounts. Normal urine contains 100 mg of glucose per day (Mac Pee et al., 2001). Patients 3, 5, 6, 9 and 10 revealed traceable proteins, thus indicating increased protein in the urine. Normal urine is negative for protein (CuvIELLO, 2002). The pH of the urine samples of both the experimental and the control groups were found to be in value of 6.0 and 6.5 which is slightly acidic. These results affirmed the statement of Strasinger and Di Lorenzo (2008) that the first morning urine of a healthy individual is slightly acidic in nature. The data also

showed that the specific gravity of the urine samples ranged from 1.025 -1.030. Specific gravity is high if less fluid is taken into the body, while low specific gravity is noted after large intake of fluid

Table 3. Results of the physical and chemical examination of urine from patients with urinary tract infections before treatment.

Patient	Color	Trans- par- ency	Sugar	Protein	pH	Specific Gravity
Experimental (Mimosa)						
1	Yellow	Turbid	Negative	Negative	Acidic (6.5)	1.03
2	Yellow	Turbid	Negative	Negative	Acidic (6.0)	1.03
3	Dark yellow	Turbid	Negative	Trace	Acidic (6.5)	1.03
4	Yellow	Turbid	Negative	Negative	Acidic (6.0)	1.03
5	Dark yellow	Turbid	Negative	Trace	Acidic (6.0)	1.03
Control (Cotrimaxazole)						
6	Dark yellow	Turbid	Negative	Trace	Acidic (6.0)	1.03
7	Yellow	Turbid	Negative	Negative	Acidic (6.0)	1.03
8	Yellow	Turbid	Negative	Negative	Acidic (6.5)	1.03
9	Dark yellow	Turbid	Negative	Trace	Acidic (6.0)	1.03
10	Dark yellow	Turbid	Negative	Trace	Acidic (6.5)	1.03

Table 4 shows the results of the microscopic examination of urine from UTI patients, which includes white blood cells (WBC), red blood cells (RBC), epithelial cells (EC), casts, bacteria, crystals, mucus threads and amorphous urates/amorphous phosphates (AU/AP).

Microscopic examinations of white blood cells confirmed that all patients were within the abnormal range. The normal range for WBC per high power field is 0-2 /hpf for male and 0-5/ hpf for female. A reading of 8-10 per high power filed conveys pathologic sign of urine (Spencer,

2005). Increased WBC can occur due to inflammation, infection, trauma or neoplasia (Strasinger and Di Lorenzo, 2008). The results confirmed that all the patients have had infection. However, the patients were within the normal range as far as red blood cells examination is concerned. This implies that there is no hemorrhagic type or bleeding disorders shown among the patients.

Five patients had plenty of epithelial cells, while five patients had moderate amounts. The presence of epithelial cells in urine, however, is normal. Casts were absent in the entire urine specimens which means that all the patients were free from any trouble or disorder of the kidney. It can be viewed that bacteria were present in the urine of all patients which indicates that the urine specimens are pathologic. Crystals were not present and mucus threads showed few. Mucus threads have no clinical significance since they come from the terminal urethra or vagina (Flynn and Whitlock, 1997). Amorphous urates/amorphous phosphates ranged from moderate to plenty. These findings substantiate the turbidity of the urine samples in the physical examination previously done.

Table 4. Microscopic examination of urine from patients with UTI before treatment

Patient	WBC	RBC	EC	Casts	Bacteria	Crystals	MT	AU/AP
Experimental (Mimosa)								
1	55-60	3-4	Moderate	None	Moderate	None	Few	Moderate
2	42-45	2-3	Moderate	None	Moderate	None	Few	Moderate
3	TNTC	1-2	Plenty	None	Moderate	None	Few	Moderate
4	35-40	2-3	Moderate	None	Moderate	None	Few	Moderate
5	TNTC	2-3	Plenty	None	Moderate	None	Few	Moderate
Control (Cotrimaxazole)								
6	TNTC	2-3	Plenty	None	Moderate	None	Few	Moderate
7	53-57	1-3	Moderate	None	Moderate	None	Few	Moderate
8	47-50	1-3	Moderate	None	Moderate	None	Few	Moderate
9	TNTC	3-4	Plenty	None	Moderate	None	Few	Moderate
10	TNTC	2-4	Plenty	None	Moderate	None	Few	Moderate

Legend: WBC- White Blood Cells
RBC- Red Blood Cells
EC – Epithelial Cells

MT – Mucus Threads
AU/AP – Amorphous Urates/Amorphous phosphates

The results of the physical, chemical and microbiological examinations done on the urine of the 10 patients were generally abnormal and predominantly in pathological state.

Table 5 presents the assessment of the medical doctors on the therapeutic effects of *Mimosa pudica* Linn and Cotrimaxazole on treatment groups. It could be gleaned that improvements were noted after day three and showed very good to excellent improvement after day five and day seven, respectively. The experimental group posted a mean of 3.15 which is described as “good improvement” in the equivalent rating scale while the control group posted a mean of 3.20 which is also described as good improvement. Improvements were monitored based on their urinalyses which were found to have improved in the physical, chemical and microscopic examinations on days 1, 3, 5 and 7.

Table 5. Therapeutic effects of *Mimosa pudica* Linn and Cotrimaxazole on treatment groups

Patient	Clinical Progress				
	Day 1	Day 3	Day 5	Day 7	Mean
Experimental					
1	0	3	4	5	3.00
2	1	3	4	5	3.25
3	1	3	4	5	3.25
4	0	3	4	5	3.0
5	1	3	4	5	3.25
Mean	0.6	3.0	4.0	5.0	3.15
Control					
6	1	3	4	5	3.25
7	1	3	4	5	3.25
8	0	3	4	5	3.00
9	1	3	4	5	3.25
10	1	3	4	5	3.25
Mean	0.8	3.0	4.0	5.0	3.20

T-test was done to compare the therapeutic effect of decocted roots of *Mimosa pudica* Linn (experimental) and Cotrimaxazole (control) against urinary tract infection as shown in Table 6.

Table 6. Comparison on the therapeutic effect of decocted roots of *Mimosa pudica* Linn and Cotrimaxazole

Treatment	Mean
Experimental (<i>Mimosa pudica</i>)	3.15
Control (<i>Cotrimaxazole</i>)	3.20
t-value computed = 0.31	

The critical value at .01 level of significance is 2.896. The t -value computed is 0.31 which is lower than the critical value. This implies that there is no significant difference between the two treatment and that the therapeutic effect of *Mimosa pudica* Linn and Cotrimaxazole to patients suffering from urinary tract infections are comparable.

Conclusion

This study confirmed the presence of phytochemicals in *Mimosa pudica* Linn. Alkaloids, saponins and sterols were found in moderate amounts, while flavonoids, glycosides and tannins were in trace amounts. Organic acids and triterpenes were found negative. The 10 patients suffering from UTI who underwent treatment using decocted roots of *Mimosa pudica* and Cotrimaxazole showed significant improvements on the third day. There were insignificant differences on the assessment by the doctors to patients administered with decocted roots of *M. pudica* and with Cotrimaxazole. Therefore, the therapeutic effect of decocted roots of *Mimosa pudica* is comparable to the control drug (Cotrimaxazole). It is recommended that roots of *Mimosa pudica* Linn should be considered as an alternative medicine against UTI. A follow-up study can also be conducted to verify the efficacy of the plant as alternative medicine against UTI.

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