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Research Article

Determination of Antioxidant and Antimicrobial Properties of Abaca (*Musa textilis* Née) Pseudostem Extracts

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ABSTRACT

Aim: This study aimed to identify and quantify the phytochemicals extracted from the pseudostem sap of the two varieties of *Musa textilis* namely, Luno and Maguindanao collected from the mountainous parts of Cavite, Philippines. The pseudostem sap extracts were assessed for their antioxidant activity through 2,2-Diphenyl-1 Picrylhydrazyl (DPPH) free radical scavenging assay and Ferric Reducing Antioxidant Power (FRAP) assay; and for their antimicrobial properties against four human bacterial strains: *Staphylococcus aureus, Enterococcus faecalis, Pseudomonas aeruginosa,* and *Escherichia coli* and two human pathogenic fungal strains *Trichoderma harzianum* and *Candida albicans* using agar well diffusion assay. **Materials and Methods:** Two varieties of *M. textilis* were identified by the representative of Philippine Fiber Industry Development Authority (PhilFIDA) and harvested from Gen. Emilio Aguinaldo, Cavite, Philippines. Luno and Maguindanao *pseudostems* were subjected to manual and mechanical decortication processes in which the abaca fiber and sap were collected while ensuring the cleanliness of the decorticating machine and borosilicate glass containers to maintain the integrity of the sap. Extracted pseudostem saps were filtered using vacuum filters and were frozen at -86ºC before being subjected to freeze-drying. Solid particles were suspended in aqueous solution obtaining a concentration of 10 mg/mL. 100 mL of the aqueous sap extracts were delivered to Central Analytical Services Laboratory, National Institute of Molecular Biology and Biotechnology in University of the Philippines Los Bano, Laguna for the conduct of the quantitative phytochemical analysis and DPPH and FRAP assays. Four human bacterial strains and one fungal pathogenic strain: *S. aureus, E. faecalis, P. aeruginosa,* and *E. coli* and *T. harzianum* were selected and acquired from Philippine National Collection of Microorganisms and *C. albicans* from the University of Santo Tomas Collection of Microbial Strains for the conduct of agar well diffusion assay. **Results and Conclusion:** The phytochemical components of the abaca pseudostem sap extracts were determined, which revealed the presence of flavonoids, phenols, quinones, and tannins for both extracts. Results showed that the 'Luno' variety had 65.36% to 66.31% scavenging activity through DPPH assay and 50% to 54.14% antioxidant activity through FRAP assay. The 'Maguindanao' variety showed 60.62% to 67.26% scavenging activity and 70.85% to 71.98% antioxidant activity. In addition, both varieties showed no antimicrobial activity against the four bacterial and two fungal strains. These results exhibit the pertinence of the organic solvents in the extraction process in drawing out necessary bioactive compounds from the pseudostem sap extracts. The statistical analysis showed no significant difference between the percent scavenging activity and the percent antioxidant activity of the extracts from both varieties.

Keywords: Abaca, *Musa textilis*, Antimicrobial activity, Antioxidant activity, DPPH, FRAP, Agar well.

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INTRODUCTION

Plants play an important role in the environment and for humans. It provides humans with food, fiber, shelter, fuel, and medicine. It is known to have the ability to convert sunlight into organic substances through photosynthesis, allowing it to survive independently, while other organisms, including humans, are dependent on plants as primary producers of food and oxygen.[1] Over the past few years, plants have greatly contributed to the medical industry by providing alternative medicines. Plants produce secondary metabolites that are rich in antioxidants and antimicrobials. Isolated extracts derived from medicinal plants have been documented to exhibit several biological effects, including antimicrobial, anti-inflammatory, and antioxidant actions. Medicinal plants synthesize antimicrobial compounds

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that possess the capacity to inhibit the proliferation of fungi, bacteria, viruses, and protozoa.[2] Antioxidants are produced to prevent diseases associated with free radicals. It is a neutralizing compound that passes free radicals to electrons to lessen the harmful effects due to the oxidative stress caused by the damages in the biological processes.[3] *Musa textilis*, commonly known as abaca, is a Philippine native plant that has few information on its phytochemistry and pharmacology. It belongs to the family of Musaceae, has a close resemblance and relation to the banana plant, and is endemic. It grows from a rootstock where several fleshy stalks will protrude, forming a circular cluster of sheaths. As it grows, the sheathing of leaves forms an herbaceous pseudostem of about 30 to 40 cm in diameter. Its oblong-pointed leaves have a bright green color on the apical surface while yellowish-green on the dorsal side. The plant stems contain 93% water and 1.3-5% fiber. Its fiber comprises combinations of basic polymers such as hemicelluloses, celluloses, and lignin.[4] Local farmers cultivate abaca in loose, loamy soil with abundant drainage, and after 18 to 24 months, the pseudostem and leaves are ready for harvest.[5] The abaca plant has 12 to 30 leaf sheaths that are manually or mechanically removed from its stem to extract high-grade fibers from the plant. After stripping, around three-quarters of the abaca plant is left as agricultural waste, which is allowed to degrade naturally within the plantation. The significant amount of waste produced yearly from abaca stripping represents unused cellulosic biomass.[6] Aside from using the abaca for its fiber, it is also utilized by people for various traditional purposes. The sap of abaca is applied to wounds to help with blood clotting, while the heated extracts from the young stalk alleviate cough and diarrhea. The methanol extract derived from abaca fruits notably reduces the blood glucose level of individuals suffering from hyperglycemia.[7] Furthermore, studies confirmed that the Musa family have medicinal properties. *Musa paradisiaca* L., for instance, exhibits antioxidant, antitumor, and antibacterial activities that support its traditional use against various diseases.[8] These activities could be due to the presence of phytochemical compounds in the Musa, such as flavonoids, dietary fibers, and tannins.[9] Although there are numerous published studies on *M. textilis* and its ethnomedicinal benefits, additional research is still needed. This study aims to examine the antioxidant and antimicrobial activities of *M. textilis* pseudostem sap extracts and its phytochemical contents, which constitute the antioxidant and antimicrobial potential.

MATERIALS AND METHODS

Collection and Preparation of the Plant Sample

Two varieties of *M. textilis* namely Luno and Maguindanao were collected for crude aqueous pseudostem extraction from Barangay Dalusag of General Emilio Aguinaldo, Cavite. Samples are owned and were identified on-site by Mr. Floro Malelang, representative of Philippine Fiber Industry Development Authority. The researchers ensured that the fiber decorticating machine was thoroughly cleaned and disinfected before the extraction process. The collected pseudostem extracts were kept in a tightly sealed borosilicate glass bottle inside an ice box and were taken to the Department of Biological Sciences, College of Arts and Sciences, Cavite State University, Indang Cavite for filtration and to the CvSU Interdisciplinary Research Building for freeze-drying. The concentrated extracts were filtered of excess pseudostem particles using vacuum filters. Samples were frozen with liquid nitrogen inside a biofreezer at -86°C. Moisture content of the freeze-dried samples was determined gravimetrically through weighing small portions of dried particles before and after freeze-drying until constant weight following.[10] Solid particles suspended in aqueous solution with a concentration of 10 mg/mL were analyzed in terms of phenolic composition, antioxidant activity, and antimicrobial activity.

In order to maintain the integrity of the *M. textilis* pseudostem extracts, aqueous extraction was done. One hundred milligrams of freeze-dried extracts were suspended in 1000 mL of distilled water[11] in order to obtain a final crude extract concentration of 10 mg/mL. 0.9% DMSO (dimethyl sulfoxide) was added to the aqueous solution to maintain the viability of the pseudostem cells.[12]

Qualitative and Quantitative Phytochemical Screening of Plant Extracts

100 mL of crude aqueous *M. textilis* pseudostem extracts of each variety were sent to Central Analytical Services Laboratory, National Institute of Molecular Biology and Biotechnology, University of the Philippines Los Baños, Laguna for qualitative and quantitative phytochemical screening. The aqueous extracts were tightly sealed in a borosilicate glass and were stored inside a cooler in order to prevent the heat to denature the extracts. Extracts of each *M. textilis* variety were subjected to detection of carbohydrates, glycosides, phytosterols, terpenoids, proteins and amino acids, gums and mucilages, and alkaloids; and quantification of total phenolic and flavonoid contents.

Determination of Antioxidant Activity

The antioxidant capacity of *M. textilis* 'Luno' and 'Maguindanao' pseudostem sap was assessed in terms of free radical scavenging activity and reduction of ferric ions through DPPH free radical scavenging assay and ferric reducing antioxidant power assay, respectively. 100 mL of Luno and Maguindanao extracts were brought to the Central Analytical Services Laboratory, National Institute of Molecular Biology and Biotechnology in University of the Philippines Los Baños, Laguna for the conduct of these assays. Ascorbic acid was employed as positive control for DPPH and FRAP assays with the concentration of 0.21 and 0.22 mM, respectively.[13]

Determination of Antimicrobial Activity

The antimicrobial activity of *M. textilis* 'Luno' and 'Maguindanao' pseudostem sap were tested against six microbial organisms; four bacterial strains: *Escherichia coli, Enterococcus faecalis, Pseudomonas aeruginosa*, and *Staphylococcus aureus*; and two fungal strains: *Candida albicans* and *Trochoderma harzianum* through agar-well diffusion assay.

Preparation of test organisms. Among the six selected test organisms, *S. aureus* (BIOTECH 1582), *E. faecalis* (BIOTECH 10348), *P. aeruginosa* (BIOTECH 1335), and *E. coli* (BIOTECH 1634); and *T. harzianum* (BIOTECH 3001), were selected and acquired from the Philippine National Collection of Microorganisms (PNCM), University of the Philippines, Los Baños, Laguna and, *C. albicans* (USTCMS 1235) was acquired from University of Santo Tomas Collection of Microbial Strains. The medical significance of these pathogens is presented in Table 1. All specimens were transported to the Bacteriology Laboratory, Interdisciplinary Research Building, Cavite State University, Indang Cavite.

Preparation and standardization of test organisms. Pure bacterial isolates were cultured in Mueller-Hinton Agar (MHA) while pure fungal isolates were cultured in Potato-Dextrose Agar (PDA) and were incubated at 37°C for 24 hr and 48 hr, respectively, to allow growth. After incubation, the cultures were suspended in 10 mL saline solution then, each strain was adjusted at a concentration of 108 cells/mL and the fungal cultures, 106 spores/mL using 0.5 McFarland Standard.[14]

Serial broth dilution. 1 mL of aqueous pseudostem extracts from the working concentration of 10 mg/mL was diluted to 10 mL of distilled water in order to achieve a concentration of 1 mg/mL. The resulting preparation was then serially diluted to 9 mL of distilled water in order to achieve a final concentration of 1000, 500, 250, 125, and 62.5 µg/mL.[15]

Agar-well diffusion assay

Agar-well diffusion method was conducted to screen the antibacterial and antifungal activities of the extracted *M. textilis*. One milliliter of saline solution containing bacterial and fungal cultures were pipetted at the center of a sterile Petri dish that were then poured with molten, cooled MHA for bacterial strains and PDA for fungal strains, and was thoroughly mixed with the inoculum.[16] Gentamicin and cotrimoxazole were prepared at a concentration of 50 µg/mL and 246 µg/mL, respectively, and were employed as positive control while 1% DMSO solution was employed as negative control.[17,18] Wells were made using sterile cork borers with 6 mm diameter upon medium solidification. Then, 100 µL of *M. textilis* crude extracts of different concentrations, antibiotics, and DMSO solution were transferred to the wells using sterile syringe filters. The plates were placed in a refrigerator for 30 min to let the *M. textilis* crude extracts diffuse in the media, and were then incubated at 37°C for 24 hr for plates containing bacterial cultures and 48 hr for plates containing fungal cultures. Antimicrobial activity of the *M. textilis* crude extracts was detected by measuring the zone of inhibition appearing after the respective incubation periods. Antimicrobial screening of *M. textilis* crude extracts was conducted in triplicates of different concentrations for each microbial culture. The plates were then visualized for measurement of apparent zones of inhibition using Vernier caliper.

Microtiter broth dilution method. Concentrations that showed visible zones of inhibition against test organisms from the agar-well diffusion method were subjected to this assay. Serial dilutions from the working concentrations: 1000, 500, 250, 125, and 62.5 µg/mL were pipetted to the microtiter plates. The positive control contained antibiotics while the distilled water was employed as the negative control. Resazurin sodium salt powder was prepared at 0.01% (wt/vol) in distilled water and stored at 4°C one week prior to use.[19] The plates were covered, sealed and incubated. After 24 hr of incubation, 30 µL of resazurin solution was added to each well and incubated overnight and was observed for color changes. Changes from blue to pink indicate reduction of resazurin hence, bacterial growth. The lowest concentration of *M. textilis* pseudostem crude extracts with no visible growth determine the MIC endpoint. The visual turbidity of the tubes was noted before and after incubation to confirm MIC values.[20] After determining the MIC of the *M. textilis* pseudostem crude extracts, aliquots of 50 µL from every tube that exhibited no visible bacterial growth were transferred on PDA plates and were incubated for 24 hr at 37°C. MBC endpoint was determined when 99.9% of the bacterial population is killed at the lowest concentration of the antimicrobial agent through observation of the pre- and post-incubated agar plates for the presence or absence of bacteria.

Statistical Analysis

Results from antioxidant assays of each *M. textilis* variety were compared and analyzed by Mann-Whitney U Test using

Table 1: List of test organisms employed to assess the antimicrobial potential of *M. textilis* pseudostem sap extracts, and their medical significance to humans (World Health Organization, 2017).

Test organism	Associated disease
E. coli	Gastroenteritis, Traveler's diarrhea.
E. faecalis	Diabetic foot ulcer, Cellulitis.
P. aeruginosa	Otitis externa, *Pseudomonas dermatitis*, Burn infections.
S. aureus	Folliculitis, Necrotizing fasciitis, Impetigo, Lymphangitis.
C. albicans	Vaginal candidiasis, Candidiasis of the mouth.
T. harzianum	Peritonitis

Table 2: Phytochemicals detected in the pseudostem sap extracts of *M. textilis* 'Luno' and 'Maguindanao'.

Phytochemical constituent	*M. textilis* variety	
	Luno	Maguindanao
Alkaloid	-	-
Flavonoid	+	+
Tannin	+	+
Saponin	-	-
Phenols	+	+
Terpenoids	+	+
Quinone	+	+
Phlobatannin	-	-
Phytosterols	-	-

Note: Positive (+) and Negative (-).

Table 3: Percent scavenging activity of *M. textilis* pseudostem sap determined through DPPH assay.

M. textilis Variety	Scavenging Activity (%)
Luno	66.76±0.49
Maguindanao	64.35±3.74
Ascorbic acid (control)	87.42±0.21

descriptive statistics including mean and standard deviation. Significance of all the statistical tests were predetermined at $p<1$.

RESULTS

Phytochemical Contents of *M. textilis* 'Luno' and 'Maguindanao' Pseudostem Extracts

Qualitative phytochemical screening of crude aqueous pseudostem sap extracts of *M. textilis* 'Luno' and 'Maguindanao' showed presence of different components such as flavonoids, tannins, phenols, terpenoids and triterpenoids, and quinones. Detected phytochemicals from both *M. textilis* varieties (as shown in Table 2) correlates to recent studies on the phytochemical analyses of different plant parts of species belonging to the Musacae family.

Antioxidant Activity of *M. textilis* Luno and Maguindanao Pseudostem Extracts

The results of DPPH assay of *M. textilis* 'Luno' and 'Maguindanao' pseudostem extracts, expressed in percent scavenging activity, revealed that both varieties exhibit free radical scavenging activities. As shown in Table 3, the percent scavenging activity of 'Luno' variety is 66.76±0.49 while 'Maguindanao' variety has 64.35±3.74 compared to that of the control drug used, ascorbic acid, which has 87.42±0.21. The difference between the percent scavenging activity of the *M. textilis* varieties and the standard drug used indicates that there is significant antioxidant activity in 'Luno' and 'Maguindanao' aqueous pseudostem extracts.

The results of FRAP assay of *M. textilis* 'Luno' and 'Maguindanao' pseudostem extracts, expressed in percent antioxidant activity, revealed that both varieties exhibit free radical scavenging activities. As presented in Table 4, the percent antioxidant activity of 'Luno' variety is 52.23±2.08 while 'Maguindanao' variety has 71.56±0.62 compared to that of the standard drug used, ascorbic acid, which has 97.61±0.66. The difference between the percent scavenging activity of the *M. textilis* varieties and the control drug used indicates that there is good antioxidant activity but 'Maguindanao' variety showed more potency in this aspect.

Table 4: Percent antioxidant activity of *M. textilis* pseudostem determined through FRAP assay.

M. textilis Variety	Antioxidant Activity (%)
Luno	52.23±2.08
Maguindanao	71.56±0.62
Ascorbic acid (control)	97.61±0.66

Antimicrobial Activity of 'Luno' and 'Maguindanao' Pseudostem Sap Extracts

Serial dilutions of *M. textilis* 'Luno' and 'Maguindanao' pseudostem sap did not show inhibitory activity against any of the selected microbial test organisms using the agar-well diffusion assay; hence, the determination of minimum inhibitory concentration and minimum bactericidal concentration did not proceed (Tables 5 and 6).

Comparison of Antioxidant Activity of *M. textilis* 'Luno' and 'Maguindanao' Pseudostem Extracts

The significant difference in the scavenging activity or antioxidant activity between the 'Luno' and 'Maguindanao' varieties of *M. textilis* is analyzed using the Mann-Whitney U test. Based on the

Table, the Mann Whitney U statistic of *M. textilis* 'Luno' is 3.00, while the Mann Whitney U statistic of *M. textilis* 'Maguinadanao' is 9.00. The *p*-values of both varieties are greater than, indicating that there is no statistically significant difference in both varieties.

DISCUSSION

Detected phytochemicals from *M. textilis* 'Luno' and 'Maguindanao' varieties correlates to recent studies on the phytochemical analyses of different plant parts of the Musaceae family. Studies show that bioactive compounds such as tannins, phenols, quinones, and terpenoids are commonly detected from the pseudostem sap extracts of plants belonging to the genera Musa. The phytochemical contents of *M. acuminata* bract and pseudostem and found that the chloroform extracts of both plant parts contain presence of saponins, tannins, coumarins, cyclo glycosides, and terpenoids; hence, an ideal source of phenolic compounds.[21] The phytochemical contents of *M. paradisiaca* L. was analyzed through Gas Chromatography-Mass Spectrophotometry (GC-MS) revealing that the ethanolic extracts of the fruit peel and pseudostem contains palmitic acid, stearic acid, palmitin, and stearin which are potent phenolic constituents.[22] Acetone extracts of wild banana (*Ensete superbum* Roxb.) have significant amounts of triterpenoid esters, proanthocyanidin, pro-pelargonidin glycosides, and alkaloids.[23] The presence of these phenolic compounds that have the ability to balance free radicals thereby reducing oxidative stress in the cells were further confirmed quantitatively through various antioxidant assays, of which, DPPH free radical scavenging assay and FRAP assay were conducted in this study.

The results of DPPH and FRAP assays revealed that the pseudostem extracts *M. textilis* 'Luno' and 'Maguindanao' exhibit antioxidant activity. This implies that the pseudostem of *M. textilis* 'Luno' and 'Maguindanao' varieties can be potential sources of free-radicals and phenolic compounds in developing preventive treatment of diseases. The concentration of the aqueous extracts used in the study (10 mg/mL) may be responsible for the detection of significant antioxidant activity, however, the use of organic solvents for the extraction process is expected to produce the same outcome but in lower concentrations. Detection of ideal percent radical scavenging activity indicates high amounts of phenolic compounds as well. The findings of this study suggest that *M. textilis* 'Luno' and 'Maguindanao' pseudostem extracts may contain ideal amounts of phenolic compounds that constitute antioxidant activity, hence, can be used in development of plant-derived drugs for medicinal and industrial applications.

The results of agar well diffusion assay revealed that the pseudostem extracts of *M. textilis* 'Luno; and 'Maguindanao' varieties exhibit no inhibitory activity against all test organisms. This implies that the aqueous extracts of the pseudostem of *M. textilis* 'Luno' and 'Maguindanao' varieties do not contain adequate bioactive compounds that can inhibit growth of common human microbial pathogens. The higher antioxidant level detected from the plant extracts, the higher the antimicrobial activity there should be due to the concentration of phenolic compounds that can inhibit bacterial growth.[24] However, the findings of this study do not correspond to the said conclusion. This could be due to the specific phytochemicals that have been obtained using the extraction method employed. The use of other extraction solvents could have provided phytochemicals with antimicrobial properties.

Table 5: Comparison of scavenging activity and antioxidant capacity of *M. textilis* 'Luno' and 'Maguindanao' pseudostem extracts using DPPH and FRAP Assays.

M. textilis variety	Mann Whitney U test	p-Value	Interpretation
Luno	3.00	0.700	Not Significant
Maguindanao	9.00	0.100	Not Significant

Table 6: Mean zone of inhibition (in mm) of *M. textilis* 'Luno' and 'Maguindanao' pseudostem extracts against selected bacterial and fungal pathogens.

Concentration	Test Organism					
	E. coli	*E. faecalis*	*P. aeruginosa*	*S. aureus*	*C. albicans*	*T. harzianum*
1000 µg	-	-	-	-	-	-
500 µg	-	-	-	-	-	-
250 µg	-	-	-	-	-	-
125 µg	-	-	-	-	-	-
62.5 µg	-	-	-	-	-	-
Gentamicin	28.47±1.14	19.92±2.49	18.87±0.79	29.45±1.83	-	-
Contrimoxazole	-	-	-	-	20.62±1.34	19.43±1.22
DMSO solution	-	-	-	-	-	-

Several plant extracts do have high amounts of antioxidant activity but showed low or no inhibitory activity against bacterial and fungal growths.[25] Several studies prove that the detection of phytochemical contents in plant extracts correlates with the extracts' antimicrobial activity. This disagrees with the findings of this study that upon the detection of free-radicals and phenolic compounds, no test organism was observed to be susceptible to different concentrations of the sap. The comparative analysis on the basic extraction and preparation of medicinal plants showed that phytochemical contents of plants used were detected on acetone, ethanol, and aqueous solutions but only in acetone and ethanolic extracts the plants exhibited antimicrobial activity.[26] Organic polar solvents are better extractor of phytochemicals than water alone.[27] Most studies aiming to determine the antimicrobial activities of plant extracts utilized organic solvents such as ethanol, methanol, ethyl acetate, and the like.[28] Extractions that utilized organic solvents had higher antibacterial activity than that of aqueous solution[29,30] due to the polarity of the solvent effective in segregating phytochemicals from remnant plant materials comprising the pseudostem sap.[26]

CONCLUSION

Based on the results of this study, the following conclusions were derived.

The pseudostem sap extracts of *M. textilis* 'Luno' and 'Maguindanao' varieties contain flavonoids, tannins, phenols, quinone, and triterpenoids.

Both *M. textilis* varieties exhibit free radical scavenging and antioxidant activities.

Pseudostem sap extracts of both *M. textilis* varieties exhibit no inhibitory activities against *Staphylococcus aureus*, *Enterococcus faecalis*, *Pseudomonas aeruginosa*, *Escherichia coli*, *Trichoderma harzianum* and *Candida albicans*.

There is no significant statistical difference between the percent scavenging activity and percent antioxidant activity of 'Luno' and 'Maguindanao' pseudostem sap.

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CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

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ABBREVIATIONS

DPPH: 2,2-diphenyl-1-picrylhydrazyl; **FRAP:** Ferric reducing ability of plasma.

ETHICAL STATEMENT

The authors consciously assure that for the manuscript "Determination of Antioxidant and Antimicrobial Properties of Abaca (*Musa textilis* Née) Pseudostem Extracts" the following is fulfilled:

The research paper constitutes the authors' original work, which has not been published previously elsewhere.

The paper accurately and comprehensively represents the authors' original research and analysis.

The paper appropriately acknowledges the significant contributions of co-authors, co-researchers, and institutions involved in the study's progress.

The findings are suitably contextualized within the framework of previous and current research.

All used sources are appropriately recognized and have proper citations. Direct quotations are denoted with quotation marks and accompanied by appropriate citations.

The research did not require IRB (Institutional Review Board) approval because the study did not involve humans as subjects for the experiment. The study also did not involve animals as subjects for research.

SUMMARY

Musa textilis commonly known as Abaca, is a native fiber-producing plant that belongs to the Musaceae family. This study utilizes the pseudostem extracts of *M. textilis* 'Luno' and 'Maguindanao' varieties to test their phytochemical contents and its antioxidant and antimicrobial potentials.

The extracts were collected and prepared using the decortication process. The collected pseudostem extracts were then filtered using a vacuum filter before being subjected to freeze drying. After the extraction process, 100 mL of the prepared extracts were to the Central Analytical Services Laboratory, National Institute of Molecular Biology and Biotechnology in the University of the Philippines Los Baños, Laguna, for the phytochemical analysis and to determine the antioxidant and scavenging activities through DPPH and FRAP assays. For the antimicrobial testing, four human bacterial strains were used: *Staphylococcus aureus, Enterococcus faecalis, Pseudomonas aeruginosa,* and *Escherichia coli*; and two human pathogenic fungal strains, *Trichoderma harzianum* and *Candida albicans* for the agar well diffusion assay.

Results from the phytochemical analysis showed the presence of flavonoids, tannin, phenols, quinone, and triterpenoids for both extracts. For the antioxidant testing, the Luno variety showed 65.36% to 66.31% scavenging activity and 50% to 54.14% antioxidant activity, while the Maguindanao variety showed 60.62% to 67.26% scavenging activity and 70.85% to 71.98% antioxidant activity. For the agar well diffusion assay, no antimicrobial activity was detected for both extracts. Further studies on the phytochemical constituents, antimicrobial activity, and antioxidant activity of *M. textilis* 'Luno' and 'Maguindanao' are necessary to confirm further and prove their important implications in the medical field.

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