

Comparative Studies on the Phytochemicals of Leaf Stem and Root of *Mimosa pigra* L.

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Abstract

Comparative studies on the phytochemicals of leaf, stem and root of *Mimosa pigra* L. were carried out using standard techniques. All statistical analysis was carried out at 5% level of significance using analysis of variance. The phytochemical composition of *M. pigra* varies with part of the plant. Flavonoid was only present in the root and cardiac glycoside was absent in the leaf of *M. pigra*. The phytochemical composition of the stem is more than any other part of the plant.

Keywords: *Mimosa pigra*; Flavonoid; Cardiac glycoside; Phytochemicals

Introduction

Fabaceae is the most common family found in tropical rainforests and dry forests of the America and Africa [1]. The genus *Mimosa* belongs to the family *Fabaceae* and is represented in Nigeria by three species namely *Mimosa invisa* Mart., *M. pigra* L. and *M. pudica* L. Members of the family *Fabaceae* are useful in traditional medicine.

Phytochemicals are biologically active, naturally occurring chemical compounds found in plants, which provide health benefits for humans further than those attributed to macronutrients and micronutrients [2]. They protect plants from disease and damage and contribute to the plant's colour, aroma and flavor. In general, the plant chemicals that protect plant cells from environmental hazards such as pollution, stress, drought, UV exposure and pathogenic attack are called as phytochemicals. Many phytochemicals, particularly the pigment molecules, are often concentrated in the outer layers of the various plant tissues. Levels vary from plant to plant depending upon the variety, processing, cooking and growing conditions [3].

Moreover, species of *Mimosa* possess medicinal properties [4]. Reported that *M. invisa* leaf and stem extract possess antifungal and antibacterial potentials. The specie *M. pudica* is

known to possess sedative, emetic, and tonic properties, and has been used traditionally in the treatment of various ailments including alopecia, diarrhoea, dysentery, insomnia, tumor, and various urogenital infections. *Mimosa pigra* have been used by the Asapio's family of Goriga Timonde in the Bawku West district of the upper east region of Ghana to treat diarrhea, typhoid fever and gonorrhea infections for the past fifty years [5]. However, there is no much information on the phytochemical composition of the three parts of *M. pigra* found in Nigeria. Therefore, the objectives of this work are to determine the phytochemicals present in the leaves, stem and root of *M. pigra* as well as to assess their phytochemical differences.

Materials and Methods

Collection and identification of plants

Samples of *M. pigra* was collected from Nnamdi Azikiwe university premises and authenticated by Dr. C.A. Ezeabara and vouchers deposited at the herbarium, department of botany, Nnamdi Azikiwe university, Awka.

Phytochemical analysis

Preparation of samples for analyses: The fresh plant parts were washed with clean water and were air-dried. The samples were separated by hand and were ground using a grinding machine (SPM-5, China) into uniform powder.

Preliminary phytochemical screening: Phytochemical screening of the plant extract was carried out as per the methods and tests given by the signs '+' denotes presence and this sign '-' denotes absence.

Quantitative phytochemical screening: The Follins-Dennis spectrophotometric method was used in all analysis.

Statistical analysis

An experiment was carried out in this study. To determine the phytochemical composition of the leaf, stem and root of *M. pigra*. The experiment was carried out using completely randomized design. Analysis of Variance (ANOVA) using SPSS

version 21 was employed in analyzing the data collected from the study [6]. All statistical analysis was carried out at 5% level of significance. The data were expressed as mean standard deviation of triplicate determinations.

stem and root of the plant while cardia glycoside was only present in the stem and root [7]. Other phytochemical assayed such as anthraquinone glycoside, flavonoid, steroid, cyanide, irridiods and terpene were absent in the plant (Table 1).

Results and Discussion

Qualitative phytochemical composition of the sample plants

The result of qualitative composition of *M. pigra* revealed that alkaloid; phenol, tannins and sponin were present in the leaf,

Table 1: Qualitative phytochemical composition of the stem, leaf and root of *Pigra*.

Parameters	Leaf	Stem	Root
Alkaloid	+	+	+
Phenol	+	+	+
Cardia glycoside	-	+	+
Anthraquinone glycoside	-	-	-
Flavonoid	-	-	+
Tannins	+	+	+
Steroid	-	-	-
Cyanide	-	-	-
Irridiods	-	-	-
Terpene	-	-	-
Saponin	+	+	+
+ Present; - absent			

Quantitative phytochemical composition of the leaf, stem and root of the test plants

The result of the quantitative phytochemical composition of the leaf, stem and root of the *M. pigra* revealed that alkaloid was highest in the leaf (0.88 ± 0.006 mg/100 g) and lowest in the stem (0.83 ± 0.000 mg/100 g). Phenol was highest in the root (79.66 ± 0.292 mg/100 g) and the lowest in the stem (54.32 ± 0.026 mg/100 g). Cardio-glycoside was highest in the stem (86.96 ± 0.237 mg/100 g) and lowest in the stem (36.69 ± 0.269 mg/100 g), there was no cardio-glycoside in the leaf [8].

Flavonoid was only present in the root with a value of 0.86 ± 0.116 mg/100 g while tannin was highest in the stem (80.50 ± 0.006 mg/100 g) and the lowest in the root (58.61 ± 0.023 mg/100 g). Saponin was highest in the stem (0.98 ± 0.012 mg/100 g) and lowest in the leaf (0.92 ± 0.006 mg/100 g). Analysis of variance showed a significant difference in the composition of alkaloid, phenol, cardia glycoside, tannins and saponin between the leaf, steam and root of *M. pigra* (Table 2).

Table 2: Quantitative phytochemical composition of the test plants (Mg/100 g).

Plant <i>M. pigra</i>	Alkaloid	Phenol	Cardiac glycoside	Flavonoid	Tannins	Steroid	Cyanide	Irridiods	Terpene	Saponin
Leaf	0.88 ± 0.006^b	57.41 ± 0.012^b	-	-	74.22 ± 0.025^b	-	-	-	-	0.92 ± 0.006^a

Stem	0.84 ± 0.006 ^a	54.32 ± 0.026 ^a	86.96 ± 0.237 ^b	-	80.50 ± 0.006 ^c	-	-	-	-	0.98 ± 0.012 ^b
Root	0.85 ± 0.015 ^a	79.66 ± 0.292 ^c	36.69 ± 0.269 ^a	0.86 ± 0.116	58.61 ± 0.023 ^a	-	-	-	-	0.96 ± 0.015 ^b
p-value	0.012	0	0	NA	0	NA	NA	NA	NA	0.002

Results are in mean standard deviation.

Means with the same letters of alphabet are not significantly difference ($P > 0.05$, DMRT).

The phytochemical composition of the whole plant was compared between the three parts of *M. pigra*. Results revealed that *M. pigra* leaf has highest composition of alkaloid (0.88 ± 0.006 mg/100 g). *M. pigra* stem has highest composition of cardia glycoside (86.96 ± 0.237 mg/100 g), tannin (80.50 ± 0.006 mg/100 g) and saponin (0.98 ± 0.012 mg/100 g) while *M. pigra* root has highest composition of phenol (79.66 ± 0.292 mg/100 g) and flavonoid (0.86 ± 0.116 mg/100 g). With the exception of alkaloid and steroid, analysis of variance showed a significant difference in the composition of all the phytochemical assayed between the three test plants. Meanwhile, the presence of these bioactive ingredients in the plants could explain their increased exploitation in modern medicine [9]. Have already discussed the use of *M. pigra* in treatment of various human diseases due to presence of bioactive constituents. This results therefore support need to inform the choice of particular species with scientific data before exploiting them for medicinal purposes.

Conclusion

This study further demonstrated that the three species of *Mimosa* have appreciable amount of anti-nutrients (phytochemical) that could be exploited for use in pharmaceutical and food industries for management of various ailments. The demand for plant extracts as sources of bioactive ingredient in the pharmaceutical industry is already high. *M. pigra* leaf should be exploited for alkaloid. *M. pigra* stem should be exploited for cardia glycoside, tannin, and saponin while *M. pigra* root should be exploited for phenol and flavonoid.

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