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Evaluation of the phytochemical contents of stem-bark and leaf extract of *Fiscus capensis*

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ABSTRACT

This research evaluated the phytochemical properties of leaf and stem-bark extract of *Fiscus capensis.* Fresh plant parts (leaf and stem-bark) of *Fiscus capensis* were collected from Emene Community in Enugu East Local Government Area of Enugu State, Nigeria. The plant parts were identified dried under room temperature. The dried leaves and stem-bark were pulverized using pestle and mortar to obtain a powdered form, then stored in air tight container until when needed for analysis. A total of 50g of the ground plant parts were weighed and dispensed into sterile conical flask and mix with 500ml of distilled water, ethanol and methanol and covered with sterile foil paper. The mixture was agitated intermittently and left to soak for 48h. The mixture was filtered using whatman filter paper, covered with perforated sterile foil paper. The filterate was concentrated using rotary evaporator and stored in the refrigerator under standard condition. The quantitative and qualitative phytochemical analyses were done to obtain the amount and presence of bioactive compounds in the extracts. The qualitative and quantitative phytochemical analyses of the extracts revealed the presence of alkaloids (0.460)%, tannins (0.100)%, steroids (0.001)%, saponins (14.79)% flavonoids (0.017)%, terpenoids (32.00)% and phenols (82.98)%. The statistical comparison of various extracts were made using one way analysis of variance (ANOVA) followed by dunnet post hoc test at $P<0.05$ was established to be statistically significant. In conclusion, the results from this research showed that *Fiscus capensis* are rich in phytochemicals and could be used in the management of different ailments.

Keywords:Phytochemicals, *Fiscus capensis,* stem-bark and leaf

INTRODUCTION

[1,2,3,4], describe medicinal plants as plants whose roots, leaves, bark and any other tissuespossess therapeutic properties. The use of medicinal plants for treatment of microbial disease is well known and has been documented since ancient's times [5,6,7]. [8,9,10], reported that more than 80% of the world population relied on traditional medicines for their primary health care needs. [11,12,13], presented a range of 70-80% of world population, mostly in developing countries, using herbal drugs. Medicinal plants have pharmaceuticals and antimicrobial properties [14,15,16]. Plants synthesize many components, which act as defensive agents, helping to protect them from microbial infection and other diseases [17,18,19].Those compounds are bioactive and can be medicinal, intoxicating or toxic depending on circumstance [20]. Several plants species have been tested for antimicrobial properties but vast majorities have not yet been adequately evaluated [21]. Various studies have been published, investigating the antifungal and antibacterial activities of plant derived compounds against a range of pathogens [22]. Antimicrobial compounds derived from plants might inhibit bacterial through different mechanisms and provide clinical values for the treatment of infection caused by resistant microbes [23]. Different substances have been identified in medicinal plants which are believed to be antimicrobial agent and these include; different forms of alkaloids, diterpens, saponins, flavonoids, sterols, quinine, different forms of other proteins as well as lipids [24]. Synthetic antibiotics accumulate in the body causing liver damage and other tissue problems. Such problems are not seen, when natural antibiotics extracted from plants are used, they are safe and potentially effective [25]. Ethnobotanical survey shows that several plant species have been used in the treatment of different forms of disease conditions

and in general have medicinal properties.

Aim and Objective of the Study

This study was designed to investigate the Phytochemical constituents of *Fiscus capensis* (Wild Fig).

MATERIALS AND METHODS

Plant Material Collection and Identification

The plant leaves and the stem of *fiscus capensis* (wild fig) were collected from Emene in Enugu East local Government Area of Enugu State. The leaves and the stem were identified and authenticated by Dr. I.F. Ugwuanyi of the Department of Plant Science, University of Nigeria Nsukka. The identified plant materials were kept in herbarium until when needed for analysis.

Sample Preparation

The leaves and stem of the plant were picked in the morning, properly washed with 10% of saline water and rinsed in sterile distilled water [4]. The stems were cut and air dried at room temperature for one month [4]. The dried leaves and stem were pulverized using sterile pestle and mortar to obtain a powdered form and then were stored in air tight sterile plastic containers under room temperature until needed for the analysis.

Preparation of Aqueous Extracts

Total of 50g of different powdered *Fiscus capensis* were weighed out using mechanical weighing balance and dispensed into sterile conical flask. Then, 500ml of distilled water was measured out and dispensed into the flask with the ground, *Ficus capensis* then covered with sterile foil paper. The mixture was agitated intermittently and left to soak for 48h at room temperature. Thereafter, filtered using whatman filter paper into sterile beaker. It was concentrated using water bath at 37ºc for 6h and then allowed to cool and stored in refrigerator until when needed [6].

Preparation of Ethanolic Extract

Total of 50g of different powdered *Ficus capensis* were weighed out using mechanical weighing balance and dispensed into sterile conical flask. Then 500ml of ethanol was measured out and dispensed into the flask with the grounded *Ficus capensis*. Then it was covered with sterile foil paper to soak for 48h. Thereafter, the mixture was filtered through whatman filter paper into sterile beaker and covered with perforated sterile foil paper. The filtrate was concentrated using rotary evaporator and stored in refrigerator until when needed.

Preparation of Methanolic Extract

Total of 50g of different powdered *Fiscus capensis* was weighed out using mechanical weighing balance and dispensed into sterile conical flask. Then 500ml of methanol was measured out and dispensed into the flask with the ground *Fiscus capensis.* Then it was covered with sterile foil paper. The mixture was agitated intermittently and left to soak for 48h. Thereafter, the mixture was filtered using sterile whatman filter paper into sterile foil paper. The filtrate was concentrated using rotary evaporator and store in the refrigerator until when needed.

Determination of Phytochemicals

Total Phenolic Content

Total phenolics contents of the extract and the function was determined using the method of [10] with slit modifications. Calibrations was prepared by mixing ethanol solution of *Fiscus capensis*. (1ml; 0025 – 0.400mlg-1 with 5ml folin-ciocalteu agent diluted tenfold and sodium carbonate, 4ml – 0.7ml). Absorbance values were measured at 765nm using an UV-VIS spectrophotometer by and the standard curve was plotted using *Fiscus capensis* extract. 1ml of each of the extract solution in methanol (5gl-1) was also mixed with the reagent above and after minutes the absorbance was measured to determine the total phenolic contents [5]. The total phenolic content in the extract and fractures in the *Fiscus capensis* equivalent were calculated by the following formula; T=CV/M

where T = Total phenolic content Miligram per gram of the sample extract of *Fiscus capensis*

C = Concentraction of gallic acid established from the carlibration curve, mgml-1

Where V = volume of the extract in milliter

And M= the weight of sample extract (g)

Total Flavonoid Content

The total flavonoid content was determined following a method by park *et al.*, 2008. In 10ml test tube, 0.3ml of extract, 3.4ml of 30% methanol, 0.15ml of NaNo3 (0.5meters) and 0.15 ALcL3 .6H_2O (0.3m)were mixed. After 5mins 1ml of NaOH was added. The solution was mixed well and the absorbance was measured against the reagent blank at 506nnm. Then the standard solution (0 to 100mgl) under the same procedure as earlier described. The total flavonoid were expressed as milligrams of rutin equivalent per/gram of dried fractions [7].

Determination of Total Alkaloids.

Total of the sample was weighed into a 250ml conical flask and 299ml of 10% acetic acid in ethanol was added and covered and allowed to stare for 24 hours. This was filtered and the extract was concentrated on water bath to one quarter of the original volume. Concentrated ammonium hydroxide was added drop wise to the extract until the precipitation was complete. The whole solution was allowed to settle and the precipitate was washed with dilute ammonium hydroxide and then filtered [3]. The residue is collected and alkaloid was dried and weighed.

Determination of Total Saponins

The samples were grounded and 20g of each were put into a conical flask and 100ml of 20% aqueous ethanol were added. The samples were heated over a hot water bath for 24hours with continues stirring at 55^{0}C. The mixture was filtered and the residue re-extracted were reduced to 40ml over water both at about 90c. The concentration was transferred into a 250ml. separating funnel and 20ml of diethyl either was added and shaken vigorously, the aqueous layer was recovered while other layer was discarded. The purification success was repeated. 60ml of n-butanol was added, the n-butanol extract were washed twice with 10ml of 5% aqueous sodium chloride. The remaining solution as heated in a water bath after evaporation, the samples were dried in an oven to a constant weight and the total saponin content was calculated.

Determination of Total Glycoside in *Fiscus capensis*

A total of 5g of the sample was weighed into a beaker and added 100ml of distilled water. Soak for 3hours and filter to get the filtrate. Then pipette 1ml of filtrate into a test tube, followed by 2ml of 3, 5-dinitro-salicylic acid and boil in a water bath for 10-15 minutes, then cool the test tubes and add 10ml of distilled water and then read the absorbance at 540nm.

Determination of the Total Tannins in *Fiscus capensis*

A quantity (50mg) of extract was boiled in 20ml of distilled water and filtered. Few drops of 0.16 $FeCl_3$ was added in the filtrate and observed for colour change. Brownish green or blue black colouration was taken as evidence for the presence of tannins.

Determination of Total Resins in the *Fiscus capensis*

A quantity 0.12g of the extract was extracted with chloroforms and the extract concentrated to dryness. The residue was re-dissolved in 3ml acetone and 3ml concentrated HCL added. This mixture was heated in a water bath for 30minutes. A pink colour that changes to magnets red indicates the presence of resins in *Fiscus capensis*.

Determination of Oil in *Fiscus capensis*

0.1g of the extracts was passed pressed between filter paper and the filter paper was observed. Translucency of the filter paper indicates the presence of the oils.

Determination of the Total Terpenoids in *Fiscus capensis*

Presence of terpenoids in extract was carried out by taking 5ml (1mg/ml) of extracts and mixed with 2ml of chloroform, followed by 3ml of conc. H_2SO_4. A reddish brown colouration at the interface confirmed the presence of terpenoids.

Determination of Steriods

A volume of (5 drops) of conc. H_2SO_4 was added to 1ml of the extract in a test tube. A red coloration indicated the presence of steroid.

RESULTS

Table 1 and 2 shows the results of the qualitative and quantitative phytochemical composition of the *Fiscus capensis* extracts. The result shows the presence of tannins, alkaloids, terpenoids, saponins, phenol, flavonoid, steriods and glycosides.

Table 1: Results on Quantitative Phytochemical Screening of Leaf Extract of *Fiscus capensis*

Phytochemicals	Weight of sample(g)	% Phytochemicals	Remarks
Glycosides	5.000	0.072	Low
Alkanoids	5.000	0.4600	Low
Saponins	5.000	14.79	Intermediate
Tannins	5.000	0.100	Low
Flavonoids	5.000	0.017	Low
Phenols	5.000	82.98	High
Terpenoid	5.000	32.00	High
Steroids	5.000	0.001	Not determine

The results on the quantitative photochemical content of both the leaf and stem of *Fiscus capensis* recorded in percentage is summarized in tables 8 and 9 above. The result indicated that phenols (82.98 +- 72.24) were the most abundant photochemical in both the leaves and stem samples where as the saponins (14.79 ± 17.04) and terpenols (32.00± 40.120) were also significantly higher than alkaloids (0.41 ± 1.020, Glycosides (0.07 ± 0.11) tannin (0.11 ± 2.00), Flavonoids (0.0170 ± 0.002) and stenoids (0.001 ± 0.0005).

Table 2: Results on Quantitative Phytochemical Screening of Stem-bark Extract of *Fiscus capensis*

Phytochemicals	Weight of sample(g)	Phytochemicals	Remarks
Glycosides	5.000	0.110	Low
Alkanoids	5.000	1.050	Intermediate
Saponins	5.000	17.041	High
Tannins	5.000	2.000	Intermediate
Flavonoids	5.000	0.002	Low
Phenols	5.000	72.24	High
Terpenoids	5.000	32.00	High
Steroids	5.000	0.005	Not determine

Table 3: Results on the Quantitative Phytochemical Screening of Leaf Extract of *Fiscus capensis*

Phytochemicals	water	N-Hexane	Ethyl acetate	Methanol	Ethanol
Alkaloids	-	-	-	+	++
Saponins	++	-	+	++	++
Flavonoids	-	-	+	+	-
Steroids	-	-	-	-	-
Phenols	++	-	-	+	+
Tannin	++	-	-	-	-
Terpenoids	-	+	+	+	++
Glycosides	++	-	-	-	-

Key ++ = Present, +=trace, - =Absence

Table 4: Results on Quantitative Phytochemical Screening of Stem-bark Extract of *Fiscus capensis*

Phytochemicals	Water	N-Hexane	Ethyl acetate	Methanol	Ethanol
Alkaloids	-	-	+	+	+
Saponins	+	-	++	++	++
Flavonoids	+	-	+	-	-
Steroids	-	-	-	-	-
Phenols	+	-	-	+	+
Tannins	++	-	+	-	-
Glycosides	++	-	-	-	-

Key ++ = Present, +=trace, - =Absence

The quantitative determination of some phytochemicals in the aqueous, methanol, ethanol and N-Hexane extracts of *Fiscus capensis* presented in tables 3 and 4 above shows the presence of phenols, saponins, tannins, flavonoids, phenols, terpenoids and alkaloids where as glycosides and steroids where absent.

DISCUSSION

In this study, the phytochemical screening of *Fiscus capensis* indicated that the extracts (Aqueous, Ethanol and methanol) of *Fiscus capensis* (leaves and stem-bark) contains alkaloids, saponins, tannins, glycosides, phenol, terpenoids and carbohydrates at varying concentrations because of different solvent used in extraction [9,10]. This result is in agreement with the work of [3] that reported the above mentioned photochemicals in the plant sample they analysed. [14], reported in their study that certain phytochemicals may be found in only one part of plant and not in the other. [19], also reported that the geographical location of the plant influences the amount of phytochemicals present in it [9]. The high phytochemical contents observed in the plant used in the present study indicated that it is a unique material for medicinal drug screening and research. A high quantity of saponins recorded in the leaf sample corroborated with [9] findings in which the saponin content of the leaf is very high. Also [12], reported the presence of all the phytochemicals except saponins. However, flavonoid is absent in both leaf and stem extracts in the present work contrary to the findings recorded by [8,9,12], this could be probably as a result of the geographical location of the plant. Phytohemicals have been extensively studied and their medicinal properties documented. The presence of alkaloids in the leaves of *Fiscus capensis* support the finding by [8], who reported that the antibacterial activity of this plant may be attributed to the presence of alkaloids. Alkaloids have been reported to possess various pharmacological activities including antihypertensive effects, antiarrhythmic effect, anitmalarial and anticancer activity [8]. Pure isolated alkaloids and their synthetic compounds have been used in medicine as an analgesic, antispasmodic and bactericidal agents [16]. [9], reported the inhibition of pathogenic bacteria by alkaloids.Saponins from fruits and vegetables are important dietary supplements and are known to exhibit antimicrobial activities and protect plants from microbial pathogens [14], they could be beneficial in modulating blood lipids, lower cancer risk and improve blood glucose response as well as possess antioxidant activity [17]. Leafy vegetable such as *Fiscus capensis* leaves are thus said to possess antimicrobial property attributed with reports on the antimicrobial potentials of *Fiscus capensis* obtained from other localities in Nigeria [19]. Saponins which are special class of glycosides, have been reported to have a wide range of pharmacological and medicinal activities, and do not pose serious risk of toxicity in humans, even in large quantities, plants containing saponins are used in wound healing in folkoic medicine [20], because they are good hemagglutinnins [17]. The presence of terpenoids in the leaves of *Fiscus capensis* support its use in the treatment and management of cancer, ulcers and malaria [21]. Plants produce volatile terpenses either to attract specific insect for pollination or otherwise to

expel certain prays which consume these plants as food [22]. In addition, terpenoids possess medicine properties such as anticarcinogenic, antimalarial, anti-ulcer, antimicrobial or diuretic activity [23] therefore, leaves of *fiscus capensis* could be used in ethnomedicine in the management of various ailments due to the presence of these terpenes. Tannin possesses astringent taste and help in healing of wounds and inflamed mucous membrane [24]. Tannins are also potent metal ion chelator; proton precipitating agents and biological antioxidants [25] the high tannin content in the seed would make it a suitable choice especially in treatment of wounds bleedings.

CONCLUSION

In conclusion, the results from this research showed that *Fiscus capensis* are rich in phytochemicals and could be used in the management of different ailments.

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