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Assessment of *Ficus Citrifolia* Latex for Phytochemical and Proximate Compositions

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Abstract

This work focused on the studies of latex (exudates) from the stem of the *Ficus citrifolia* tree for the presence of secondary metabolites (phytochemical screening), as well as proximate fractions, such as moisture, ash, crude fat, crude fibre contents, etc, present. The latex was collected by incision from the stem of the *F. citrifolia* tree. Phytochemical screening was performed on the fresh latex using standard methods, while proximate analysis was performed on the latex that had been coagulated with glacial acetic acid. The results of phytochemical screening showed the presence of cardiac glycosides, flavonoids, carbohydrates, steroids, tannins and alkaloids; while terpenes, saponins and anthraquinones were absent. The proximate analysis gave various proximate fractions as follows: moisture (1.80 %), ash (0.300), crude fat (81.77 %), crude fibre (0.17 %), protein (0.15 %) and total carbohydrates (15.81). The presence of the bioactive compounds revealed by the phytochemical screening implies that the latex could serve as starting materials for drug formulation, since these compounds have been known to possess medicinal properties. The presence of encouraging percentages of crude fat and total carbohydrates implies that the latex could serve as a good source of energy in case of animal food formulation.

Keywords: latex, phytochemical screening, proximate, secondary metabolites.

Introduction

Latex has been defined as a stable milky fluid dispersion (emulsion) of polymer micro particles in an aqueous medium found in nature in 10 % of all flowering plants [1,2]. It is a complex emulsion consisting of amino acids, proteins, alkaloids, starches, sugars, oils, tannin, resins and gum that coagulate on exposure to air. It serves mainly as a defence against herbivorous insects [3]. The ability of latex to serve as defence against herbivores has been attributed to the presence of compounds such as alkaloids, cysteine, rubber and protease [4]. Its ability to serve as defence and the presence of bioactive compounds raise the curiosity to study latex from various plants for the possibility of harnessing such latex as an insecticidal or a possible component of some drugs. This present research, therefore, focused on possible bioactive compounds present, as well as proximate fractions of latex from the stems of *Ficus citrifolia.*

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Ficus citrifolia is a flowering tree, of the family *Moraceae* and genus *Ficus,* which can grow up to 15 m (50 ft) tall. It can drop aerial roots from branches and spread horizontally, fusing with the parent tree as they grow. It has a broad top, light grey bark, some aerial roots and milky sap [5]. Economic importance of *F. citrifolia* include its use as a component of diet for animals including human beings, its therapeutic value for chemotherapeutic patients, etc. The latter is because it possesses antidiabetic, antidiarrhea, antiepilepsy, anti-inflammatory, ear drop properties [6]. Ficus species are known to possess antioxidant properties [7]. Also, just as other members of the genus, the pharmacological properties could be attributed to the presence of some metabolites. *Ficus* species have been reported to contain flavonoids, stilbenes, triterpenoids and xanthones; tannins, saponins, steroids, cardiac glycosides, Phlobatannins, anthroquinone, triterpenes, alkaloids and xanthoproteins [8]. This work reports on bioactive constituents and proximate fractions of the latex of the stem of *Ficus citrifolia*

Materials and Methods

Sample Collection and Preparation

The leaves, bark and fruits of the plant were first collected from the premises of the University of Jos Senior Staff Quarters, Bauchi Road, Jos North Local Government Area of Plateau State, Nigeria. They were then identified by Mr Azila at the Herbarium of the Federal College of Forestry, Jos. The plant was identified and designated the Voucher number FHJ 253. The Latex was then collected by incising the stem and branches of the tree after with a knife thereby causing the latex to exude out of the stem. The exudates were then collected as a liquid into a small bottle and stored in a refrigerator for use within 48 hours.

Phytochemical Screening of the Latex

The methods employed in phytochemical are methods also employed by [9,10].

Test for Alkaloids: The fresh latex (5 ml) was extracted with 3 ml of 1 % hydrochloric acid and tested for alkaloids with Mayer's reagent, Dragendorff's reagent and Picric acid solution (Hager's reagent), respectively as in [11].

Test for Saponins: The latex (5 ml) was shaken with water in a test tube. If frothing persisted on warming, that showed the presence of saponins [12].

Test for Tannins: The latex (5 ml) was shaken with 1 ml of distilled water, filtered and the filtrate tested with ferric chloride reagent. A blue-green precipitate, if observed, was taken as evidence for the presence of tannins [13,14].

Test for Anthraquinones (Bornstrager's Test): Chloroform extract of the latex was tested with 100 % ammonium hydroxide. The appearance of a bright violet colour in the ammoniac layer (lower layer) indicated the presence of free anthraquinones [15].

Test for Cardiac Glycosides:A small alcohol (70%) extract of the latex (2 ml) was tested with 3 drops of alkaline lead sub-acetate (pH 7.5) as described in [16]. The appearance of a brown ring

at the interphase indicated the presence of deoxy-sugar characteristic of cardenolides.

Salkowski Test for Terpenes/Steroidal Ring: The procedure described by [12] was used. The appearance of a red colour in the lower chloroform layer indicated the presence of terpenes or a steroidal ring.

Test for Flavonoids: Tests for flavonoids were as in the literature [13,14]: 5 ml of latex was completely mixed with acetone, and the residue was extracted in warm water after evaporating the acetone on a water bath. The mixture was filtered while hot. The filtrate was cooled and used for the following tests:

a. **Lead Sub-acetate Test for Flavonoids: Lead sub-acetate [basic acetate, $Pb_3(OH)_4(O_2CCH)_2$] solution was added t**o 5 mL of the above filtrate . If a yellow coloured precipitated appered, it indicated the presence of flavonoids.

b. **Sodium Hydroxide Test for Flavonoids:** Exactly 5 mL of 20% sodium hydroxide solution was added to an equal volume of the filtrate. A yellow solution, if observed, indicated the presence of flavonoids.

Test for Carbohydrates [16]**:**

i. A small quantity (2 mL) of the sample was dissolved in 3 mL of distilled water and mixed with a few drops of Molisch reagent. Then 1 mL of conc. Sulphuric acid was carefully added down the side of the inclined tube so that the acid forms a layer beneath the aqueous solution without mixing it. A reddish or violet ring at the junction of the liquids observed indicated the presence of carbohydrates.

ii. Exactly 5 mL of Latex Crude Sample was heated with 1mL of conc. Sulphuric acid. If a black colour and effervescence occurred, it indicated the presence of carbohydrates.

Proximate analysis

For the proximate analysis, the latex (15 mL) was poured into a beaker and 10 mL of glacial acetic acid was added gently, while stirring, till coagulation was completed [17]. After coagulation, it was removed from the beaker and washed properly with distilled water. From 15 mL of latex 6.88 g of the coagulated form was obtained.

The standard proximate fractions considered are: ash, moisture, total proteins, total fat, total fibre and total carbohydrates contents [18]. As is the practice in literature, five of the six constituents were obtained via chemical reactions and experiments, while the sixth constituent, carbohydrates, was calculated as the difference of the sum of percentages of the other five and 100 % [19 -22].

Results

Phytochemical and Proximate Analyses

The results for phytochemical and proximate analyses are shown in Table 1 and 2 respectively. All the compounds tested for were found present in the latex of *F. citrifolia*, except anthraquinones and saponins.

Table 1: Results of the Phytochemical Screening of Latex From the Stem of *Ficus citrifolia*

Test	Observation	Inference
Alkaloids:		
Mayer's reagent		+
Dragendorff's reagent	Cream precipitate	+
Hager's reagent	Orange precipitate Yellow precipitate	+
Anthraquinones:		
Bornstrager's Test	Cloudiness/ absence of bright violet colour	-
Carbohydrates:		
Conc. Sulphuric acid	Blackening and effervescence	+
Molisch reagent	A reddish ring	+
Cardiac glycosides:		
Keller Killiani Test	A brown ring obtained at the interphase	+
Flavonoids:		
20 % NaOH	Yellow colour	+
$(CH_3CO_2)_2Pb$	Yellow colour	+
Saponins: Frothing	No stable frothing	-
Steroids/Terpenes:		
Salkowski Test	A reddish-brown colour of the interphase	+
Tannins:		
$FeCl_3$ test	Blue precipitate	+

Key- = Negative + = Present

Table 2: Proximate Fractions of Coagulated Latex of the stem of *Ficus citrifolia* tree

S/N	Proximate Fraction	Percentage
1	Ash	0.3000
2	Moisture	1.8040
3	Fat	81.7670
4	Fibre	0.1670
5	Protein	0.1524
6	Carbohydrate	15.8096
7	Total	100

Discussion

These results indicate that the latex from the stem of *Ficus citrifolia* could be used for medicinal purposes, since the compounds found present are reported to possess some medicinal/pharmacological properties. Flavonoids in the body are known to reduce the risk of heart diseases [23]. Flavonoids have been shown to be highly effective scavengers of most types of oxidizing molecules, including singlet oxygen and various free radicals [24], which are possibly involved in DNA damage and tumour promotion [25]. Also, flavonoid-rich plant extracts from different species have been reported to possess antibacterial activity [26-28]. Histopathological examinations have also revealed the improvement in damage Liver on treatment with flavonoids [29]. Therefore, the presence of flavonoids in the latex from *Ficus citrifolia* could be suggested for use in the treatment of hepatitis and other Liver ailment.

Tannins-containing plants are used to treat non-specific diarrhea, inflammation of the mouth and throat, and slightly injured skins [6].

Also, tannins have been shown to possess antibacterial activities against *Kocurail rhizophilia, Staphylococcus aureus, Bacillus subtilis, and psendomonas aeruginosa* [30], thus, it is not misleading to say that the Latex from *Ficus citrifolia* can be used in the treatment of diarrhoea. The presence of alkaloids in the latex implies that the latex possesses some pharmacological activities exhibited by alkaloids; such include: vasodilatory activity e.g. vincamin (Raymond *et al*., 2010), antibacterial activity e.g. chelerythrine [31], antiarrhymic activity e.g. quinidine [32], hence the latex from *Ficus citrifolia* could be used in diarrhoea treatment and as diuretic.

Steroids were observed to be moderately present. Pharmacologically, steroids in the body can act as hormones, e.g. Vasopressin, a naturally occurring hormone used to manage antidiuretic hormone secreted by the posterior lobes of the hypothalamus [33], hence the latex of *Ficus citrifolia* could be used as a diuretic. Carbohydrates were also confirmed as moderately present in the latex sample. It should be noted that carbohydrates are more soluble in polar solvents due to the presence of OH groups.

The main function of carbohydrate is to provide the body and brain with energy [34]. Biologically, speaking carbohydrates are molecules that contain carbon, hydrogen and oxygen atoms in specific ratios. Most carbohydrates in the food we eat are digested and broken down into glucose before entering the bloodstream. Our body cells convert carbohydrates into fuel molecules adenosine triphosphate (ATP), through a process called cellular respiration.

The presence of carbohydrate in latex implies that, the latex could be a good source of energy. Cardiac glycosides are a class of organic compounds that increase the output force of the heart and increase its rate of contraction by acting

on the cellular sodium potassium ATPase pump [35]. Their beneficial medical uses are in the treatment of congestive heart failure and cardiac arrhythmias, however, the relative toxicity prevents them from being widely used [36]. Cardiac glycosides, nevertheless, have a diverse range of biochemical effects regarding cardiac cell functions and have also been suggested for use in cancer treatment [37].

The low moisture content accounts for the long life shelf, implying that it will not easily deteriorate after coagulation and drying has taken place. And this low moisture content would not promote susceptibility to microbial growth and enzyme activities. It shows that the sample can stay for months without degrading during shipping to any part of the world. And there are non-volatile compounds released. The ash content is very low, which implies that there are fewer inorganic compounds and more organic compounds.

Fat is very high showing that the *Ficus citirifolia* latex could contain natural rubber [38]; the functions of lipids are storage of energy, insulating (absorb heat), water repellant, antioxidant (vitamin E), cofactor for enzymes (vitamin K), blood clot formation, etc [39]**.** Fibre and protein contents were found to be very low showing, their low potential as dietary source for proteins and fiber. Carbohydrate content account for the presence of polysaccharides, which would be good in the polymer industry and is a source of energy, in the synthesis of cell components, forms part of cells and tissues [40].

Conclusion

The results obtained in this work showed that the Latex from the stem of *Ficus citrifolia* contains some organic secondary metabolites such as alkaloids, cardiac glycosides, tannins, flavonoids and steroids that are responsible for its use in folk medicine. If found safe, on further research, the plant latex can be recommended for therapeutic use because of the presence of the secondary metabolites, as seen from the result.

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