



***Ficus capensis* Thumb. (Moraceae): Review of Its Ethnomedicinal Uses, Pharmacological Activities and Phytochemical Constituents**

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Authors' contributions

This work was carried out in collaboration between all authors. Author KBE designed the study, wrote the protocol. Author SOA wrote the first draft of the manuscript. Authors OTF and OFK managed the literature searches. All authors read and approved the final manuscript.

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ABSTRACT

Ficus capensis Thumb (Moraceae) also known as the Cape fig plant belongs to the mulberry family and is a native of tropical Africa and the Cape Islands. Pharmacological studies have validated significant actions of different extracts as antimicrobial, relaxation of gastrointestinal tract, antioxidant and immune-booster agents, thus supporting some of its folkloric uses. This study was done to document the ethnomedicinal uses, phytochemical constituents, as well as the pharmacological activities of the plant *Ficus capensis*.

Keywords: *Ficus capensis*; moraceae; ethnomedicinal uses; pharmacological activities; phytochemical constituents.

1. INTRODUCTION

Majority of the world's population in developing countries still rely on herbal medicines to meet their health needs. Many of the world's population are knowledgeable in the use of plants and herbs in their environs for the treatment, cure and or management of different diseases [1,2]. Herbal medicines are often used to provide first-line and basic health services, both to people living in remote areas where it is the only available health service and to people living in poor areas where it offers the only affordable remedy [3]. Even in areas where modern medicine is available, the interest in herbal medicines and their utilization have been increasing rapidly in recent years. Medicinal plants and herbal medicines account for a significant percentage of the pharmaceutical market [3]. Modern medicine recognizes herbalism as a form of alternative medicine, as its practice is not strictly based on evidence gathered using the scientific method [4].

Ficus capensis (Moraceae) also known as the Cape fig plant belongs to the mulberry family and is a native of tropical Africa and the Cape Islands. The plant is a deciduous tree with spreading roots and branches and broad green leaves. *F. capensis* has been reported to possess pharmacological properties such as antimicrobial [5,6], relaxation of gastrointestinal tract [7,8] antioxidant [9] immune booster [10] and tocolytic activity [11].

2. DESCRIPTION

Ficus capensis commonly known as bush fig, fig of heaven, is a fast-growing, deciduous or evergreen tree [12]. It usually grows to about 5-12 metres (16-39 ft) in height, but may attain a height of 35-40 metres (115-131 ft). The large, alternate and spirally- arranged leaves are ovate to elliptic with irregularly serrated margins. Fresh foliage is conspicuous red colour and the papery. The bark of young trees is smooth and pale greyish-white in colour, in contrast to the flaky, yellow back of *F. sycomorus*; with increasing age, the bark becomes darker and rough. The figs are carried on short or long drooping spurs (or fascicles) which may emerge from surface roots, the trunk or especially from lower main branches. The figs are 2 to 4 cm in diameter and acquire a rosy, speckled exterior when ripe. The fig seeds are dispersed after passing through the intestinal tracts of birds, bats and primates. The

tree is found from Cape Verde and Senegambia, across tropical West Africa to Cameroon and the Central Africa Republic, then eastwards to Eritrea, Northern Somalia and Yemen, and southwards through all tropical eastern and southern African countries. The tree is of variable height depending on location. In Senegal, the plant can be 4-6 m tall, while in Nigeria, it can be 6-9 m tall or up to 20 m or more. The trunk is 1.2 m or over in girth, with spherical crown, often low-branching. The tree is of open and wooded Soudano-Guinean savanna and secondary jungle, by watercourses from Senegal to West Cameroon, in lowlands to high altitudes, and widespread in tropical Africa [13].

In Nigeria, the tree is cultivated in all parts of the country but more abundant in the Middle-Belt (North-Central) of Nigeria. It is commonly called Ogbaikolo among the Igalas, Opoto in Yoruba [14]; in Nsukka area of Enugu State, the plant is known as Akokoro, in Hausa as Uwaryara [15]. It is known as Rimabichehi by the Fulanis and Obada in Edo State [7].

3. ETHNOMEDICINAL USES

Almost all the parts of *F. capensis* plant have been found useful. Some parts are used to treat pregnancy-related ailments most especially cases of threatened abortion [11]. The bark decoction is used in Senegal in baths for the new-born, children with rickets and feverish children. The bark pulped up with *Xylopia* fruit is given in enemas for oedema [13,16]. The latex is used for treating wounds, toothache, eye problems, general body pain, lung and throat problems, gonorrhoea and as an anti-emetic. Root preparations of *Ficus capensis* are used for the treatment of cough, sore throat, diarrhoea, stomach pain in babies, chest pain, infertility, uterine pain, gonorrhoea, oedema, and as an emmenagogue and emetic [17]. Bark decoctions or infusions are used against pain, rheumatism, diarrhoea, stomach problems, oedema in children, infertility and as a galactagogue; bark macerations are drunk for treatment of fever and cough, and the powdered bark is applied on skin rashes and mouth sores [17]. The leaves are chewed as a remedy for peptic ulcer, leaf maceration is drunk against chest problems, leaf infusions are drunk to treat tonsillitis and stomach pain. Sap squeezed from leaves is applied onto wounds, leaf decoctions are used as a disinfectant wash and in the treatment of ophthalmia, the sap of young shoots is taken against gonorrhoea, preparations are used to

treat infertility, tuberculosis, abscesses and sores, and as a lactogenic, purgative and aphrodisiac. The plant has been used extensively for the management of leprosy, epilepsy, rickets, infertility, gonorrhoea, oedema, respiratory disorders and as emollient [18]. In Nigeria, *F. capensis* has been used by the Igede people Benue state as a treatment for dysentery and in wound dressing [19]. Gill [20] reported the use of the plant leaves in treating dysentery, oedema, epilepsy and rickets in infants among some tribes in Edo-Delta areas. *F. capensis* is believed by the Igala people of Kogi State to possess immune-boosting property, hence, forming part of most of their traditional remedies for several ailments [10].

4. PHYTOCHEMICAL CONSTITUENTS

The results of the phytochemical screening by [25] showed the presence of tannins, terpenoids,

alkaloids, flavonoids, cardiac glycosides and reducing sugars, with steroids and anthraquinones absent in the water extract of the leaves and bark of *Ficus capensis*. Saponin was present in the bark but absent in the leaves. Terpenoids, flavonoids, steroids, cardiac glycosides and reducing sugars were present in ethanol extract of the leaves and bark, while anthraquinones were absent. Alkaloids were present in the ethanol extracts of the bark but absent in leaves. Adebayo & Adeniyi [6] reported the presence of tannins in the bark. Saponins were highest in the leaves, reduced in the stem and least in the bark. Alkaloids and phenolics were highest in the bark while their quantity was least in the leaf. Terpenoids and flavonoids were highest in the leaf samples. Owolabi et al. [11] equally reported the presence of saponins, cardiac glycosides, tannins and flavanoids with traces of alkaloids and anthracene derivatives in the stem bark. The qualitative and quantitative



Fig. 1. *Ficus capensis*; (A) Young leaves (B) Fruits (C) Matured leaves (D) Stem with fruits

Table 1. Ethnomedicinal uses of *Ficus capensis*

Location	Plant part	Form	Conditions treated	References
Senegal	Bark	Decoction	Fever	[13,16]
Tanganyika	Bark	Decoction	Galactogogue	[13]
Senegal/ Ivory Coast	Roots	Decoction	Stomach-ache	[16]
Ivory Coast	Latex	Drunk	Gonorrhoea	[16]
Nigeria	Bark	Cooked	Skin-infections	[13]
Ghana/ Nigeria	All parts	Cooked	Leprosy	[13,21]
Ghana/ Nigeria	Bark	Decoction	Dysentery	[13,16,21]
C.A.R	Bark	Grind	Circumcision	[13,21]
Senegal	Sap	Rob or drop	Wounds, eye-troubles	[13]
Zaire	Sap	Applied	Burns	[13]
Ghana	Sap	Drunk	Venereal diseases	[13]
Sierra Leone	Bark	Eaten	assuage thirst, sore throat	[13,16]
Ghana	Bark	Soup	breast milk	[13,16]
Ghana	Leaves	Ground-up	Haemostatic and cicatrising	[13]
Nigeria	Leaves	Cooked	Blood-tonic, immune boosting	[10]
Senegal	Roots	Ground-up	debility and female sterility	[13,16]
Ivory Coast, Nigeria, Gambia, Ghana, Senegal	Bark, Latex All parts	Decoction, Sap	Leprosy, diarrhoea, dysentery, epilepsy, sexually transmitted diseases (STD) rickets, poison antidote, chest ailments, tuberculosis, convulsions, pain, in anaemia, eye-troubles, cleansing and wounds.	[5,13,16,21,22,23,24]
Ivory Coast	All parts	Decoction	Enema	[16]
Ivory Coast/ Nigeria	Leaves	Decoction	Dysentery	[16,19]
Ivory Coast	All parts	Decoction	Headache and bronchial troubles	[16]
C.A.R	Bark	Cooked	Oedema	[16]

phytochemical analyses of aqueous leaf extract revealed the presence of reducing sugar, saponins, tannins, flavonoids, soluble carbohydrates, alkaloids, steroids, hydrogen cyanide, glycosides, terpenoids, fats and oil [26]. The following compounds were found from n-hexane and ethyl acetate fractions of ethanol extract of *F. capensis* leaves: 4, 4, 24-trimethyl-cholesta-8-en-3- β -ol, mixture of campesterol, stigmasterol and β -sitosterol, stigmasterol, 3- β -o-glucoside and 4, 5, 7-trihydroxy flavan-3-ol, xanthoxin, and β -amyirin [27]. Francois et al [28] reported the presence of carvacrol (65.78%), α -caryophyllene (29.81), caryophyllene oxide (25.70 %), linalool (3.97%), 3-tetradecanone (2.90%), geranylacetone (1.20%), 3,7,11-trimethyl-3-hydroxy-6,10-dodecadiene-1-ylacetate(1.53%), hexahydrofarnesyl acetone

(1.21%), α -caryophyllene (0.81%), 2-methyl-3-hexyne (0.69%) and scytalone (0.69%).

5. PHARMACOLOGICAL USES / BIOLOGICAL ACTIVITIES OF *Ficus capensis*

Ficus capensis has been scientifically proven to be biologically useful as drug/medicine because of its antimicrobial, antibacterial, antifungal, antioxidant and anti-sickling activities.

6. MICROBIAL INHIBITORY ACTIVITIES

Several studies have proven the microbial inhibitory activity of *F. capensis*. Microbial inhibitory activities of the stem, root and leaf of *F.*

capensis against test disease-causing microorganisms were reported [6]. The bark extracts had the highest inhibitions on *Pseudomonas aeruginosa*, *Candida albicans* and *Staphylococcus aureus*. While *Streptococcus faecalis* and *Proteus mirabilis* were resistant to many antibiotics (87.5%), they were effectively inhibited by all concentrations of ethanolic *F. capensis* extract. Oyeleke et al. [5] reported the inhibitory effect of the leaves and stem bark of *F. capensis* against *Escherichia coli* and *Shigella* species but no activity against *Salmonella typhi*. [29] reported the crude extract inhibited *S. aureus*, *Escherichia coli*, *Bacillus subtilis* and *Candida pseudotropicalis* at 2 mg/ml but *P. aeruginosa* and *Salmonella typhimorium* were not inhibited at the same concentration. [30] also reported antimicrobial activities of the methanol extract of *Ficus capensis* leaf against some clinical pathogenic bacteria namely: *Escherichia coli*, *Klebsiella pneumoniae*, *Proteus mirabilis*, *Staphylococcus aureus*, *Serratia marcescens*, *Pseudomonas aeruginosa*, *Micrococcus roseus* and *Bacillus cereus*. The leaf extract had inhibitory effect on all the test organisms except *Pseudomonas aeruginosa*.

7. ANTI-ULCER ACTIVITY

The anti-ulcer effects of the aqueous extract of the leaves of *Ficus capensis* were evaluated in rats using diclofenac sodium-induced ulcer model. The extract showed significant ($P < 0.05$) dose-dependent anti-ulcer activity. The percentage ulcer inhibition of the extract at 100, 150 and 200 mg/kg were 25, 41.7 and 43.3% respectively, while that of ranitidine (150 mg/kg) was 66.7% [26].

8. ANTI-SICKLING ACTIVITY

Ficus capensis was reported to have shown significant antisickling activity because of the anthocyanins and terpenoids present in the plant. It was said to have reversal anti-sickling activity [31]. The anti-sickling test showed inhibition of sickling at 32.81% and 36.9% respectively on sickled red blood cell samples from patients using concentrations of 50 µg/L and 100 µg/L. Significantly high erythropoietic and anti-sickling properties of the plant have been reported [32].

9. ANTIDIARRHEAL ACTIVITY

The leaf aqueous extract of the plant produced a significant dose-dependent increase in

percentage inhibition of the movement of charcoal meal in the small intestine of the mice $P < 0.05$. The extract showed a percentage inhibition of 23.52% 31.41% and 48.95% at a dose of 100 mg/kg, 200 mg/kg and 400 mg/kg. This is comparable to atropine at a dose of 0.1 mg/kg which showed a percentage inhibition of 44.02%. The aqueous extract also exhibited a dose-dependent increase in the average onset of stooling in the animals using castor oil model. The onset of stooling in atropine-treated animals was 19 ± 0 min. The leaf extract exhibited a significant dose-dependent decrease in the number and weight of stool produced by the mice [7].

10. TOXICITY OF *F. capensis*

The acute toxicity test of the aqueous leaf extract showed no death or obvious signs of toxicity up to 5000 mg/kg body weight. Oral administration of aqueous extract of *F. capensis* up to 5 g/kg caused no death in mice. Also, no signs of obvious behavioural and physical adverse effects were observed [26].

11. LEUKOCYTES MOBILIZATION

Daikwo [10], observed the plant extract increased leukocyte mobilization in all the treated groups in a study. Evaluation of data obtained from their study indicated a significant ($p < 0.05$) dose-dependent increase in leukocyte mobilization, with doses 150 and 250 mg/kg respectively, the most mobilized being neutrophils at a dose of 250 mg/kg.

12. IMMUNE-BOOSTING ACTIVITY

The immune system is subject to modification by substances to either enhance or suppress its ability to resist invasion by pathogens. Justification of the folkloric use of the plant as an immune boosting agent has been reported [10].

13. PROXIMATE ANALYSIS AND MINERAL CONTENTS

Ficus capensis leaves were found to have high quantities of calcium, magnesium and phosphorus. Iron, zinc, copper and manganese were present but not in very high concentration. Sodium and potassium were absent. Manganese was absent in *F. capensis* bark while calcium

and magnesium were present in the highest concentrations [25].

The result of proximate analysis of the leaves of *F. capensis* reported by [25] was: moisture content 25.80%, proteins 17.47%, crude fat 1.80%, ash 11.00%, crude fibre 41.00% and carbohydrates 2.93% from samples collected in Edo state, Nigeria. Results obtained by [33] were moisture content 33.55.60%, protein-11.83%, crude fat-1.01%, ash-11.40% and crude fiber-15.95%. Achi [34] reported lipid content-1.83%, fiber-4.77%, moisture content-104.53%, carbohydrate-73.77%, ash-6.65% and protein-6.31% for samples collected in Anambra state, Nigeria.

F. capensis bark yielded 10.00% - moisture, 3.73%-protein, 2.00%-crude fat, 10.95% ash, 20.50%-crude fibre, and 52.82%-carbohydrate [25]. Ojokuku [35] reported their findings to be moisture- 9.8%, protein-3.63%, crude fat-1.92%, ash-15.60%, crude fibre-16.38%, carbohydrate-52.66% for samples collected in Lagos state, Nigeria. Isah [33] reported moisture-80.48%, protein -1.31%, crude fat -0.22, ash- 1.34% and crude fibre -6.00%. The differences in their proximate content maybe due to the different geographical location of collection.

14. CONCLUSION

This review shows that *F. capensis* has the potential for drug development based on popular uses and biological studies. Further studies, however, are necessary to verify important folkloric uses of the various parts of the plant. Research into bioactivity- guided fractionation of extracts and isolation of compounds responsible for various pharmacological activities such as antimicrobial, anti-ulcer, anti-diarrheal, anti-sickling and immune boosting activities should be done as this is vital for drug development studies.

CONSENT

It is not applicable.

ETHICAL APPROVAL

It is not applicable.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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