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Review Article

Botany, Uses, Chemistry and Pharmacology of *Ficus microcarpa*: A Short Review

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ABSTRACT
In this short review on *Ficus microcarpa* L. f., the first for the species, current information of the botany, uses, phytochemistry and pharmacology is presented and discussed. A common tree in coastal areas of the West Pacific region, *F. microcarpa* is characterised by its curtain of dangling aerial roots and small pink fruits. Considered sacred with spiritual significance, the species is an important food sources for birds and mammals, and a popular shade and ornamental plant. Used as traditional folk medicine to treat various diseases and disorders, *F. microcarpa* is rich in triterpenoids, phenylpropanoids, flavonoids and phenolic acids. The aerial roots are most studied, and yielded the highest number of compounds (86), notably, triterpenoids (56), phenylpropanoids (13) and phenolic acids (12). Pharmacological properties of *F. microcarpa* include antioxidant, antibacterial, anticancer, anti-diabetic, anti-diarrhoeal, anti-inflammatory, anti-asthmatic, hepatoprotective and hypolipidemic activities.

Key words: *Ficus microcarpa*, Fig, Banyan, Triterpenoids, Cytotoxic, Anti-diabetic.

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INTRODUCTION

Figs of the genus *Ficus* consist of over 800 species and they belong to the family Moraceae, which has about 40 genera.[1] In the Plant List of 2013, 919 species of *Ficus* have been listed as accepted names including that of *F. microcarpa.*[2] There are 99 species in China of which 16 are endemic and two are introduced.[3] In Taiwan, 21 species are endemic and 20 are introduced.[4] Figs have historical and religious significance. According to the biblical book of Genesis, Adam and Eve covered their genitals in shame after consuming the forbidden fruits of *Ficus sycomorus* in the Garden of Eden.[5] Gautama Buddha attained enlightenment while meditating underneath the sacred Bodhi tree (*Ficus religiosa*). Fig trees attract frugivorous birds and mammals,[6,7] and are respected as abodes for spirits.[5]

Fruits and leaves of *Ficus* species are an important source of food and medicine in South China.[8] The foliage is harvested as fodder for livestock in Nepal.[9] Trees of *Ficus carica* (common fig) have been cultivated in many countries for their edible fruits which are consumed raw, dried, canned and in other processed forms.[1] Major pharmacological properties of *Ficus* species include anticancer, anti-tumour, anti-diabetic, anti-inflammatory, antiulcer, hypoglycaemic, hypocholesterolaemic, gastroprotective and hepatoprotective activities.[1,10]

In 2008, a review on the genus *Ficus* was published covering aspects of botany, ethno-medicine, bioactivities, chemical constituents, clinical studies and toxicology.[1] Since then, *Ficus* species reviewed include *F. religiosa*,[11-13] *F. racemosa*,[14-16] *F. hispida*,[17] *F. bengalensis*,[18] *F. thonningii*[19] and *F. deltoidea.*[20] To the best of our knowledge, this is the first review on *F. microcarpa*.

Botany and Uses

Ficus microcarpa L. f. with common names of Chinese or Malayan banyan, Indian laurel and curtain fig, is an evergreen tree up to 30 m in height, with dangling aerial roots which develop into columnar stems.[21,22] Leaves are alternate, simple, leathery, glossy green and oval-elliptic with slightly pointed tips. Flowers are tiny, unisexual and borne within a round structure called the syconium or fig. Fruits are small and turn from pink to purple when ripe. Photos of the aerial roots, columnar stems, leaves and fruits of *F. microcarpa* are shown in Figure 1.

The geographical distribution of *F. microcarpa* stretches from South, Southeast and East Asia through Australia and the Pacific Islands.[21,23] It is commonly found in coastal areas. The species is a popular ornamental plant that is potted as bonsai or grown in gardens as topiary. Believed to be abodes for spirits, trees are sacred and often grown in the vicinity of temples. In Sabah, Malaysia, young leaves of *F. microcarpa* (ara jejawi) have been reported to be the most preferred food item of the proboscis monkey *Nasalis larvatus*, out of 11 plant species surveyed.[24]

In Okinawa, Japan, dried leaves, aerial roots and bark of *F. microcarpa* (gazyumaru) have been used as folk medicine for controlling perspiration, alleviating fever and relieving pain.[25] In China, *F. microcarpa* (rong shu) is commonly planted as a shade tree,[3] and has been used to treat flu, malaria, acute enteritis, tonsillitis, bronchitis and rheumatism.[26] The Okinawan soba is a famous noodle made by kneading wheat with the lye of wood ash. The wood ash of *F. microcarpa* yields noodles of high quality. In South Asia, the plant has been used as traditional medicine for the treatment of type-2 diabetes.[27]

Phytochemistry

Compounds isolated from the different plant parts of *F. microcarpa* are listed in Table 1. Of these, the aerial roots are most studied, and yielded the highest number of compounds (86), notably, triterpenoids (56), phenylpropanoids (13) and phenolic acids (12) (Figure 2).

Triterpenoids of *F. microcarpa* reported in two or more scientific papers are friedelin,[31,52] lupeol,[31,50] oleanolic acid,[25,41,52] 20-taraxastene-3β,22α-diol[46,50] and ursolic acid.[31,45] They contain friedelane, ursane, oleanane, lupane, cycloartane, taraxerane, peroxy and cyclopropyl skeletons. Betulinic acid, betulonic acid, lupeol and lupeol acetate belong to the lupane-type of triterpenoids consisting of four six-rings and one five-ring (Figure 3). Oleanolic acid and oleanonic acid have an oleanane structure with five six-rings which is similar to the ursane-type as represented by ursolic acid and ursonic acid. The difference between the oleanane- and the ursane-type is the methyl group localization of the topmost E-ring.[53]

Triterpenoids are the largest group of secondary plant metabolites with more than 20,000 members known.[54] Synthesised by the cyclization of squalenes, tritepenoids belong to two main types. Tetracyclic triterpenoids comprise the dammarane, lanostane, cycloartane, cucurbitane, tirucallane and meliacane types. Pentacyclic triterpenoids include the friedelane, lupane, oleanane and ursane types, which are found in *Ficus* species. Triterpenoids are known to have remarkable anticancer, antiviral, anti-inflammatory, antimicrobial, hepatoprotective and cardioprotective properties.[53,55,56] Compounds common in the leaves of *F. microcarpa* are flavonoids, megastigmanes and pheophytins (Table 1). Dominant flavonoids are catechin, epicatechin and isovitexin. Phenolic acids are found in the bark and aerial roots, while the bark and leaves yielded sterols.

Pharmacological Properties

Antioxidant

Methanol extracts of bark, fruits and leaves of *F. microcarpa* exhibited potent antioxidant activities of DPPH, ABTS and superoxide radical scavenging.[25] Strongest activities were observed in the bark with EC_{50} values of 7.9, 4.0 and 98 µg/ml, respectively. Isolated from the ethyl acetate fraction of the bark extract, catechol, syringol and *p*-vinylguaiacol scavenged DPPH radicals with EC_{50} values of 1.3, 5.4 and 8.8 µg/ml, respectively. The same group of scientists also reported on the total phenolic content and antioxidant activity of *F. microcarpa* aerial roots.[41] Among four fractions of the methanol extract, the ethyl acetate fraction possessed the highest content of phenolic compounds. It also showed the strongest antioxidant activity based on DPPH, ABTS+ and superoxide radical scavenging, reducing power and β-carotene bleaching. Flavonoids isolated from leaves of *F. microcarpa* were reported to possess strong antioxidant activities of 6.6–9.5 µM trolox equivalent at 2.0 µM concentration.[33] They were ficuflavoside, catechin, epicatechin, isovitexin, luteolin 6-*O*-β-D-glucopyranoside and isosaponarin.

Antibacterial

Methanol extracts of bark (BM), fruits (FM) and leaves (LM), and the ethyl acetate fraction of the bark extract (BE) of *F. microcarpa* exhibited antibacterial activity against Gram-positive bacteria of *Bacillus brevis*, *B. cereus* and *B. subtilis*, and Gram-negative bacteria of *Escherichia coli* using the disc-diffusion method.[25] Based on diameter of inhibition zones the ranking was: BE > BM > FM > LM. The ethyl acetate fraction of the aerial root extract of *F. microcarpa* also exhibited the strongest antibacterial activity followed by the methanol extract.[41] Recently, the antibacterial activity of acetone and aqueous extracts of leaves, stem bark and root bark of *F. microcarpa* against Gram-positive *Staphylococcus aureus*, and Gram-negative *Pseudomonas aeruginosa* and *E. coli* was reported.[57] Based on the diameter of inhibitory zone, antibacterial activity was ranked as root bark > leaves > stem bark.

Anticancer

The cytotoxic efficacy of 11 triterpenes isolated from aerial roots of *F. microcarpa* was investigated using the methylene blue assay, and tested against HONE-1 nasopharyngeal carcinoma, KB oral epidermoid carcinoma and HT29 colorectal carcinoma human cancer cell lines.[45] Ursonic acid and ursolic acid showed potent cytotoxic activity against all three cell lines with IC_{50} values of 4.0–6.3 µM and 4.7–8.8 µM, respectively. 3β-Acetoxy-25-hydroxylanosta-8,23-diene and acetylursolic acid were only effective against HT29 and KB cells, respectively. Oleanonic acid, acetylbetulinic acid, betulonic acid and 3-oxofriedelan-28-oic acid were effective against HONE-1 and KB cells. All the eight compounds possess a carboxylic acid functionality at C-28 showed significant cytotoxic activities against the tested cell lines with IC_{50} values of 4.0–9.4 µM. Compounds of 3β-acetoxy-12,19-dioxo-13(18)-oleanene, 3,22-dioxo-20-taraxastene and 3β-acetoxy-25-methoxylanosta-8,23-diene did not display any cytotoxic effects with IC_{50} values >10 µM.[45] 4-(2-Methylbut-3-en-2-yl)-4'-methoxy-2,5-dihydroxychalcone, a new chalcone from aerial roots of *F. microcarpa* exhibited weak cytotoxicity against K562 and PC3 human cancer cell lines.[26] Plectranthoic acid (Figure 4), a pentacyclic terpenoid isolated from the aerial roots of *F. microcarpa* was recently reported to possess potent 5'AMP-activated kinase (AMPK) activating properties, far superior than metformin.[27] Treatment with plectranthoic acid inhibited proliferation of prostate cancer cells, promoted G0/G1 phase cell cycle arrest, and induced apoptosis in the cancer cells in an

Figure 1: Aerial roots (top left), columnar stems (top right), and leaves and fruits (bottom) of *Ficus microcarpa*.

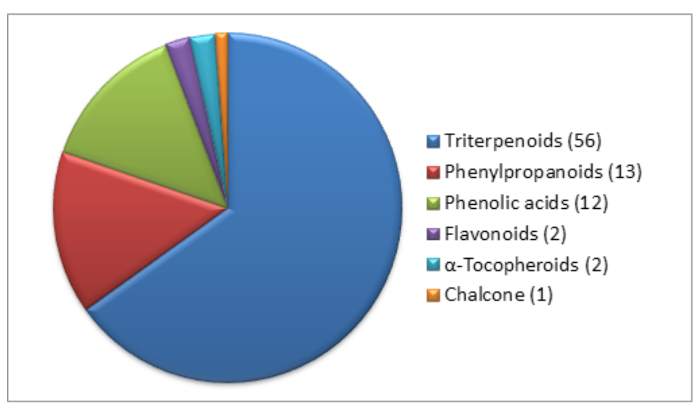

Figure 2: The breakdown of compounds isolated from the aerial roots of *Ficus microcarpa*.

Table 1: Compounds isolated from different plant parts of *Ficus microcarpa*

Compound class and name	Plant part	Reference
Apocarotenoid		
Ficusone*	Heartwood	[28]
Chalcone		
4-(2-Methylbut-3-en-2-yl)-4'-methoxy-2,5-dihydroxychalcone	Aerial root	[26]
Chitinases		
(GLx Chi) A-C	Latex	[29]
Chlorins		
Ficuschlorins A-D	Leaf	[30]
Ficusmicrochlorins A-C	Leaf	[4]
Coumarin		
Marmesin	Bark	[31]
Flavonoids		
Catechin	Leaf, bark	[31-33]
Epicatechin	Leaf, bark, aerial root, fruit	[32-34]
Ficuflavoside*	Leaf	[33]
Ficuglucoside	Heartwood	[35]
Ficuisoflavone*	Bark	[36]
Ficusol	Heartwood	[35]
Isolupinisoflavone E*	Bark	[36]
Isosaponarin	Leaf	[33]
Isovitexin	Leaf	[33,37]
Isovitexin-3"-*O*-glucopyranoside	Leaf	[37]
Luteolin 6-C-β-D-glucopyranoside	Leaf	[33]
Orientin	Leaf	[37]
Quercetin	Leaf, aerial root, fruit	[35]
Rutin	Aerial root	[35]
Vitexin	Leaf	[37]
Hydroxybenzoates		
Methyl-4-hydroxybenzoate	Bark	[31]
Methyl 4-hydroxy-3-methoxybenzoate	Bark	[31]
Isoprenoid		
4,5-Dihydroblumenol	Heartwood	[28]
Lactones		
Methoxybenzoate	Bark	[31]
Ficusolide diacetate*	Heartwood	[38]
Ficuspirolide*	Heartwood	[28]
Ficusolide*	Heartwood	[28]
Lignans		
Ficusal*	Heartwood	[38]
Fiscusesquilignans A, B*	Heartwood	[38]
Megastigmanes		
Bridelionoside B	Leaf	[33]
Dihydroalangionoside A	Leaf	[33]
Ficumegasoside*	Leaf	[33]
(3*S*,5*R*,6*R*,7*E*,9*S*)-Megastigman-7-ene-3,5,6,9-tetraol	Leaf	[33]
Monoterpenoid		

Ficusic acid	Heartwood	[35]
Phenylpropanoids		
(7*E*,9*Z*)-Dihydrophaseic acid 3-*O*-β-D-glucopyranoside*	Aerial root	[39]
2,2'-Dihydroxyl ether	Aerial root	[39]
Erythro-guaiacylglycerol	Aerial root	[40]
Erythro-guaiacylglycerol 9-*O*-β-D-glucopyranoside*	Aerial root	[40]
Ficuscarpanic acid*	Aerial root	[39]
Ficuscarpanosides A, B*	Aerial root	[39,40]
Icariside D2	Aerial root	[39]
Guaiacylglycerol	Aerial root	[40]
Guaiacylglycerol 9-*O*-β-D-glucopyranoside*	Aerial root	[40]
3-(4-Hydroxy-3-methoxy phenyl) propan-1,2-diol	Aerial root	[40]
4-Methoxy guaiacylglycerol-7-*O*-β-D-glucopyranoside	Aerial root	[40]
Syringin	Leaf	[33]
(7*S*,8*R*)-Syringoylglycerol	Aerial root	[39]
(7*S*,8*R*)-Syringoylglycerol-7-*O*-β-D-glucopyranoside	Aerial root	[39]
Phenolic acids		
Catechol	Bark, aerial root	[25,41]
Coumaran	Bark	[25]
Coumaric acid	Leaf, aerial root, fruit	[34]
Chlorogenic acid	Bark	[42]
Gallic acid	Aerial root	[34]
Isovanillic acid	Bark, aerial root	[25,41]
Methyl chlorogenate	Bark	[42]
Procyanidins B1, B3	Bark	[42]
p-Propylguaiacol	Bark, aerial root	[25,41]
p-Propylphenol	Bark, aerial root	[25,41]
4-*n*-Propylresorcinol	Bark, aerial root	[25,41]
Protocatechuic acid	Bark, aerial root	[25,41,42]
Syringaldehyde	Bark, aerial root	[25,41]
Syringol	Bark, aerial root	[25,41]
Vanillin	Bark, aerial root	[25,41]
p-Vinylguaiacol	Bark, aerial root	[25,41]
Pheophytins		
Aristophyll-C	Leaf	[4]
13^2(*R*)-Hydroxypheophytin a	Leaf	[4]
13^2(*S*)- Hydroxypheophytin a	Leaf	[4]
13^2(*R*)-Hydroxypheophyton a	Leaf	[4]
13^2(*S*)-Hydroxypheophyton a	Leaf	[4]
13^2(*S*)-Pheophyton a	Leaf	[4]
13^2(*R*)-Pheophyton a	Leaf	[4]
Pyropheophytin a	Leaf	[4]
Sterols		
Daucosterol	Leaf	[33]
Erogosterol peroxide	Bark	[31]
6β-Hydroxystigmast-4-en-3-one	Bark	[31]
β-Sitostenone	Bark	[31]
β-Sitosterol	Bark, leaf	[31,33]
β-Sitosterol 3-*O*-(6'-octadecanoyl) β-D-glucopyranoside	Leaf	[33]

6’-(β-Sitosteryl-3-*O*-β-glucopyranosidyl)hexadecanoate	Bark	[31]
Stigmasterol	Bark	[31]
α-Tocopheroids		
α-Tocopherol	Aerial root	[43]
α-Tocospiros A, B*	Aerial root	[43]
Triterpenoids		
29(20→19)Abeolupane-3,20-dione*	Leaf	[44]
3β-Acetoxy-12,19-dioxo-13(18)-oleanene*	Aerial root	[45]
3β-Acetoxy-12β,13β-epoxy-11α-hydroperoxyursane*	Aerial root	[46]
3β-Acetoxy-11α,12α-epoxy-16-oxo-14-taraxerene*	Aerial root	[45]
3β-Acetoxy-11α,12α-epoxy-14-taraxerene	Aerial root	[45]
3β-Acetoxy-20α,21α-epoxytaraxastane*	Aerial root	[49]
3β-Acetoxy-20α,21α-epoxytaraxastan-22α-ol*	Aerial root	[47]
3β-Acetoxy-21α,22α-epoxytaraxastan-20α-ol*	Aerial root	[45]
3β-Acetoxy-1β,11α-epidioxy-12-ursene*	Aerial root	[46]
3β-Acetoxy-11α-ethoxy-12-oleanene	Aerial root	[48]
3β-Acetoxy-11α-ethoxy-12-ursene*	Aerial root	[48]
3β-Acetoxy-12α-formyloxy-13,27-cyclours-11α-ol*	Aerial root	[49]
3β-Acetoxy-11α-hydroperoxy-13αH-ursan-12-one*	Aerial root	[46]
3β-Acetoxy-11α-hydroperoxy-12-oleanene	Aerial root	[48]
3β-Acetoxy-11α-hydroperoxy-12-ursene*	Aerial root	[48]
(20*S*)-3β-Acetoxy-20-hydroperoxy-30-norlupane*	Aerial root	[46]
3β-Acetoxy-18α-hydroperoxy-12-oleanen-11-one*	Aerial root	[46]
3β-Acetoxy-19α-hydroperoxy-20-taraxastene*	Aerial root	[47]
3β-Acetoxy-11α-hydroxy-11(12→13)abeooleanan-12-al*	Aerial root	[50]
3β-Acetoxy-15α-hydroxy-13,27-eyclours-11-ene*	Aerial root	[49]
3β-Acetoxy-11α-hydroxy-12-oleanene	Aerial root	[48]
3β-Acetoxy-11α-hydroxy-12-ursene*	Aerial root	[48]
3β-Acetoxy-25-hydroxylanosta-8,23-diene*	Aerial root	[45]
(20*S*)-3β-Acetoxylupan-29-oic acid*	Aerial root	[46]
3β-Acetoxy-25-methoxylanosta-8,23-diene	Aerial root	[45]
3β-Acetoxy-19α-methoxy-20-taraxastene*	Aerial root	[47]
3β-Acetoxy-22α-methoxy-20-taraxastene*	Aerial root	[47]
3β-Acetoxy-α-methoxy-12-ursene*	Aerial root	[48]
3β-Acetoxy-19(29)-taraxasten-20α-ol*	Aerial root	[45]
3β-Acetoxy-20-taraxasten-22α-ol*	Aerial root	[47]
3*β*-Acetoxy-20-taraxasten-22-one	Aerial root	[51]
3β-Acetoxy-12-oleanen-11-one	Aerial root	[46]
3*β*-Acetoxy-20-taraxasten-22-one	Aerial root	[51]
β-Acetoxy-12-ursene-11-one	Bark	[31]
3β-Acetoxy-12-ursene-11-one	Bark	[31]
3β-Acetoxyolean-12-en-11α-ol	Aerial root	[50]
Acetylbetulinic acid	Aerial root	[45]
Acetylursolic acid	Aerial root	[45]
β-Amyrin acetate	Bark	[31]
α-Amyrone	Leaf	[44]
Betulinic acid	Bark	[31]
Betulonic acid	Aerial root	[45]
Canophyllol	Bark	[31]

Cycloart-23-ene-3β,25-diol	Bark	[31]
Cycloart-25-ene-3β,24-diol	Bark	[31]
3β,11α-Diacetoxy-12-ursene	Aerial root	[48]
29,30-Dinor-3β-acetoxy-18,19-dioxo-18,19-secolupane*	Aerial root	[50]
3,22-Dioxo-20-taraxastene*	Aerial root	[45]
Epifriedelinol	Leaf	[52]
20*α*,21*α*-Epoxytaraxastan-3*β*-ol*	Aerial root	[51]
Friedelin	Leaf, Bark	[31,52]
Friedelinol	Bark	[31]
Glutinol	Leaf	[52]
3β-Hydroxy-20-oxo-29(20→19)abeolupane*	Aerial root	[51]
(3β)-3-Hydroxy-29(20→19)abeolupan-20-one	Leaf	[44]
(22*E*)-2S,26,27-trinor-β-Hydroxycycloart-22-en-al*	Aerial root	[49]
3β-Hydroxy-11α-hydroperoxy-12-ursene*	Aerial root	[48]
27-nor-3β-Hydroxy-25-oxocycloartane*	Aerial root	[49]
(23*E*)-27-nor-3β-Hydroxycycloart-23-en-25-one	Aerial root	[49]
Lupeol	Bark, aerial root	[31,50]
Lupeol acetate	Aerial root	[50]
Lupenone	Leaf	[44]
Lupenyl acetate	Leaf	[52]
12-Oleanene-3,11-dione	Bark	[31]
Oleanolic acid	Leaf, bark, aerial root	[25,41,52]
Oleanonic acid	Aerial root	[45]
3-Oxofriedelan-28-oic acid	Aerial root	[45]
22-Oxo-20-taraxasten -3*β*-ol*	Aerial root	[51]
Plectranthoic acid	Aerial root	[27]
Ptiloepoxide	Aerial root	[51]
19,20-Secoursane-3,19,20-trione*	Leaf	[44]
20-Taraxasten-3*β*-ol*	Aerial root	[51]
20(30)-Taraxastene-3*β*,21*α*-diol*	Aerial root	[51]
20-Taraxastene-3β,22α-diol*	Aerial root	[46,51]
Taraxerol	Leaf	[52]
Teraxerone	Bark	[31]
12-Ursene-3,11-dione	Bark	[31]
Ursolic acid	Bark, aerial root	[31,45]
Ursonic acid	Aerial root	[45]

Compounds with an asterisk are novel to *F. microcarpa*

AMPK-dependent manner. Plectranthoic acid is therefore a potent activator of AMPK with therapeutic potential against prostate cancer.

Anti-diabetic

In a review on *Ficus* species with anti-diabetic properties, *F. microcarpa* was among the six species identified.[58] The other five species were *F. bengalensis*, *F. carica*, *F. hispida*, *F. racemosa* and *F. religiosa*. The hypoglycaemic activity of the ethanol leaf extract of *F. microcarpa* in alloxan-induced diabetic rats has been reported.[59] Administration of 200 mg/kg of the extract reduced the blood glucose level to 102 mg/dL compared to 267 mg/dL of the diabetic control after two weeks. Decrease in TBARS, and increase in GPx, SOD and CAT levels demonstrated the antioxidant properties of the extract. Evidence for its hypoglycaemic activity was shown by the increase in HDL, and decrease in triglycerides, total cholesterol, LDL and VLDL. Similar results were also obtained with the methanol leaf extract of *F. microcarpa* in alloxan-induced diabetic rats.[60] At 100, 200 and 400 mg/kg, the extract reduced the blood glucose level by 33%, 53% and 54% after three weeks. The extract also reduced serum aspartate transferase, triglycerides, cholesterol and urea levels in the serum, and increased the insulin level in the blood. Besides being a potent activator of AMPK with therapeutic potential against prostate cancer, plectranthoic acid also displayed anti-hyperglycemic effects by inhibiting amylase, glucosidase and dipeptidyl peptidase-4 (DPP-4) activities suggesting its possible role in the treatment of type-2 diabetes.[27]

Anti-diarrhoeal

The anti-diarrheal activity of the leaf extract of *F. microcarpa* has been determined by castor oil induced diarrhoea in rats.[61] The extract admin-

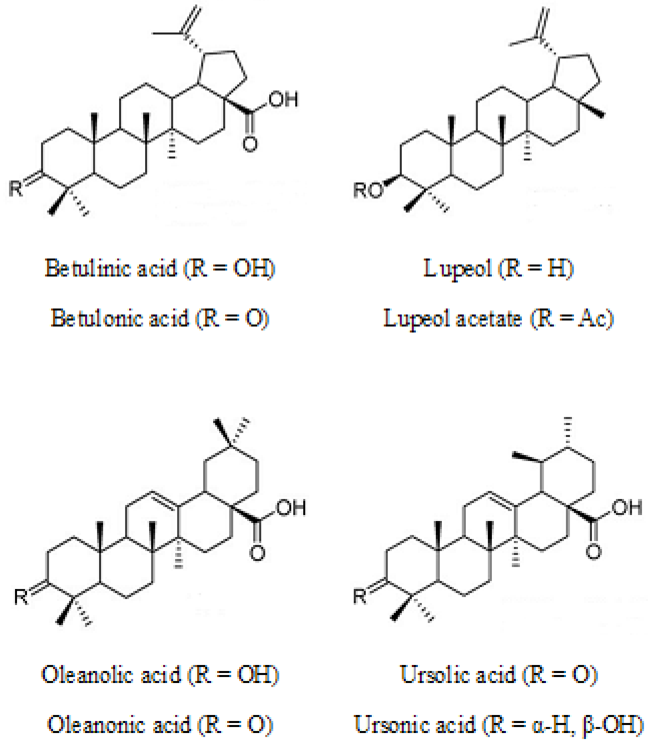

Figure 3: Lupane-type (top row), oleanane-type (bottom left) and ursane-type (bottom right) of triterpenoids of *Ficus microcarpa*.

istered orally at doses of 300 and 600 mg/kg, produced a marked anti-diarrheal effect in rats. At 300 mg/kg, the percentage of inhibition based on the number and weight of faeces was 79% and 66%, and both 32% at 600 mg/kg. There was also reduction in anti-enteropooling activity based on the volume and weight of intestinal content. Compared to the castor oil control, the reduction was 53% and 31% at 300 mg/kg, and 46% and 32% at 600 mg/kg, respectively.

Other properties

Other properties of *F. microcarpa* include anti-inflammatory,[62] anti-asthmatic,[63] hypolipidemic[64] and hepatoprotective[65,66] activities.

CONCLUSION

Like most *Ficus* species, *F. microcarpa* has multiple uses, both medicinal and non-medicinal. A sacred plant with spiritual significance, the species is an important food sources for birds and mammals, and a popular shade and ornamental plant. It is used as traditional folk medicine to treat various diseases and disorders. Its phytochemistry, notably that of the aerial roots, is well studied with a wide array of triterpenoids, phenylpropanoids, flavonoids and phenolic acids isolated. Pharmacological properties of *F. microcarpa* include antioxidant, antibacterial, anticancer, anti-diabetic, anti-diarrhoeal, anti-inflammatory, anti-asthmatic, hepatoprotective and hypolipidemic activities. Future directions will entail studies on its pharmacology using animal models and isolated bioactive compounds.

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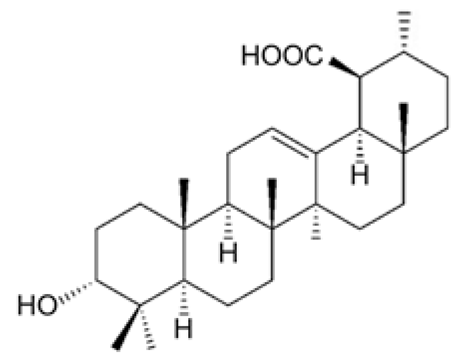

Figure 4: Molecular structure of plectranthoic acid.

CONFLICT OF INTEREST

No conflict of interest to declare.

ABBREVIATIONS USED

ABTS: 2,2'-azino-bis(3-ethylbenzothiazoline-6-sulphonic acid); **AMPK:** 5'AMP activated kinase; **CAT:** catalase; **DPP-4:** dipeptidyl peptidase-4; **DPPH:** 1,1-diphenyl-2-picryl-hydrazyl; **EC_{50}:** median effective concentration; **GPx:** glutathione peroxidase; **HDL:** high-density lipoprotein; **IC_{50}:** median inhibitory concentration; **LDL:** low-density lipoprotein; **SOD:** superoxide dismutase; **TBARS:** thiobarbituric acid reactive substances; **VLDL:** very low-density lipoprotein.

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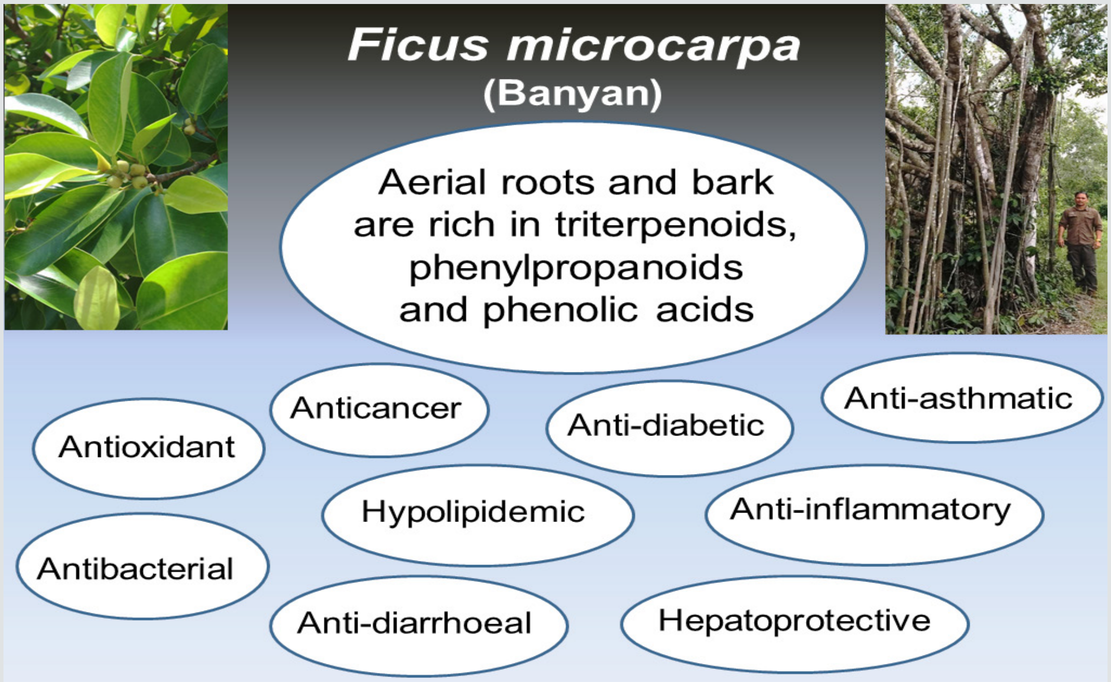
PICTORIAL ABSTRACT



SUMMARY

- *Ficus microcarpa* has multiple medicinal and non-medicinal uses.
- A sacred plant with spiritual significance, the species is an important food sources for birds and mammals, and a popular shade and ornamental plant.
- It is used as traditional folk medicine to treat various diseases and disorders.
- Its phytochemistry is well studied with a wide array of triterpenoids, phenylpropanoids, flavonoids and phenolic acids isolated.
- Pharmacological properties include antioxidant, antibacterial, anticancer, anti-diabetic, anti-diarrhoeal, anti-inflammatory, anti-asthmatic, hepatoprotective and hypolipidemic activities.
- Future directions will entail pharmacological studies using animal models and isolated bioactive compounds.

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