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A review on *Ficus palmata* (Wild Himalayan Fig)

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Abstract

Traditionally, various plants are used for treatment of many diseases. *Ficus palmata* is a herbaceous perennial plant belonging to the family Moraceae. It contains a very juicy fruit and is used for making various products such as squash, jam and jelly from this fruit. The fruits contain chiefly sugars and mucilage and are principally used as an item of diet in several cases of constipation and in the diseases of the lungs and the bladder. The *ficus palmata* plant is used in various diseases, e.g. gastrointestinal disorders, hypoglycemia, tumour, ulcer, diabetes, hyperlipidemia and fungal infections. Traditionally, stem latex is applied to extract spines deeply lodged in the flesh. The phytochemical screening of the *Ficus palmata* plant extracts showed the presence of alkaloids, tannins, flavonoids, terpenoids and cardiac glycosides and aerial parts of *Ficus palmata* utilizing liquid-liquid fractionation and different chromatographic techniques resulted in the isolation of a new isomer of psoralenoside namely, trans-psoralenoside in addition to, one triterpene: germanicol acetate, two furanocoumarins: psoralene, bergapten, one aromatic acid vanillic acid and the flavone glycoside rutin. The *ficus palmata* fruit shows antioxidant activity using free radical scavenging and ferric reducing activities. The plant also shows in vitro antibacterial and antifungal activities of petroleum ether, chloroform, ethyl acetate, acetone, methanolic, ethanolic and water extracts. Fruit extract were analyzed against cervical cancer cell lines for antiproliferative activity while aqueous extract of *Ficus palmata* leaves showed dose dependant anti-calcinogenic action. *Ficus palmata* total plant extract was found to show hepatoprotective, nephroprotective, antiulcer and anticoagulant activity.

Keywords: *Ficus palmata*, Fruit, Edible, Antioxidant.

Introduction

Ficus palmata Forsk. commonly known as 'Fegra Fig' belongs to the family of Moraceae or Urticaceae. It is found to be growing wild in the Himalayan region, so also named as Wild Himalayan fig and is mainly the native of North-Western India and Rajasthan regions. Fegra plants are of common occurrence at places up to 1,000 metres above the sea-level. These trees are occasionally found in the forests, but grow well around the villages, in wastelands, fields, etc.^{1,2}

Synonyms: *F. caricoides* Roxb. *F. virgata* Wall. ex Roxb.³

Indian names: Manmjedi (Andhra Pradesh); Khemri, Pheru (Dehradun); Pepri (Gujrat); Phegra, Fagura, Khasra, Daghla Anjir, Fagad, Fagar (Himachal Pradesh); Abjiri, Bedu, Khemri (Hindi); Pheru (Jaunsar); Bedu (Kumaun); Phegwara, Phagoru, Fagu, Anjir (Punjab).

Other names:

English- Indian Fig (Wild Himalayan fig).

Ayurvedic- Phalgu, Anjiri.

Siddha- Manjimi.

Nepali- Bendu, Anjir, Timilo, Beru, Bedu.^{1, 2, 3}

Scientific Classification:⁴

Domain	Eukaryota
Kingdom	Plantae
Subkingdom	Viridaeplantae
Phylum	Tracheophyta
Subphylum	Euphyllophytina
Infraphylum	Radiatopses
Class	Magnoliopsida
Subclass	Dilleniidae
Superorder	Urticanae
Order	Urticales
Family	Moraceae
Genus	<i>Ficus</i>
Species	<i>palmata</i>

Morphology:

- **Plant** - Deciduous Tree
- **Height** - 6 to 10 m (30 feet approx.)
- **Leaves**- Alternate, broad, ovate and membranous with size range 12.92 cm long and 14.16 cm broad.
- **Flowers** - Unisexual, monoecious (individual flowers are either male or female, but both sexes can be found on the same plant), greenish white and very small.
- **Fruit** - Syconoid, the average diameter is 2.5 cm, weight 6 gm, the colour varying from deep violet to black.
- **Seeds** - Numerous, round and very small.
- **Soils** - Prefers light (sandy), medium (loamy) and heavy (clay) soils, requires well-drained soil and can grow in nutritionally poor soil. The plant prefers acid, neutral and basic (alkaline) soils. It cannot grow in the shade. It requires dry or moist soil and can tolerate drought.^{1,2}



Figure 1: *Ficus palmata* whole plant



Figure 2: *Ficus palmata* twig



Figure 3: Unripen fruits



Figure 4: Ripe fruits

Distribution

Ficus palmata is a highly variable and common wild fig occurring in North West hills on hot, dry slopes in clay-loam soils in Uttarakhand, Punjab and Kashmir in India, Nepal, Pakistan, Afghanistan, Iran, Arabian Peninsula, Somalia, Sudan, Ethiopia and South Egypt.¹

Flowering and fruiting season

Flowering starts from March and continues up until the end of April. The fruiting season starts from the second fortnight of June and continues till the first half of July.

Chemical constituents

The fruits are juicy, containing 45.2% extractable juice and 80.5% moisture. The total content of soluble solids of the juice is 12.1%. The fruit-juice contains about 6% total sugars. The pectin content of the fruit is 0.2%. The fruits are not the richest source of vitamin C and contain only 3.3 mg of vitamin C per 100 g of pulp. The protein content of the fruit is 1.7%, and the ash content is 0.9%. Some of the mineral elements like phosphorus, potassium, calcium, magnesium and iron were found to be 0.034, 0.296, 0.071, 0.076 and 0.004% respectively.

Edible uses

The whole fruit, along with the seeds, is edible. Fruit is raw and very tasty. It is sweet and juicy, having some astringency, which is due to the presence of white latex just beneath the epicarp. The astringency can be removed by keeping the fruits immersed in water for about 10 to 15 minutes before eating. The overall fruit quality is excellent. The unripe fruits and young growth are cooked and eaten as a vegetable. They are boiled, the water is removed by squeezing and they are then fried.

Medicinal uses

The fruit is demulcent, emollient, laxative and poultice. They are principally used as an item of diet in the treatment of constipation and diseases of the lungs and bladder. The sap is used in the treatment of warts. *Ficus palmata* plant is used in various disease e.g. gastrointestinal, hypoglycemic, anti-tumour, anti-ulcer, anti-diabetic, lipid lowering and antifungal activities. Traditionally stem latex is applied to extract spines deeply lodged in the flesh.^{1, 2, 5, 6}

Phytochemical analysis

- The phytochemical screening of the *Ficus palmata* plant extracts showed the presence of alkaloids, tannins, flavonoids, terpenoids and cardiac glycosides.⁷
- Phytochemical investigation of the aerial parts of *Ficus palmata* utilizing liquid-liquid fractionation and different chromatographic techniques resulted in the isolation of a new isomer of psoralenoside namely, trans-psoralenoside in addition to, one triterpene: germanicol acetate, two furanocoumarins: psoralene, bergapten, one aromatic acid vanillic acid and the flavone glycoside rutin.⁸

Pharmacological activity

Antioxidant activity

The antioxidant activities of *Ficus palmata* fruit were determined using free radical scavenging activities and ferric reducing activities. The free radical scavenging activities were evaluated by 2,2-diphenyl-1-picrylhydrazyl (DPPH) and 2,2'-azino-bis-3-ethylbenzo thiazoline-6-sulphonic acid (ABTS) cation radical scavenging assays. The DPPH scavenging activity was found to be 104.9 mg Catechin Equivalents/100 g Fruit weight in methanol fruit extract while in acetone extract, it was 146.9 mg Catechin Equivalents/ 100 g Fruit weight. The ABTS assay measures the ability of fruit extract to scavenge the cationic radical ABTS⁺ produced by the oxidation of ABTS. The ABTS cation scavenging activity was found to be 557.09 mg Butylated hydroxyanisole/100 g Fruit weight in the methanol extract while in acetone extract, it was 729.45 mg Butylated hydroxyanisole /100 g Fruit weight. Ferric reducing activity was found to be 77.6 mg Ascorbic acid /100 g Fruit weight in the methanol extract while in acetone extract, it was 146.67 mg Ascorbic acid /100 g Fruit weight.^{9, 10}

Antimicrobial activity

The in vitro antibacterial and antifungal activities of petroleum ether, chloroform, ethyl acetate, acetone, methanolic, ethanolic and water extracts of *Ficus palmata* were tested against ten bacterial strains and three fungal strains by disc diffusion method. The ethanolic bark extracts of *Ficus palmata* showed significant activity (18 mm) against *Staphylococcus aureus*.¹¹

Antiproliferative activity

The Antiproliferative activity of the fruit extract was analyzed against cervical cancer cell lines, namely C33A, HeLa and one normal Peripheral Blood Mononuclear (PBM) cells using colorimetric 3-(4,5-Dimethylthiazol-2-yl)-2,5-Diphenyltetrazolium Bromide (MTT) assays. C33A and HeLa cells were cultured with an extract concentration equivalent to 0.667, 1.66, 3.33, 5.0 and 6.67 mg/ml of fruit while primary culture of PBMCs was incubated with 5.0 and 6.67 mg/ml fruit extracts. All the extracts demonstrated potent antiproliferative activity against C33A cells. The extracts did not show antiproliferative activity against HeLa cells. Acetone extract showed highest antiproliferative activity while it was low for methanol extract.⁹

Anti-calcinogenic Activity

Effect of aqueous extract of *Ficus palmata* leaves was studied on in vitro homogeneous system of initial mineral phase formation for calcium phosphate, its subsequent growth and demineralization. For Mineralization By employing 5.0 ml system which was prepared by adding 0.5 ml of KH₂PO₄ (50 mM), 0.5 ml of CaCl₂ (50 mM), 2.5 ml of Tris buffer (210 mM NaCl + 0.1 mM tris HCl) and increasing volume of the aqueous extract ranging from 0.2 ml to 0.8 ml by subsequently decreasing the volume of water ranging from 1.3 ml to 0.7 ml. The aqueous extract of *Ficus palmata* showed dose dependant anti-calcinogenic action in demineralization of Calcium Phosphate. As the dose increases the anti-calcinogenic effect also increases.¹²

Hepatoprotective Activity

Hepatic toxicity following CCl₄ administration is reflected by an increase in the biochemical parameter levels, such as aspartate aminotransferase (AST), alanine aminotransferase (ALT), gamma glutamyl transpeptidase (GGT), alkaline phosphatase (ALP) and total bilirubin. Treatment with *Ficus palmata* total extract showed dose dependent reduction in the levels of all the measured parameters. Animal treated with 400 mg/kg body weight of *Ficus palmata* showed a significant reduction in the levels of AST, ALT, GGT, ALP and bilirubin (27.36, 39.85, 29.72, 20.69 and 51.61%) indicating good protection against liver damage induced by CCl₄. Tissue parameters such as non-protein sulfhydryl groups (NP-SH), malonaldehyde (MDA) and total protein (TP) were also measured for signifying the hepatoprotective potential of *Ficus palmata*. Histopathological study of liver cells was also conducted.¹⁰

Nephroprotective Activity

In addition to tissue parameters like non-protein sulfhydryl groups (NP-SH), malonaldehyde (MDA) and total protein (TP), nephroprotective effect was evaluated by measuring the serum levels of sodium, potassium, creatinine and urea. Dose dependent reduction in the elevated parameters resulted from the treatment with *Ficus palmata* total extract. Animals treated with *Ficus palmata* showed highly significant reduction in the levels of serum urea, serum creatinine, sodium and potassium levels (50.56, 34.28, 28.94 and 45.19%) indicating a good protection against CCl₄ induced nephrotoxicity. Reduction in the levels of serum urea and serum creatinine was more than that resulted from the treatment with the standard drug Sil. Kidney cells of rats treated with CCl₄ and 400 or 200 mg/kg body weight *Ficus palmata* total extract showed complete recovery of kidney cells with no histopathological changes.¹⁰

Antiulcer Activity

Antiulcer activity was explored by observing stomach lesions after treatment with ethanol. *The ficus palmata total extract* was tested at 200 and 400 mg/kg body weight for possible antiulcer effect against 80% ethanol induced lesions. All the fractions were tested at two doses of 100 and 200 mg / kg body weight. Protection against ulcer by *Ficus palmata* total extract was dose dependent and highly statistically significant.¹⁰

Anticoagulant Activity

Whole blood clotting time (CT) was taken as a measure for the anticoagulant activity of the extract. *Ficus palmata* total extract and all fractions were subjected to clotting time assay using warfarin as standard. The increase in the CT resulted from treatment with total extract, petroleum ether and chloroform fractions were statistically significant, time dependent and dose dependent. The total extract at a dose of 400 mg/kg body weight resulting in an increase in CT reached 6.70 ± 0.26 while warfarin time was 8.23 ± 0.67 after 120 min. The effect of the 200 mg/kg body weight was very close to that of the high dose after 120 min although it was less in the early stages of the experiment. The petroleum ether fraction ended up with the same efficacy after 120 min; however, the higher dose (200 mg/kg) was more effective after 30 and 60 min.¹⁰

Conclusion

This brief review finally concluded that the *Ficus palmata* has a wide therapeutic potentiality against various diseases or disorders. So, further exploration of such unexplored species in the field of therapeutics and medicine can contribute healthcare in one other way.

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