STANDARDIZATION TECHNOLOGY OF DRYING AND VALUE ADDITION OF *FICUS RACEMOSA* (GULAR)

PRE-DISSERTATION REPORT

Submitted by

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CERTIFICATE

This is to certify that GITESH K. CHAWARE has personally completed M.Tech (Food Technology). Pre-dissertation entitled, "STANDARDIZATION TECHNOLOGY OF DRYING AND VALUE ADDITION OF *FICUS RACEMOSA* (GULAR)*"*under my guidance and supervision. To the best of my knowledge, the present work is the result of his original investigation and study. No part of pre-dissertation has ever been submitted for any other purpose at any University. The project report is appropriate for the submission and the partial fulfilment of the conditions for the evaluation leading to the award of Master of Food Technology.

Signature of Supervisor

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DECLARATION

I hereby declare that the work presented in the pre- dissertation report entitled "STANDARDIZATION TECHNOLOGY OF DRYING AND VALUE ADDITION OF *FICUS RACEMOSA* (GULAR)*'*" is my own and original. The work has been carried out by me at School of Agriculture, Lovely Professional University, Phagwara, Punjab, India under the guidance of Dr.Vikas Kumar**,** Assistant Professor (Food Technology) of School of Agriculture, Lovely Professional University, Phagwara, Punjab, India, for the award of the degree of Master of Technology in Food Technology.

Date: **GITESH K. CHAWARE**

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I certified that the above statement made by the student is correct to the best of my knowledge and belief.

Place: Phagwara, Punjab (India) **Dr. Vikas Kumar**

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CHAPTER :1

INTRODUCTION

Ficus racemosa. Linn (Moraceae) is an evergreen, moderate large sized spreading,lactiferous, deciduous tree, without much prominent aerial roots found throughout greater part of India in moist localities and is often cultivated in villages for its edible fruit (Ventakamaran.,1972). Different parts of *F.racemosa* are traditionally used as fodder, edible and ceremonial. All parts of this plant (leaves,fruits, bark, latex, and sap of the root) are medicinally important in the traditional system of medicine in India (Swain.,1990). The leaves powdered and mixed with honey is given inbilious infections. Fruits are a good remedy for visceral obstruction and also useful in regulating diarrhea and constipation. The astringent nature of the bark has been employed as a mouth wash in spongy gum and also internally in dysentery, menorrhagia and haemoptysis (Chopra et al.,1958) The bark is antiseptic, antipyretic andvermicidal, and the decoction of bark is used in the treatment of various skin diseases, ulcers and diabetes.

It is also used as a poultice in inflammatory swellings/boils and regarded to be effective in the treatment of piles, dysentry, asthma, gonorrhea, gleet, menorrhagia, leucorrhea, hemoptysis and urinary diseases (Nadkarni et al.,1976) Apart from the usage in traditional medicine, scientific studies indicate *F. racemosa* to posses various biological effects such as hepatoprotective, chemopreventive, antidiabetic, anti inflammatory, antipyretic, antitussive and antidiuretic16. The bark has also been evaluated for cytotoxic effects using 1BR3, HepG2, HL-60 cell lines and found to be safe and less toxic than aspirin, a commonly consumed anti inflammatory drug(Rao et al., 2002).

Tree about 20 m tall often with aerial roots, bark whitish-brown,smooth, Leaves grooved minutely hairy, lamina ovate-lanceolate to elliptic-lanceolate, tri-ribbed,8-10pairs of lateral pairs from broad to narrowly cuneate, oblique base, margin entire, acuminate at apex,glabrous on both sides, stipules triangular-ovate, brown, sub persistent, cystoliths present only on lower side. Hypanthodia on long peduncles, borne in large clusters from tubercles on the main trunk and mainleafless branches, subpyriform-globose, green, subtended by, broadly triangular-ovate brownish brads,bracts, apical orifice sunken, closed by brown bracts without internal bristles. Male flowers are sessile,ostiolar Z2-3 whorls, united, lobes dentate and stamens. Gall flowers pedicellate, dispersed among female. Female flowers are sessile or subsessile, ovary substipitate, glabrous style, stigma simple. Figs depressed subglobose or pyriform, red when ripe usually streaked. Seeds are lenticular 1 mm. Syconus fruit.(Warrier., 1996)

It is unusual in that its figs grow on or close to the tree trunk, termed cauliflory(Berg 1989) . In India the tree and its fruit are called ‘gular’ in the north and ‘atti’ in the south. The fruits are a favourite staple of the common Indian macaque. In Kerala it is consider as one among nalpamara. It serves as a food plant for the caterpillars of the butterfly the Two-brand Crow (*Euploea sylvester*) of northern Australia (Manandhar.,1972) .The Ovambo people call the fruit of the Cluster Fig ‘eenghwiyu’ and use it to distill ‘Ombike’, their traditional liquor.(Anonymous, Wealth of India, CSIR, New Delhi, 1952).

CHAPTER 2 : PROBLEM BACKGROUND

Gular fig, Cluster fig or Country fig, which is considered sacred, has golden coloured exudates and black bark. Joy et al., (2003). This is native to Australia, South East Asia and the Indian subcontinent. It is unusual in this plant that its figs grow on or close to the tree trunk. It is one of the herbs mentioned in all ancient scriptures of Ayurveda. It has various synonyms like yajnanga, yajniya, yajnayoga, yajnyasara etc. suggesting its use in ritual sacrifice. The plant growsall over India in many forests and hills. It is frequently found around the water streams and is also cultivated. Joseph and Raj (2010). Leaves are ovate, ovate-lanceolate or elliptic, subacute, entire and petiolate and are shed by December and replenished by January and April, when the tree becomes bare for a short period. It is seen dwelling in areas up to 1200 m altitude on hilltop. This requires well-drained, medium to heavy soils for its successful cultivation and comes up in all kinds of soils except in water logged and clay soil. The plant is propagated by using cuttings of stem and root suckers. Seeds can also be used for propagation. The flowers are pollinated by very small wasps. It has evergreen leaves, if it is close toa water source. Otherwise it sheds its leaves in January. Figs have been traditionally used by children to play. Thin sticks can be joined by inserting them in goolar figs to make interesting shapes. Paarakh (2010).

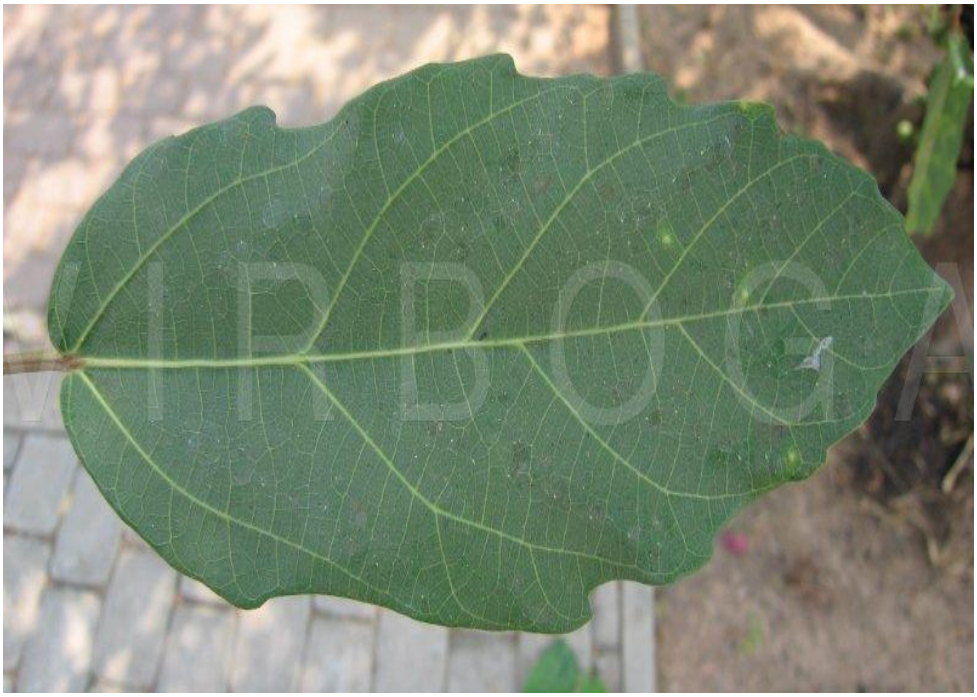
- **Structure of fruit and leaves of Ficus racemosa**

1) Ficus racemosa (unripe)

2) Ficus racemosa (ripe & mature)

3) Ficus racemosa (fruit)

4) Ficus racemosa (leaf)



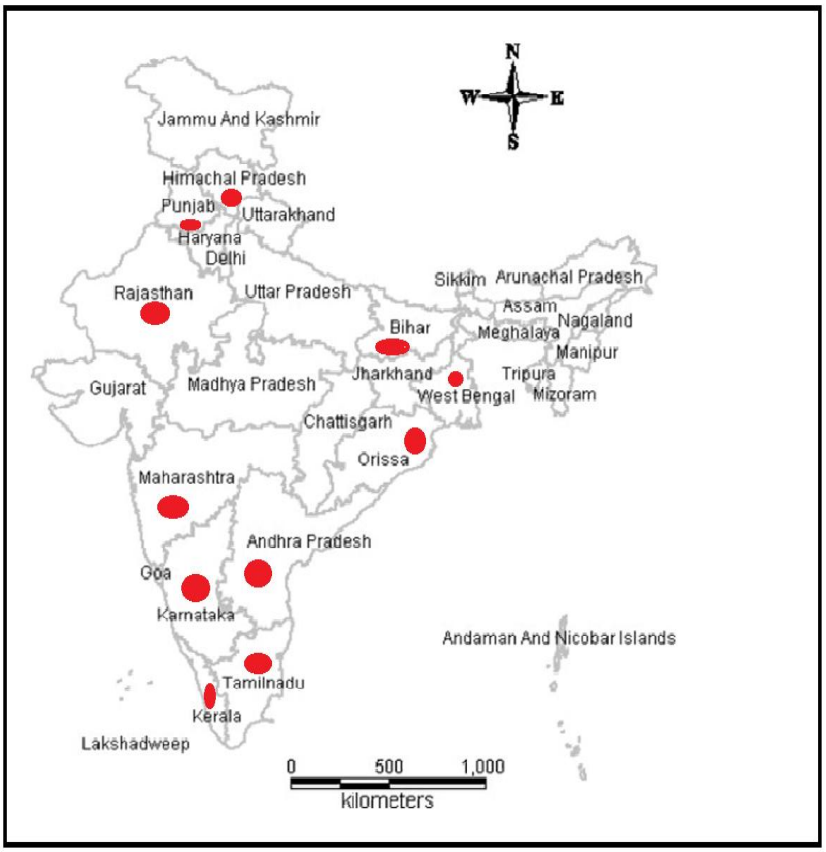
5) Ficus racemosa (leaf rooted)

6) Ficus racemosa (indian fig) tree.

CHAPTER 3 : REVIEW OF LITERATURE

Distribution and Production of Ficus Racemosa

The plant is large decidious tree distributed all over india from outer Himalayan ranges.Punjab,Khasia mountain,Maharashtra,Bihar,Orissa,West bengal,Rajasthan,Deccan and common in South India.it is found throughout the yeats, grows in evergreen forests, moist localities,and bank of streams,decidious forests,to the elevation of 1800m above sea level, often cultivated in villagesfor shade and edible fruits.



Classification and locality of ficus racemosa linn

Kingdom	Plantae
Division	Magnoliophyta
Class	Magnolipsida
Order	Urticales
Family	Moraceae
Genus	*Ficus*
Species	*Racemosa*

(Bhalerao et al., 2014)

Vernacular names of Ficus racemosa linn.

Sanskrit	Yajnayoga,Sadaphalah,Brahanvrkisha,Shitavalkah, Sutah,Udumbara,Gular,Mashakin,Jantukaphalah,Jantuphalah,Krmiphalah, Vasudrumah,Saumya,Hemadugdhaka,Jantumati,Yagniyah,Audumbara
Hindi	Pushp-hina, Pani Bhuj, Dumar, Goolar, Umari, Yajnyadumbur, Udumbara,Jantu-Phal,Dharma-Patra,Goolar
English	Gularfig,ClusterFig,CountryFig
Bengali	Udumbara
Telugu	Brahmamamidi, Atti, Bodda
Gujrati	Goolar, Umbaro
Manipuri	Heibong
Malayalam	Atthi, Atthi Al, Aththi, Atthi-al, Udumbaram, Jantuphalam
Marathi	Umbar,Udumbar
Urdu	Dumar
Oriya	Dimri
Konkani	Rhumbud
Irula	Athi
Kannada	Atti, Atti Mara
Others	Goolar, Atthi, Atteeka, Athi, Crattock, Country Fig, Dumrii, ClusterFig,Vellaiatthi,GularFig, Indian Fig, Redwood Fig, Rumbodo

(Verma et al.,2014)

Nutrient Content of Ficus racemosa(nutrient per 100 gm of fresh tissue)

Moisture content	80.20%
Crude protein	1.475gm
Protein(N x 6.25)	28.125gm
Total lipids	7.58%
Ascorbic acid	0.0053gm
Carotenoids	0.2 gm
Total Phenols	1.025gm
Anthocyanin	0.6864gm
Lycopene	0.0848gm
Chlorophyll; a) Chloroohyll a	0.00489gm
b) Chlorophyll b	0.00613gm
c) Total Chlorophyll	0.01102gm
Total carbohydrate	15.84 gm
Starch	0.146gm
Reducing Sugar	14.85gm
Non Reducing Sugar	0.099gm
Crude Fat	1.079gm
Crude Fibre	0.544gm
Mineral Content (turnes of ashyield)	2.632 gm

(Bhogaonkar., et al 2014)

Minerals contents of *Ficus racemosa* (mg/100gm fresh tissue)

Elements	**Qualitative**	**Quantitative**
Sulphur	+	-
Calcium	+	7.62gm-
Magnesium	+	-
Iron	+	315mg
Sodium	+	329mg
Potassium	+	49.3gm
Chlorine	+	-
Phosphrous	+	1312mg
Maganese	-	-
Copper	-	-
Nickel	-	-

(Chavhan V N, et al, 2014)

Comparisonofnutrientcontentof*Ficus racemosa* withotherplantspecies(Nutrientsper100 gm freshtissue)

Phytonutrients	***F. racemosa***	***F. carica***	***F. reliogiosa***	***P. dactylifera***
Moisture Content (gm)	80.2	88.1	62.5	59.2
Crude Fibre (gm)	0.5	2.2	9.9	3.7
Protein (gm)	28.12	1.3	2.5	1.2
Fat (gm)	1.0	0.2	1.7	0.4
Mineral (gm)	2.0	0.6	2.3	1.7
Carbohydrate (gm)	15.84	7.6	21.2	33.8
Carotene (□g)	200	162	NA	26
Ascorbic acid (mg)	5.3	05	NA	03
Calcium (mg)	30.5	80	289	22
Phosphorus (mg)	103	30	89	38
Iron (mg)	250	1.0	NA	0.96

(Kanerkar.,et al 2014)

Ficus racemosa – **Umber** *Ficus carica* – **Anjeer**
Ficus religiosa – **Pipal** *Phoenix dactylifera*-**Dates**

Macroscopic character of *Ficus racemosa* Linn. Leaves

	Description
Size	Lamina: Length 7-17cm, Breadth 3- 7 cm, Petiole: 3.2-8 cm
Shape	Ovate, Ovate- Lanceolate
Margin	Entire
Apex	Acute
Venation	Reticulate
Colour	Green (fresh), greenish brown (dried)
Odour	Not significant
Taste	Slightly acrid
Texture	Smooth, papery, glaucouse

(Subhash., et al 2010)

Physical constant values of *Ficus racemosa* Linn. Leaves

	Percentage*
Total ash	11.863
Acid insoluble ash	1.508
Alcohol (90%)soluble extractive	16.572
Water soluble extractive	19.107

(Each value is an average of three determinations) (Pulok., et al, 1999)

Structures of phytochemicals found in Ficus racemosa from various parts

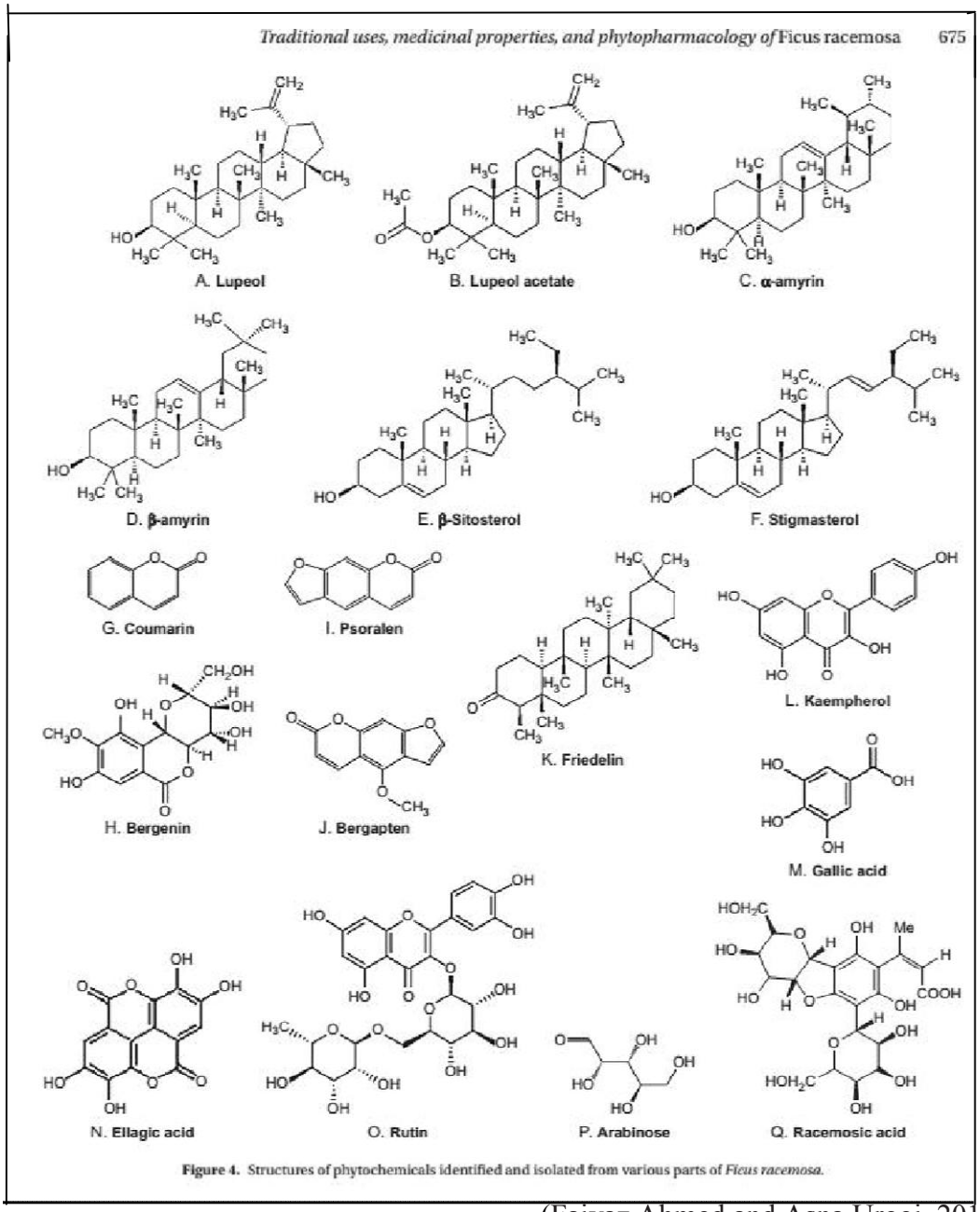


Figure 4. Structures of phytochemicals identified and isolated from various parts of *Ficus racemosa*.

(Faiyaz Ahmed and Asna Urooj, 2010)

Phytoconsitituent of ficus racemosa linn

Plant part	Phytoconsitituent	Reference
Leaf	Sterols, tannins and flavonoids, triterpenoids (Lanosterol) and alkaloids. A new tetracyclic triterpene glauanol acetate which is characterized as 13α, 14β, 17βH, 20αH-lanosta-8, 22-diene-3β-acetate and racemosic acid were isolated from the leaves	Kapur et al.,(1958)
Stem-Bark	Tannin, wax, saponin gluanol acetate, β-sitosterol, leucocyanidin- 3 – O – β – D - glucopyrancoside,leucopelargonidin – 3 – O – β – D - glucopyranoside, leucopelargonidin – 3 – O – α – L rhamnopyranoside, lupeol, ceryl behenate, lupeol acetate, α-amyrin acetate, leucoanthocyanidin, and leucoanthocyanin from trunk bark, lauanol acetate, lupeol, β-sitosterol and stigmasterol were isolated from stem bark	Srivastava et al., (1992)
Trunk-Bark	Upenol, β-sistosterol and stigmasterol	Husain et al.,(1992)
Fruit	Glauanol, glauanol acetate, hentriacontane, β sitosterol, glauanolacetate, glucose, tiglic acid, esters of taraxasterol, lupeolacetate, friedelin, higherhydrocarbons and other phytostero	Suresh., et al (1979)
Root	Cycloartenol, euphorbol and its hexacosanoate, taraxerone, tinyatoxin; bark euphorbol and its hexacosanate, ingenol and its triacetate, taraxerone	Kumar et al.,(2011)
Latex	a-amyrin, β-sitosterol, cycloartenol, cycloeuphordenol, 4-deoxyphorbol and its esters, euphol, euphorbinol, isoeuphorbol, palmitic acid, taraxerol, tinyatoxin, tirucallol, trimethyl ellagic acid	Bheemachari et al.,(2007)

Phytoconsitituent and their anti diabetic principals

Phyto chemicals	Anti Diabetic Principals	Referances
Alkaloids	Well known for their anti-diabetic activities by different mechanisms	Varma et al.,(2009)
β-Sitosterol	Have potential anti-diabetic activities	Alam et al., (2009)
Flavenoids	Flavonoids are known to regenerate the damaged pancreatic β-cells in diabetic animals.Well known for their anti-diabetic activities by different mechanisms.	Chakravarthy et al.,(1982) Varma et al.,(2009)
leucopelargonidin-3-O-β-Dglucopyranoside, leucopelargonidin-3-O-α-Lrhamnopyranoside	All of which are known to reduce hyperglycemia.	(Ahmed and Urooj (2009)
Lupeol	Showed elevated serum insulin level and concomitant reduction ofserum glucose, Has potential anti-diabetic activity.	Gupta et al., (2012), Alam et al., (2012)
Polyphenolic compounds	Have anti-oxidant and free radical scavenging properties that might be responsible for the anti- diabetic activity.	Heroor et al.,(2013)
Saponins	Well known for their anti-diabetic activities by different mechanisms.	Verma et al.,(2009)
Tannins	Known to possess anti-diabetic activity, have a potential hypoglycemic effect.	Vivek et al., (2010), Rizvi and Mishra.,(2013)

Botanical uses of ficus racemosa linn.

PLANT PART	USE	Reference
Fruits	Used in leprosy, diarrhoea, circulatory and respiratory disorders and menorrhagia Tender fruits are used as astringent, stomachic, refrigerant, in dry cough, loss of voice, diseases of kidney and spleen, astringent to bowel, styptic, tonic, useful in the treatment of leucorrhoea, blood disorder, burning sensation, fatigue, urinary discharges, leprosy, epitasis, carminative and intestinal worms. They are also useful in miscarriage, spermatorrhoea, epididymitis, cancer, myalgia, scabies, haemoptysis, intrinsic haemorrhage and extreme thirst	Joseph et al., (2010) Prabhakar et al.,(1990)
Roots	Roots are used in dysentery, pectoral complaints, and diabetes, applied in mumps, other inflammatory glandular enlargements and hydrophobia	Vedavathy et al.,(1995)
Bark	It is highly effective in threatened abortion and also recommended to treat Menorrhagia, leucorrhoea, gonorrhoea, urinary diseases, hemorrhage and skin diseases . The bark is highly recommended in urological disorders, diabetes, hiccough, leprosy, dysentery and piles.	Chopra et al.,(1958)
Leaves	The leaves are excellent wash for wounds and ulcers. They are useful in dysentery and diarrhea. The infusion of bark and leaves is also employed as mouth wash to spongy gums and internally in dysentery, menorrhagia, efficient remedy in glandular swelling, abscess, chronic wounds, cervical adenitis and haemoptysis	Rao et al.,(1995)
Latex	It is administered in haemorrhoids, boils, alleviates the edema in adenitis, parotitis, orchitis, traumatic swelling, toothache, vaginal disorders, diarrhoea particular in childrens and also	Paarakh et al.,(2009) Mukherjee et al.,(1995)

	aphrodisiac. Latex is applied externally on chronic infected wounds to alleviate edema, pain and to promote the healing The latex is reportedly used for treating piles	
Root Sap	It is used for treating diabetes The sap of this plant is a popular remedy for mumps and other inflammatory enlargements In Sri Lankan indigenous system of medicine, it is used in the treatment of skeletal fracture. The Australian aborigines use this plant in the treatment of mumps,smallpox, heamaturia, menorrhagia and inflammatory conditions. In Siddha the bark, fruits and latex are used to treat constipation, anaemia and dysentery	Patil et al.,(2009) Sharma et al.,(2008).

Pharmalogical Actions of Ficus racemosa

Pharmacological actions	Parts used	Extract	Experimental models	References
Antihyperglycemic	Steam-bark Stem-bark Fruits	Ethaol Metanol Metanol	Alloxan - induced Alloxan induced Alloxan - induced	Channabasavaraj et al.,(2008) Bhaskara et al.,(2003)
Antitussive	Stem bark	Methanol	Cough-induced model by sulphur di oxide gas	Rao et al.,(2008)
Hepatoprotective	Steam bark Leaf	Methanol Ethanol	Hepatotoxicity induced by Ccl4 Hepatotoxicity induced by CCl4	Biswas et al.,(2003), Chandrashekhar et al., (2008)
Antioxidants	Fruits	Ethanol	DPPH free radical scavenging assay	Ratnasooriya. , et al (2003)
Wound healing	Steam bark	Ethanol	Excised and Incised wound model	Mukherjee et al., (1998)
Antidiarrheal	Steam bark	Ethanol	Castor oil–induced diarrhea PGE2-induced enter pooling	Khan and Sultana., (2005)
Anti-inflmmatory	Leaf		Carrageenan-, serotonin-, histamine-, and dextran-induced rat paw edema	Khan and Sultana (2005)
Antiulcer	Fruit	Etahnol	Pylorus ligation, ethanol induced, cold restraint stress	Sukhramani et al., (2013)
Antibacteria	Leaf	Petroliu m Ether	*E. coli, B. pumilus, B. subtilis, P. aeruginosa, S. aureus*	Mandal et al.,(2000)

Hypolipidemic	Bark	Ethanol	Alloxan-induced	Maity et al.,(2000)
Renal anticarcinogenic			Potassium bromate induced nephrotoxicity, Ferric nitrilotriacetate-induced nephtotoxicity	Leach et al.,(2004), (Faiyaz and Manjunath.,(2011)

Experimental methods followed by various scientist Ficus on racemosa.

Plant part	Animal model used	Extract type	Dose	Duration	Route	Reference
Root	*In vivo*. Adult albino Wistar rat of either sex weighing between 150-240 g	Metanolic	100,200 and 400mg/kgbw	15 days	Oral	Verma et al.,(2009)
Root&Bark	*In vivo*. Male Wistar albino rats having a weight of 170-220 g	Ethanolic	200 and 400 mg/kgbw	4 Weeks	Oral	Samyal et al.,(2014)
Bark	*In vivo*. Swiss albino mice and rat of either sex, weighing 25-30 g and 150-200 g, respectively	Metanolic	100 and 200 mg/kgbw	21Days	Oral	Heroor et al.,(2013)
Bark	*In vivo*.Sprague-Dawley rat of either sex; weighing 200-220g.	Aqueous& A lcoholic	400mg/kgbw	21 Days	Oral	Sachan et al.,(2009)
Bark	*In vivo*. Albino Wistar male rat 7 to 8 weeks old; weighing 150-200g	Ethanolic	300mg/kgbw	45Weeks	Oral	Sophia and Manoharn (2007)
Steam bark	*In vivo*. Healthy adult male Wistar rat between 8-9 weeks of age; weighing 140-160g	Bark Powder&A q ueous extract	500mg/kgbw	6Weeks	Oral	Ahmed and Urooj.,(2009)
Leaf	*In vivo*. Male and female Wistar albino rat having weight 180- 230g	Methanolic (50%&70%)	250 and 500 mg/kgbw	4Weeks	Oral	Maurya et al.,(2011)
Leaf	*In vivo*. Albino Wistar rat of either sex; 200-250g	Ethanolic	100,200 &300mg/kgbw	Single Dose	Oral	Patil et al.,(2010)

Leaf	*In vivo*. Male albino rat 180-210g	Ethanolic	100, 250 &500mg/kgbw	10Days	Oral	Vivek et al.,(2010)
Fruit	*In vivo*.Sprague-Dauley rat of Either sex, weighing 200-250g	Ethanolic	200mg/kgbw	21Days	Oral	Ramana et al., (2011)
Fruit	*In vivo*. Swiss albin mice aged 4-5 weeks average weight 20-25g	Ethanolic	100 and 200mg/kgbw	14 Days	Oral	Zulfikir et al.,(2011)

Current status, limitations and remedies

Except for the use of *F. racemosa* plants for local health care needs, not much information has been available on their market potential and trading possibilities. A major factor impeding the development of the medicinal plant based industries and commercial use of these plant extract in developing countries has been the lack of information, systematic data and insufficient in-depth research on the social and economic benefits that could be derived from the industrial utilization of these medicinal plants Silva.,(1996). As a result, the governments or entrepreneurs have not exploited the real potential of these plants. In developing countries, diabetes-specific barriers include lack of patient education about diabetes and diabetes management, stigmatization, too little/weak diagnosis and treatment facilities, negligence, poor training of healthcare professionals (HCPs) and the cost of the anti-diabetic products. Changing diabetes situation in Bangladesh requires partnerships with public and private sectors to strengthen the healthcare system, patient empowerment, access to treatment and advocacy combined with patient-focused investments in the quality of healthcare delivery. Several authors are currently being undertaken to isolate the active compounds by bioassay-guided fractionation from the species that showed high biological activity during screening Pathak and Das., (2013). Studies on such plants with respect to their efficacy, safety profile, adverse interaction, proper standardization, etc. need to be conducted with utmost priority not only by the respective manufacturers but also by the pharmacy, pharmacognosy and medicinal enterprises.

CHAPTER 4:

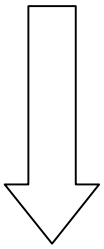
EXPECTED RESEARCH OBJECTIVES :

1) Drying of of Ficus Racemosa fruits at different temperatures and determination of phytochemicals retention.
2) To prepare and evaluate the *Ficus Racemosa* enriched nuggets and Instant Beverage Mix.
3) Storage studies of the developed beverages by using different packaging materials and at different storage conditions.
4) Consumer studies of developed products.

CHAPTER 5 : PROPOSED RESEARCH METHODOLOGY

EXPERIMENT 1 - Drying of of Ficus Racemosa fruits at different temperatures and determination of phytochemicals retention.

Plant Part	Drying Temperature
Fruit	45°
Fruit	55°
Fruit	65°



Phyto-Chemical Testing

Experiment 2 : To prepare and evaluate the *Ficus Racemosa* enriched nuggets.

On the basis of the phytochemicals attributes, the best part of the plant will be selected and will be utilized for the nuggets preparation as per the procedure given below.

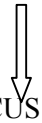
Sr No	Black Gram Dal(%)	Ficus Racemosa Powder (best)	Salt	Black Pepper(%)
1	0	0	0.5	0.5
2	50	50	1	1

Design : RSM
No of Replication : 3

PREPARARTION OF RAW MATERIAL

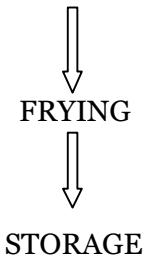
BLACK GRAM WERE WASHED AND SOAKED FOR 12 hr

THEN GRIND THE BLACK GRAM IN PASTE FORM



MIXING OF FICUS RACEMOSA POWDER

SALT AND PEPPER WERE ADDED



Experiment 3 : – Storage studies of the developed beverages by using different packaging materials and at different storage conditions.

Storage condition	Storage Duration
Ambient	0
Refrigerated	30
	60
	90

No. of treatments = 2×4=8

Number of replication = 3

Experiment 4 : - Consumer studies of developed products.

Consumer studies for the acceptance and rejection of the product will be carried out using the hedonic scale.

Chemical composition

6.1.1 Protein content *AOAC 2000*

6.1.2 Fat content *Ranganna 2016*

6.1.3 Crude fibre content *AOAC 2000*

6.1.4 Moisture content *AOAC 2000*

6.1.5 Ash content *AOAC 2000*

6.1.6 Sugars *AOAC 2000*

6.1.7 Dietary fibre content *AOAC 2000*

6.2 Phytonutrient composition

6.2.1 Flavonoids *AOAC 2000*

6.2.2 Tannins *AOAC 2000*

6.2.3 Phytic acid *AOAC 2000*

6.2.4 DPPH assay *AOAC 2000*

6.2.5 Metal chelation *AOAC 2000*

6.2.6 Ascorbic acid	*AOAC 2004*
6.2.7 Phenols	*AOAC 2000*
6.2.8 FRAP	*AOAC 2000*
6.2.9 Chlorophyll	*AOAC 2000*
6.3 Antimicrobial activity	*AOAC 2000*
6.3.1 Antidiabetic activity	*AOAC 2000*
6.3.2 FTIR	*AOAC 2000*
6.4 Organoleptic evaluation	

CHAPTER 6 : EXPECTED RESEARCH OUTCOMES

Ficus Recemosa shows antimicrobial, antioxidants property show it will shows the health benefits to public consumption. People who are still not aware of this plant will get aware of its uses , ultiliztion in different form. The expected product will be rich in carbohydrates, iron and sodium.The main aim is to standardize the drying technique in which the dried fruits will have the retention of maximum amount of nutrients in it. Thus the product developed from the dried will be beneficial for maintaining good health or for its nutritional benefits

Future prospect

. Majority of experiments confirmed benefits of *F. racemosa* in the management of diabetes mellitus. Numerous mechanisms have been proposed for this plant extracts. All of these actions may be responsible for the reduction of diabetic complications Bnouham et al.,(2006). There occurs a selective decrease in the hyperglycemic state after the administration of extracts of different parts of the plant, which may be mediated through a number of bioactive compounds present in the extract Khan et al., (2011). Herbal drugs have increased in popularity due to their natural origin, lesser side effects and low cost. It is recommended that the plant extract of *F. racemosa* can be successfully utilized in combination for the cure of diabetes and related diseases due to their hypoglycemic action. Polyherbal therapy is said to be a better choice in the treatment of diabetes mellitus having the advantage of producing maximum therapeutic efficacy with minimal side effects. This may provide synergistic, potentiative, agonistic/antagonistic pharmacological properties within themselves because of the presence of vast range of phytobioactive constituents Raghavendra et al., (2011). This also gives an opportunity to reduce the dose of herbs used for glycemic control in order to avoid the

burden of herbal overdosing. Therefore, such combined therapy might be the key future driving force in the realm of green pharmacology and pharmacognosy Rawat et al.,(2012).

Conclusion

The plant parts of *F. racemosa*, which has been used as a crude drug for the welfare of mankind in old civilization, is now of a matter of concern due to its unexplored potentials obtained by various modern techniques. *F. racemosa* possess compounds that have potential anti-diabetic activities as discussed in the present paper. Such knowledge can be applied in future studies aimed at a safe, evidence-based use of traditional medicinal plants in global phyto-pharmacotherapy and also for the discovery of novel leads for herbal drug development, might be useful for the developing as well as the developed countries

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