

**UTILIZATION OF *Ficus geniculata* (PUTKAL) FOR DEVELOPMENT OF VALUE-  
ADDED PRODUCT**

**PRE-DISSERTATION REPORT**

**Submitted by**

**MADHU KUMARI**

Registration No. – 11709391

Programme – M.Sc. (FOOD TECHNOLOGY)

Section H1730

**School of Agriculture**

**Lovely Professional University, Phagwara**

**Under the Guidance of**

Dr. Vikas Kumar

Assistant Professor

**School of Agriculture**

**Lovely Professional University, Phagwara**





### ***CERTIFICATE***

This is to certify that Madhu Kumari has personally completed M.Sc. Pre-dissertation entitled, “*Utilization of Ficus geniculata (putkal) for development of value-added product*” 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

Dr. Vikas Kumar  
Assistant Professor

**School of Agriculture**

**Lovely Professional University, Phagwara**

## DECLARATION

I hereby declare that the work presented in the pre- dissertation report entitled “**Utilization of *Ficus geniculata* (putkal) for development of value-added product**” 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 Science in Food Technology.

**Date:**

**Madhu Kumari**

**Place:** Phagwara, Punjab (India)

**Registration No. :** 11709391

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**

**Date:**

Assistant Professor(Food Technology)  
School of Agriculture

Lovely Professional University  
Phagwara, Punjab, India

## *INDEX*

<i>CHAPTERS</i>	<i>TOPICS</i>	<i>PAGE NO.</i>
1.	Introduction	
2.	Problem Background	
3.	Review of Literature	
4.	Proposed Objectives	
5.	Proposed Research Methodology	
6.	Expected Research Outcome	
	References	

## **CHAPTER 1: INTRODUCTION**

### **1.1 FICUS (Ficus Cracia)**

From the ancient time “fig” a fruit which is desiccated as well as stored by human. The Sumerian civilization, Phoenicians, Ancient Greek and Old Chinese are the evidence for the promotion of the fig culture as well as storage of its leaves and fruit for consumption. It is found in various piece of world and based on that it is known by the diverse name like "fig" in English , "anjir" in India, "higo" in Spanish, "Figue" in French and "fiege" in German. (Imran etal, 2011).

Ficus belong to moracease family which is an evergreen and deciduous tree and its taxonomy detail is given in table no. 1 .They are found in tropical and also subtropical territories. The class ficus constitute one of the biggest genera were 511 ficus tree exist in Asia , Malaysia , Pacific island and South America , 112 of Ficus species have found in Africa, South of Sahara and Madascar (Kala etal).

Vegetative characteristics of the ficus are extremely variables. These are generally organised in the ficus are stipules, leaves and fruits, sometimes trunk and formation of prop root. In all ficus we find a “Milky white fluid” fluid when we broke it any parts of the plants. This is very vast collection which includes 1800 species. Stipules which is a commonly present in which pair of stipules encloses the end of each twig providing a sheath for the new leaf and most of cases stipules falls at early stages (deciduous in nature). Leaves varies from different species of ficus is like alternate, simple, wavy margin, ovate, floagate.Fig carcia leaves is having deeply lobed leaves (Brown etal, 2016)

Ficus is classified as Kingdom: Plantae, Division: Magnoliophyta, Class: Magnoliopsida, Order: Urticales, Family: Moraceae, Genus: Ficus, Species: carica. Ficus carcia shows many traditional health effects (Prasad et al., 2006).It also cure the disorders of the endocrine system (diabetes), respiratory system (liver diseases, asthma, and cough), gastrointestinal tract (ulcer and vomiting), reproductive system (menstruation pain), and infectious diseases (skin disease, scabies, and gonorrhea).

The nutrient supplement of dried figs , they are the rich source of minerals and vitamins, giving per 100 g serving the accompanying: iron, 30%; calcium, 15.8%; potassium, 14%; thiamin (B1) 7.1%; and riboflavin (B2) 6.2%. Figs are without sodium and in addition fat and cholesterol free . Fig natural products contain minimum 17 amino acids, among which

aspartic acid and glutamine are the most amazing ones . Dried figs contain moderately high amount of unrefined crude fibre (5.8%, w/w), higher than those of all other regular natural products . Over 28% of the fiber is of the solvent type, which has aid to control of blood sugar and blood cholesterol and in weight reduction. The concentration of polyphenols in dried figs is high among the commonly consumed fruit and beverages (Salmon et al, 2006).

Ficus species contain flavanoids glycosides, phenolic acids, steroids , saponins, coumarins, alkaloids, tannins, triterpenoids-oleanolic acids, ursolic acid,  $\alpha$ -hydroxy ursolic acid, gallic acid, ellagic acid, protocatechuic acid, maslinic acid. The phenolic compounds are likewise found are gallic acid and ellagic acid. Furanocoumarins are additionally found. Non-enzymatic and enzymatic are likewise found were ascorbate oxidase, ascorbate peroxidase, catalase, peroxidase are enzymatic constituents and flavanoids, vitamins, phenolic mixtures are non-enzymatic. In leaf, bark and heartwood of *F. palmeri* –  $\beta$ -sitosterol and tetracyclic triterpene-glaunol, were found. *F. benjamina* likewise contains cinnamic acid, lactose, naringenin, quercetin, caffeic acid, stigmasterol in the leaves, barks and natural products (Sirisha et al, 2010).

Ficus species are utilized as nourishment , encourage, restorative reason. *Ficus racemosa* are utilized as a part of gastrointestinal issues and barks of *F. arnottiana* and *F. hispida* additionally indicate hypoglycaemia activity. *F. bengalis* likewise demonstrates anthelmintic movement which represses insulin action from liver and kidney. It additionally demonstrates displays hostile to tumor action . They are additionally use in gastric issues and scabies, respiratory confusion , gonorrhoea , draining , loss of motion, diabetes, loose bowels, bone break . disinfectant, astringent cure. Figs (organic products ) additionally contains amino acids asparagine and tyrosine and in palatable part are alanine , threonine, tyrosine, and valine in seeds , alanine and valine in proteins( Sirisha et al, 2010).

*Ficus carica* is 15-20 feet tall deciduous tree with branch and trunk having the diameter of 7 feet The milky white ( latex ) of the plant is which contain ficin (Badgular, 2011). Its roots are shallow and spreaded. Figs are axillary on leafy branchlets, and usually pear shape. The fig which are matured has tough peel, which on ripening stage get crack and its pulp are exposed. Its flower have receptacles which grow from its old leaves Female flower is located on upper part were as the down the male flower. The receptacles which are ripen contain seed. The number of the seed is 30-1600 per fruit in different size. The colour of the leaves is bright green and its bark is smooth .

## **Ficus geniculata**

Among all *Ficus geniculata* is one of them which isn't being touch in the field of research till now. In India there are extensive number of group are living and from the old time frame they are generally utilizing the wildy verdant vegetables for eating and also therapeutic treatment. But these learning are simply known just by the neighbourhood and clan community. Jharkhand is a state in eastern India where 26.2% of aggregate rate is of the calendar clan individuals and Oraon are the second biggest clans which is completely relied upon the horticulture of vocation (Jerath etal,2015). They use as various purposes .More as 130 assortments of indigenou nourishment are distinguished; huge numbers of them are rich wellspring of micronutrient and macronutrients. In beneath some rundown of the vegetables are given which is being not known by the all individuals because of absence of absence of information regarding this species

The same number of advantages are seen about the diverse ficus species and additionally the Jharkhand tribal organic products which are picked as eating, therapeutic and furthermore demonstrate antioxidicity, antimicrobial movement property yet at the same time

## **NUGGETS**

Nuggets are commonly known as warrians or chunks. It is having small cube shape. Green gram is also used for the preparation of nuggets , is one of the traditional preparation in India and utilize throughout the year(Yadav and Khetarpaul, 1993).

Particularly saturated fats are not on consumer demands, resultant in the decreased consumption of fat in diet.Due to its deliciousness its demand has been increasing in the market. Generally different type of nuggets are prepared from black gram with the addition of salt, dietary fibres and black pepper. Black gram is a rich source of all the nutrients which includes include 20 to 25% of proteins, 40 to 47% of starch along with ash, fats, carbohydrates and essential vitamins.It is consumed in different form either consumed after boiling or without boiling it is directly consumed or sometimes it hull is removed then consumed.It is used various culinary delight and and its good for the diabetic person.For the proper nugget preparation its should be well whipped and consistency and density should be proper maintained.The batter small droplet is set on an oil spread plate and dried under sun.The end point of cooking give crispy texture and hollow inner core shape. It is expected that appropriate shape and surface of nugget is straightforwardly related with the consistency of the batter by changing the moisture content and level of air circulation (Nilanthi etal, 2014).

## **CHAPTER 2: PROBLEM BACKGROUND**

Leucorrhoea is a vaginal discharge at the time of female reproductive cycle. It is generally caused by the improper diets as well as loss of iron in the blood. Sometimes due to diabetics also lead to leucorrhoea. Due to which wound is caused on vagina lead to itching. In that case combination of all these help in curing problems i.e. Root of jhajhuni (*Mirabilis jalapa*), Kela and putkal (*Ficus geniculata*) are crushed together and juice is made from that. And this is consumed 2 times in a day (Tomar, 2012).

Polyphenol is the largest group of phytochemical which demonstrates the superb properties of antioxidant and play a major role in the scavenger which are required for decrease homeostasis which are responsible for degenerative diseases. And the *Ficus geniculata* contain  $6.04 \pm 0.29$  phenol content (Mahadkar et al, 2013). *Phutkal*, and the product of the *sarai* (*Bambusa arundinacea*) plant were utilized to treat stomach ailments, for examples, diarrhea, and vomiting. *Phutkal* has high levels of zinc which may be the reason for its efficacy in treating diarrhea.

Now days 10 million of people are suffering from the Urinary tract infection and one of the five women are suffering from the life time problem. And the 90% of the people are caused by the bacteria *E.coli*, *S.aureus*, *Klebsiella sp.*, *Proteus vulgaris*, *Pseudomonas aeruginosa*, *acinetobacter* and *serratia*, and they are gram negative bacteria. Bacteria enter in the urinary tract through urethra and begin to multiply in bladder. Uropathogens which is attached to epithelial cell wall they form colony which lead to the tissue damage. Now a trend of modern medicines with combination of traditional plants which help in curing the urinary tract infection as well as gastro-intestinal effects in *Ficus geniculata* also play an important role (Kumari, 2016).

The main concern is that shoot of the *Ficus geniculata* is not available all the year as well as the people are not aware about its benefits.



## **CHAPTER 3: REVIEW OF LITERATURE**

### **TAXONOMY OF FICUS**

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

Table No.- 1(Sirisha etal, 2010).

### **Table 2: VERNACULAR NAME OF FICUS (*Ficus carica*) ARE LISTED BELOW**

<b>Region/language/ system of medicine</b>	<b>NAMES</b>
English	Common fig tree, Fig
Hindi	Anjeer, Anjir, Tin
Sanskrit	Angira, Anjeer, Anjir, Anjira, Phalgu, Rajodumbara, Udumvara
Eastern India	Doomoor, Angir, Dumur, Dumar, Udumbara

Western India	Anjir, Anjeer, Angir
Southern India	Anjeera, Anjoora, Anjooram, Anjura, Anjuru, Appira, Cevvatti, Chikappatti, Cimaiyatti, Madipatu, Manchi Medi, Manjmedi, Shima-Atti, Shimayatti, Simaatti, Simayatti, Simeyam, Simmeatti, Tacaiyatti, Tenatti, Tenatti, Teneyatti, Theneyatthi, Utumparam
Northern India	Fagari
Urdu	Poast, Darakht Anjir, Anjir Zard
Unani	Anjir
Arabic	Anjir, Teen, Teen barchomi, Ten
Brazil	Figo, Figueira, Figueira-Da-Europa
Portuguese	Figueira-Do-Reino
Burmese	Thaphan, Thinbaw, Thapan
Chinese	Mo Fa Guo, Wu Hua Guo
Cook Islanda	Suke
Croatian	Smokva, Smokvencia, Smokvina
Czech	Smokvon
Danish	Almindelig Figen, Figen

Dutch	Echte Vijeboom, Gewone Vijgeboom, Vigg
Estonian	Harilik, Viigipuu
Ecuador	Higo
Finnish	Viikuna
French	Caprifuier, Carique, Figue, Figuier, Figue Commune
German	Echte Feige, Echter Feigenbaum, Essfeige, Feige, Feigenbaum
Hungarian	Fugea
Italian	Fic, Fico, Fico Comune
Iran	Anjeer
Japanese	Ichijiku
Korean	Mu Hwa Gwa, Mu Hwa Gwa Na Mu
Macedonian	Smoka
Malaysia	Anjir
Mangarevan	Pika
Marshallese	Wojke, Piik

Nepalese	Anjiir
Norwegian	Fiken
Pakistan	Faag, Anjeer, Injir, Baghi, Inzar, Anzar, Anjir
Palestinian	Fig
Persian	Anjir, anjeer
Palauan	Uosech
Polish	Figowiec

Russian	Inzir
Samoan	Mati
Serbian	Smoka, Smokovnica, Smokva
Spanish	Breva, Higo, Hibuera comun
Solvascina	Figa, Figovec, Figovina
Solvencina	Figonik
Swedish	Fikon, fikontrad
Tongarevan	Monamona

Taumotuan	Tute
Turkey	Incir, Yemis
Vietnamese	Qua Va, Vo Hoa Qua

Nadkarni et al (1982), Kirtikar and Basu et al (1995), Khare et al (2007), Lin (2012) and Badgular et al, 2014.

### **ORIGIN AND DISTRIBUTION**

The Fig is originated in the Asia but now a day it has been grown throughout the world but in some place growth is in large concentration. Its wide distribution in different countries are : United States, Turkey, England, Algeria, Tunisia, Syria, Spain, Italy, Jordan, New Zealand, Puerto Rico, Greece, Israel, China, Australia. According to (Mawa et al, 2013) it originate from from Western Asia and spread to the Mediterranean by humans. It is also an imperative world crop today. Turkey, Egypt, Morocco, Spain, Greece, California, Italy, Brazil, and other places with typically mild winters and hot dry summers are the major producers of edible figs.

### **PHOTOCHEMICALS PROPERTIES OF FICUS** (Mawa et al, 2013)

The bioactive compounds which are present in

**FIG:** are phenolic compounds, phytosterols, organic acids, anthocyanin composition, triterpenoids, coumarins, and volatile compounds such as hydrocarbons, aliphatic alcohols. Phenolic compounds, organic acids, and volatile compounds which are mostly present in most of the species. The leaves of the fig contain Phenolic acids such as 3-*O*- and 5-*O*-caffeoylquinic acids, ferulic acid, quercetin-3-*O*-glucoside, quercetin-3-*O*-rutinoside, psoralen, bergapten, and organic acids (oxalic, citric, malic, quinic, shikimic, and fumaric acids).

**LEAVES:** The volatiles compound which are found in the leaves which are differentiated in different classes such as aldehydes: methylbutanal,

2-methylbutanal, (*E*)-2-pentanal, hexanal, and (*E*)-2-hexanal, alcohols: 1-penten-3-ol, 3-methyl-1-butanol, 2-methylbutanol, heptanol, benzyl alcohol, (*E*)-2-nonen-1-ol, and phenylethyl alcohol, ketone: 3-pentanone, esters: methyl butanoate, methyl hexanoate, hexyl acetate, ethyl benzoate, and methyl salicylate, monoterpenes: limonene and menthol, sesquiterpenes:  $\alpha$ -cubenene,  $\alpha$ -guaiene,  $\alpha$ -ylangene, copaene,  $\beta$ -bourbonene,  $\beta$ -elemene,  $\alpha$ -gurjunene,  $\beta$ -caryophyllene,  $\beta$ -cubebene, aromadendrene,  $\alpha$ -caryophyllene,  $\tau$ -muurolene,  $\tau$ -cadinene,  $\alpha$ -muurolene, germacrene D, and (+)-ledene, norisoprenoid:  $\beta$ -cyclocitral, and miscellaneous compounds: psoralen.

**FIG FRUIT AND BARK:** they benzyl aldehyde, benzyl alcohol, furanoid, linalool, pyranoid (*trans*), cinnamic aldehyde, indole, cinnamic alcohol, eugenol, and *trans*caryophyllenes sesquiterpene: germacrene D, hydroxyl caryophyllene, angelicin, and bergapten [ cyaniding as aglycone and some pelargonidin derivatives and also conatin volatiles compound .

**FRESH AND DRIED FIG SKINS:** Total and individual phenolic compounds, phenolic acid, chlorogenic acid, flavones, and flavonols. dried figs contained total higher amounts of phenolics than the pulp of fresh fruits, owing to the contribution of the dry skin.

**PULPS AND PEELS OF FIGS:** Phenolic acids; 3-*O*- and 5-*O*-caffeoylquinic acids, ferulic acid, quercetin-3-*O*-glucoside, quercetin-3-*O*-rutinoside, psoralen, and bergapten, and organic acids (oxalic, citric, malic, shikimic, and fumaric acids). Phenolics, anthocyanins, fructose, glucose, and sucrose presence were also seen.

**FRUIT:** contain aldehydes: 3-methyl-butanal, 2-methylbutanal, (*E*)-2-pentanal, hexanal, heptanal, octanal, and nonanal, alcohols: 1-penten-3-ol, 3-methylbutanol, benzyl alcohol, (*E*)-2-nonenol, and phenylethyl alcohol, ketone: 6-methyl-5-hepten-2-one, esters: methyl hexanoate, methyl salicylate, and ethyl salicylate, monoterpenes: limonene, menthol,  $\alpha$ -pinene,  $\beta$ -pinene, linalool, eucalyptol, sesquiterpenes:  $\alpha$ -cubenene, copaene,  $\beta$ -caryophyllene,  $\tau$ -muurolene,  $\tau$ -cadinene, and germacrene D, norisoprenoid:  $\beta$ -cyclocitral, and miscellaneous compounds: eugenol.

## BIOLOGICAL ACTIVITY

PART	ACTIVITY
Latex	Anticancer activity

Leaves	Hepatoprotective activity
Leaves	Hypoglycemic activity
Leaves	Hypolipidemic activity
Fig	Antibacterial activity
Fig	Anti-fungal activity
Fig	Antipyretic Activity
Leaves	<i>Antituberculosis Activity</i>
Leaf	Cough
Fruit, root, and leaf	Colic treatment
Fruit, root, and leaf	Indigestion
Fruit, root, and leaf	Loss of appetite
Fig	Antidiarrheal
Fig	Metabolic
Fig	Cardiovascular
Fig	Respiratory
Fig	Antispasmodic
Fig	Anti-inflammatory
Fig	Antiplatelet, inflammatory, and gut motility
Fig	Antioxidant
Fig	Laxative
Leaf	Prevention of nutritional anaemia
Leaf	Anthelmintic
Leaf	Irritant potential
Fruit	Nutritive diet
Fig fruit	Various drug preparations
Leaf	Tuberculosis
Fig	Anticancer
Fruit	Mild laxative, expectorant, and diuretic

Table no- 3 (Aziz et al, 2013)

## NUTRITIVE VALUE OF *Ficus carica*

MINERALS	Mg/100g
Potassium	382.4-611.5 mg/100g
Magnesium	110.50-202.40 mg/100g
Calcium	78.72–132.80 mg/100g
Sodium	5.58–17.84 mg/100g
Ferrous	5.69–10.09 mg/100g
Phosphorous	31.91-76.96 mg/100g
Copper	0.25-0.42mg/100mg
Zinc	0.32-0.62 mg/100g
Nickel	below the detection limit (0.1 mg/l)
Cobalt	below the detection limit (0.1 mg/l)

(Khan et al, 2011)

### Vernacular name of *Ficus geniculata*

*Ficus geniculata* species which is yet obscure by people in general and in addition in the creating divisions its advantages utilizes all are uninformed. *Ficus geniculata* is one of those in tables which is being under-used. And it is usually known as "Putkal" in Jharkhand, "Mong lor" in Meghalaya, "Phak Huead Daeng" in Thailand, Khongnang Taru in Manipur and Duba, Jan and Nala and so forth in Assam.

### Area and Production

*Ficus geniculata* belongs to moraceae family and it was first time revealed in the in Manipur in India, and also found in the Jharkhand in the month March-April blooming and fruiting and large happens in May – August. Its propensity is tree and territory in deciduous woods edge and its tree are found in the forest (Singh et al, 2014). *Ficus geniculata* is discovered all around in Asia, Bangladesh, China, India, Laos, Myanmar, Nepal, Thailand, and in India Andaman & Nicobar and Vietnam and privately dispersed in Arunachal Pradesh, Assam, Jharkhand, Bihar, West Bengal, Meghalaya, Orissa, Sikkim, Tamil Nadu. It is for the most part discovered Oran innate of Jharkhand. (Chaudhary et al, 2012).

### CLASSIFICATION:



**Botanical name:***Ficus geniculata*

**Family:** Moraceae

**Genus:**Ficus

**Species:**Geniculata

**NUTRITIVE VALUE OF *Ficus geniculata***

As all the plant we uptake consist of different nutritive value which are beneficial for our health.

**NUTRITIVE VALUE OF *Ficus geniculata*(on dry dry basis)**

S.no.	Elements	g/ 100g	References
1	Protein	18.7g/100g	(Jerath etal, 2015)
2.	Total fat	1.8g/100g	
3.	Total carbohydrates	58.4g/100g	
4.	Dietary fiber	45.1g/100g	
5.	Vit A ( $\beta$ -carotene)	530 $\mu$ g/100g	
6.	VIT C	5mg/100g	
7.	Calcium	672mg/100g	
8.	Iron	8.89mg/100g	
9.	Zinc	4.63mg/100g	
10.	Sodium	11.3mg/100g	
11.	Folic acid	10.9 $\mu$ g/100g	
12.	Energy	324Kcal/100g)	
13	Ascorbic acid (Vit C)	146.00 mg/100g	(Gupta eatal, 2017)
14.	Magnesium content	41.11 mg/100g	
15.	Potassium content	6.33 mg/100g	
16.	Sulphur content	13.36 mg/100g	

17.	Iron contents	1.33 mg/100g	
18.	Calcium content	27.82 mg/100g	
19.	Phosphorous content	13.32 mg/100g	
20	Ferrous contents	1.33 mg/100g	
21	Manganese	099mg/100g	
22	Zinc	0.11 mg/100g	

(Jerath et al, 2015) (Gupta et al, 2017)

#### TOTAL FLAVONOL CONTENT GAE mg/g of dry material (Mean ±SEM)

S.No.	Sample	mg/g
1.	Aq methanol extract	41.73±0.011
2.	Acetone extract	7.35 ±0.03

(Tapan et al,2011).

The reducing ability of the aqueous methanol extract of the nine wild edible plants in descending order was *B. purpurea* > *D. pentagyna* > *G. pedicellata* > *F. geniculata* > *F. pomifera* > *F. clavata*

#### REDUCING POWER (ASCORBIC ACID EQUIVALENT) OF THE PLANTS EXTRACTED BY TWO DIFFERENT SOLVENT

S.No.	SAMPLE	Mg/ g
1.	Aq. methanol extract	10.56±0.08
2.	Acetone extract	7.14±0.18

(Tapan et al,2011).

#### Biological activities of *Ficus geniculata*

S.No.	Plant Part	Biological activity	Key finding	Reference
1	Leaf	Antibacterial activity	In aqueous plant extract $0.41 \pm 0.01$ cm antibacterial activity (ZI) in 50mg/ml, $0.23 \pm 0.01$ in 25mg/ml, $0.19 \pm 0.02$ in 12.5mg/ml . In methanolic plant extract $0.43 \pm 0.02$ in 50 mg/ml, $0.34 \pm 0.03$ in 25 mg/ml $0.31 \pm 0.03$ in 12.5 mg/ml	Kumari, Sinha , sahu and Khalkho, 2016
2.	Leaf	Antioxidant activity	( $6.04 \pm 0.10$ ) amount of phenolic content was found in <i>Ficus geniculata</i>	Mahadakar et al, 2013
3.	Leaf	Antioxidant activity	Its shows 4000.00 mg of AEAC / 100 gm of total antioxidants.	Gupta etal, 2017

4.	Shoot	Medicinal purpose	In curing colic, dysentary	Kumari etal, 2016
----	-------	-------------------	----------------------------	-------------------

### UTILIZATION OF THE FICUS GENICULATA

Young leaves and buds are cooked and consumed by the tribal people. Pickle are also made from that and consume throughout the year (Singh etal , 2014). The tender shoots that sprouts from the trees are traditionally used for eating purposes which are being dried and used in different pulses.

Leucorrhoea is a vaginal discharge at the time of female reproductive cycle. It is generally caused by the improper diets as well as loss of iron in the blood. Some times due to diabetics also lead to leucorrhoea. Due to which wound is caused on vagina lead to itching. In that case combination of all these help in curing problems i.e . Root of jhajhuni (Mirabilis jalapa) ,Kela and putkal (Ficus geniculata ) are crushed together and juice is made from that .And this is consumed 2 time in a day (Tomar, 2012).

Polyphenol is the largest group of phytochemical which shows the excellent properties of antioxidant and play a major role in the scavenger which are required for redox homeostasis which are responsible for degenerative diseases. And the Ficus geniculata contain  $6.04 \pm 0.29$  phenol content (Mahadkar, etal 2013). Its shoots are cooked as saag, as ate in raw form and dried for storage for whole round year (Gupta etal, 2017). In Thailand its green leaves and shoots are cooked as curry and eaten as salad (Chantarasuwan etal, 2012).

### PHYSICO- CHEMICAL PROPERTIES NUGGETS

CHARACTERSTIC	BLACK GRAM
MOISTURE (%)	$2.30 \pm 0.04$
ASH(%)	$2.57 \pm 0.02$
CRUDE FIBRE(%)	$2.78 \pm 0.04$
CRUDE FAT(%)	$1.15 \pm 0.01$
TOTAL CARBOHYDRATES(%)	$24.5 \pm 0.04$
TOTAL ENERGY (k cal/100 g)	$483.09 \pm 0.09$

(Sharma etal, 2014)

## **CHAPTER 4: EXPECTED RESEARCH OBJECTIVES**

The objectives of the present study is as under –

- To characterize and evaluate the different part of *Ficus geniculata* for their phytochemical potential.
- To prepare and evaluate the *Ficus geniculata* enriched nuggets.
- To study the storage stability of nuggets.

## **CHAPTER 5: PROPOSED RESEARCH METHODOLOGY**

**Experiment 1: To characterize and evaluate the different part of *Ficus geniculata* for their phytochemical potential.**

Traditionally dried different parts will be collected from the native places and analysed for various attributes.

<b>Sr. No.</b>	<b>Plant Part</b>
<b>1</b>	<b>Bark</b>
<b>2</b>	<b>Shoot</b>
<b>3</b>	<b>Leaves</b>

Number of treatments: 3

Number of replications: 3

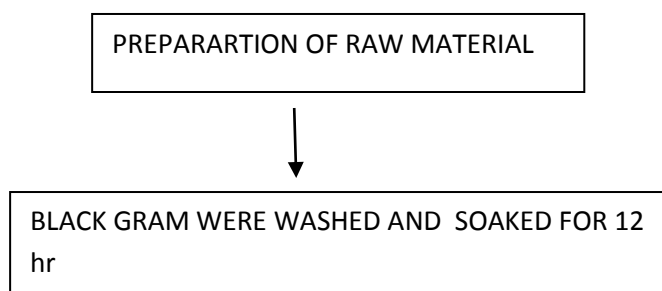
**Experiment 2: To prepare and evaluate the *Ficus geniculata* enriched nuggets.**

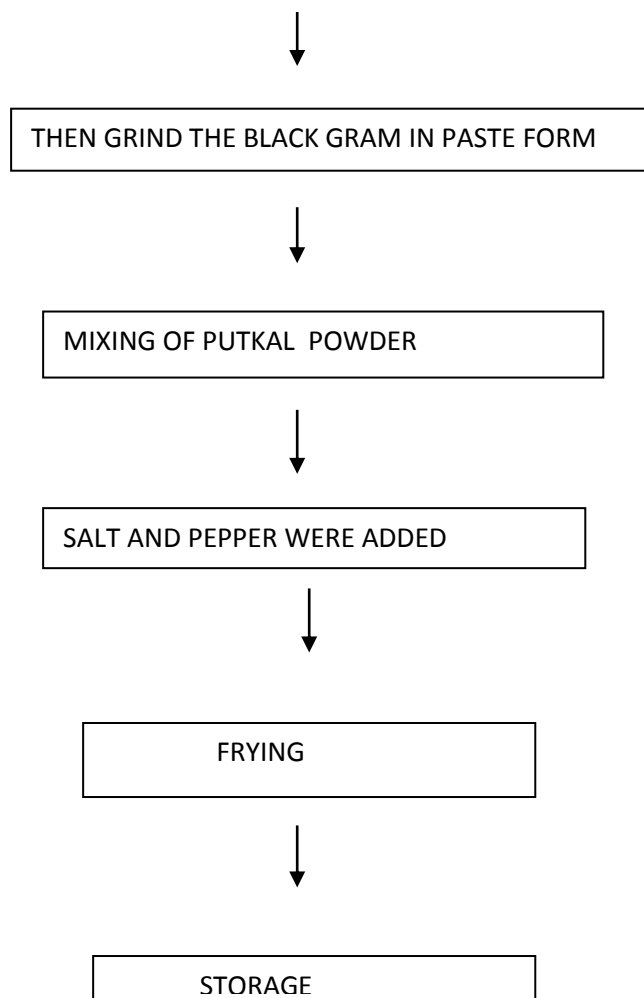
- On the basis of the phytochemicals attributes, the best part of the plant will be selected and will be utilized for the nuggets preparation as per the procedure given below.

<b>Sr. No.</b>	<b>Black gram daal (%)</b>	<b>Putkal powder (best) (%)</b>	<b>Salt (%)</b>	<b>Black pepper (%)</b>
1	0	0	0.5	0.5
2	50	50	1	1

Design: RSM

Number of replications: 3





**Experiment 3: To study the storage stability of nuggets.**

Storage conditions	Storage durations (days)
Ambient	0
Refrigerated	30
	60
	90

*No. of treatments = 2×4=8*

*Number of replication = 3*

## **6.1 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 OUTCOME**

Ficus geniculata 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 , utilization 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 flowers 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.

## REFERENCE

- A.Sharma, & D. Vaidya & G. S. Abrol &N.Rana & N.Chauhan(2014). Functional and textural properties of Indian nuggets assorted with mushroom for lysine enrichment: J Food Sci Technol 52(6):3837–3842
- A.Imran, R.K.Jat and S.Varnikan(2011). A review on traditional , pharmacological, pharmacogonostic properties of Ficus carica (Anjir):Department of Pharmacy, 2 (12), pg 124-127.
- B.Chantarasawan, C.C.Berg, F.Kjellberg, N.Ronsted, M.Garcia, C.Baider, P.C.V.Walzer (2015). A New Classification of Ficus Subsection Urostigma (Moraceae) Based on Four Nuclear DNA Markers (ITS, ETS, G3pdh, and ncpGS,).The National Conservation and Reservation centre of Shenzha China
- L.N.Chaudhary,J.V.Sudhakar, A.Kumar, O.Bajpai, R.Tiwari and G.V.S.Murty (2012), Synopsis of the Genus ficus L. (Moraceae) in India, 193-216
- M.T.Devi, S.S.Ningthoujam,D.S.Ningombam, D.K.Roy, A.K.Das, K.S.Potsamgbam (2015).First record of Ficus geniculata kutz in Manipur, North East India; New York Science Journal 8 (10).
- N.Kumari, A.Sinha, P.R.Sahu and A.S.Khalho (2016).Evaluation of antimicrobial activities of ancient medicinal plant extracts against E.coli and S.aureus:Scholar Research Library , 6 (1), PG 1-5.
- N.Sirirsha, M.Sreenivasulu, K.Sangeeta and C.M.Chetty (2010).Antioxidant properties of Ficus species –A review:International Journal of Pharm Tech Research, Vol 2 No.4 , pp 21724-21820.
- P. R. Sahu and M. P. Sinha , 2016 Evaluation of inhibitory potential of locally found plants in North-EasternIndia on clinically isolated pathogens Scholars Research Library 6 (2):25-31
- Q.Z.Hong (2003):Ficus geniculata kutz;Forest Fl ,Burma :447:1817
- R.Naniwadekar, C.Mishra and A.Datta (2015), Fruit resource tracking by hornbill species at multiple scales in a tropical forest in India , Cambridge Journal
- R.Sahu (2013) : Ficus Linnaeus:Flora of China,5:37-71

- Rekha sinha and valeria lakra 2007 . Medicinal use of plants for the treatment of diarrhoea and dysentery by the tribals of jharkhand,Orissa and west bengal 26 (3/4) : 194-201
- S.G.Jerath, A.Singh, P.Kamboj, G.Goldberg and M.S.Magsumbol (2015).Traditional knowledge and nutritive value of indigenous Food in the Oraon Tribal Community of Jharkhand:An exploratory cross-sectional study; Ecology of Food and Nutrition ,54:5, Pg:493-519.
- S.H.Brown (2016).Ficus:Tree and Vines of Florids:University of Florida IFAS Extension, (239), 533-7513.
- Ambika Sharma & Devina Vaidya & Ghan Shyam Abrol & Neerja Rana & Nilakshi Chauhan(2014), Functional and textural properties of Indian nuggets assortedwith mushroom for lysine enrichment; J Food Sci Technol (June 2015) 52(6):3837–3842
- Yadav S and Khetarpaul N (1993). Preparation and nutritional evaluation of wadi: an indigenous legume fermented product of India. *Journal of Dairying, Food and Home Science (INDIA)* 12:173-181.
- Dahanayake Nilanthi\*, AL Ranawake and DD Senadhipathy (2014):Effects of water stress on the growth and reproduction of black gram (*vigna mungo* l.). Tropical Agricultural Research & Extension 17(1)