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ORIGINAL ARTICLE

# ANTI-DIABETIC POTENTIAL OF GENUS *FICUS* L.- A REVIEW

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**Abstract:**

*Diabetes mellitus (DM), both insulin-dependent DM (IDDM) and non-insulin dependent DM (NIDDM) is a common and serious metabolic disorder throughout the world. Traditional plant treatments have been used throughout the world for the therapy of diabetes mellitus. Among many medications and other alternative medicines, several herbs have been known to cure and control diabetes; additionally they have minimal side effects. The present review is an attempt to explore hypoglycaemic role of genus Ficus L. (Moraceae) plants with anti-diabetic and related beneficial effects originating from different parts of world as reported in literatures. The genus Ficus L. (Moraceae) was first published in Systema Naturae by Carolus Linnaeus in 1735. Ficus is one of the largest genuses among angiosperms. Among the genera of seed plants it ranked as the twenty-first. It comprises of about 800 species distributed in tropical and subtropical regions of the world. Some of the most important species of Ficus are F.racemosa , F. religiosa, F. carica, F. sycomorus, F. microcarpa and F. bengalensis.*

**KEYWORDS:**

*Ficus*, Hypoglycaemia, Rat, Diabetes, Blood glucose.

## INTRODUCTION

The world prevalence of diabetes in 2010 among adults aged 20-79 years is estimated to 6.4%, affecting 285 million adults. Between 2010 and 2030, there is an expected 70% increase in numbers of adults with diabetes in developing countries and a 20% increase in developed countries (Shaw JE *et al.*, 2010). Each year more than 231,000 people in the United States and more than 3.96 million people worldwide die from diabetes and its complications (IDF, 2009). The limitations of currently-available oral antidiabetic agents either in terms of efficacy and safety coupled with the emergence of the disease into a global epidemic have encouraged a concerted effort to discover drugs that can manage type 2 diabetes more efficiently (Ranjan C and Ramanujam R, 2002). Also, with increasing incidence of diabetes mellitus in rural population throughout the world and due to adverse effects of synthetic medicine, there is a clear need for development of indigenous, inexpensive botanical sources for anti-diabetic crude or purified drugs (Venkatesh S *et al*., 2003).

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In the recent years, there is revival of interest in the traditional system of medicine, where medicinal plants are major source of biodynamic compounds of therapeutic values. The traditional knowledge on medicinal plants is the main basis for the bio cultural and ecosystem conservation as well as selection of various plants species for further pharmacological, phytochemical, toxicological and ecological studies. Health will not be a problem if man lives with nature (Vijayan K *et al.*, 2003). Ethno pharmacological surveys indicate that more than 1200 plants are used in traditional medicine for their alleged hypoglycaemic activity (Kesari AN *et al.*, 2007). Traditionally, various parts of the *Ficus* species are used for medicinal purpose (Bakshi, 2001). From the source of literature documents and relevant approaches on genus *Ficus*, the attempts are done in present article to explore recent experimental investigations of anti-diabetic potential of different parts of *Ficus* species.

## 1.Ficus arnottiana

### Bark extracts

Wistar albino rats of either sex were bred in animal house and diabetes was induced in 5 day old neonates by intraperitonial injection of Streptozotocin (STZ) (90mg/kg body weight). 8 weeks after injection of STZ, animals showing fasting blood sugar (FBS) more than 150mg/dl were taken for study. Glibenclamide 5mg/kg, p.o. was taken as standard drug. Hypoglycaemic investigation was carried out with extracts of Pt. ether, chloroform, acetone and methanol. All the extracts showed reduction in blood glucose level but maximum reduction was observed with acetone extract which showed 51% reduction *(P<0.01)* as compared with standard Glibenclamide which showed 67% reduction in FBS. (Mazumder PM *et al*., 2009).

## 2.Ficus bengalensis L.

### 2.1 Alcoholic Leaves & Bark Extracts

Two different doses (100mg/kg & 250 mg/kg) of each extract of leaves and bark of *Ficus bengalensis* were given to healthy and 2-3 months old albino Wistar rats of either sex with standard drug Glibenclamide and the treatment was carried out for 30 days. Blood glucose level was significantly ($p< 0.001$) increased in diabetic control group as compared to vehicle control group. Administration of *F. bengalensis* bark extract (100 and250 mg/kg body wt.) and Glibenclamide significantly ($p< 0.001$) decreased the diabetic blood sugar level as compared to diabetic control group and both the doses of bark extracts worked similarly as standard drug, Glibenclamide (insignificant difference). Maximum effect was observed at 250 mg/kg of bark extract one day 30, while leaves had no effect on blood glucose level. The groups treated with extract alone, at a dose of 250 mg/kg of leaf and bark extract found to be insignificant when compared with vehicle control group. (Mishra JN *et al*., 2013).

### 2.2 Aqueous bark extracts

*F. bengalensis* aqueous bark extracts (100,300 and 500mg/kg/day) were given to healthy albino male Wistar rats with standard drug Glibenclamide and diabetes was induced experimentally by single intraperitoneally of Streptozotocin (STZ). STZ treatment increased blood glucose levels significantly *($F > 0.05$; $p < 0.001$)* in experimental rats when compared to control rats. Administration of *F. bengalensis* bark aqueous extract (500 mg/kg body weight / day) decreased the blood glucose levels significantly *($F > 0.05$; $p < 0.001$)* at 5 hrs in STZ – induced diabetic fasted, fed and glucose loaded rats. The hypoglycaemic activity was equivalent to that of Tolbutamide (100 mg / kg body weight / day) treated positive control rats. The metabolic enzymes of glucose was significantly decreased *($F > 0.05$; $p < 0.001$)* in STZ –induced diabetic rats when compared to control rats. Oral administration of *F. bengalensis* bark aqueous extract (500 mg/kg body weight / day) to STZ -induced diabetic rats brought back the levels of glycolytic enzymes significantly ($F > 0.05$; $p < 0.001$) to near normal levels. The levels of liver and kidney lipid peroxidation including hydroperoxides and malondialdehyde were significantly *($F > 0.05$; $p < 0.001$)* decreased to near normal levels in STZ- induced diabetic rats after treatment with F. bengalensis bark aqueous extract (500 mg/kg body weight / day). *F. bengalensis* bark aqueous extract (500 mg/kg body weight / day) decreased the levels of serum electrolytes significantly *($F > 0.05$; $p < 0.001$)* in STZ -induced diabetic rats. The study indicates the hypoglycaemic, antiperoxidative and ameliorative potential of *F. bengalensis* bark aqueous extract on STZ –induced diabetic rats. (Gayathri M *et al*., 2008).

### 2.3 Aqueous aerial roots extract

Effect of 300mg/kg body weight dose of aqueous extract of *F. bengalensis* aerial roots was evaluated with reference of drug Glipizide and elemental Mg and Ca intake as glycaemic elements on blood glucose level of normal, sub and mild diabetic experimental rat models. The result with mentioned dose shown maximum fall of 43.8 and 40.7% respectively in blood glucose level during Fasting Blood Glucose and glucose tolerance test of normal rats. The same dose of 300mg/kg body weight showed a significant reduction in blood glucose level of 54.3% in sub and 51.7% in mild diabetic rats during glucose tolerance test. The concentration of Mg and Ca (1.02% and 0.85% respectively) identified through laser induced breakdown spectroscopy in most effective dose could be responsible for such a high percentage fall in blood glucose level as they take part in glucose metabolism. (Singh RK *et al.*, 2009)

### 2.4 Ethanolic extract of fruit, bark and aerial roots

Male albino rats (130-185gm) were taken for study and diabetes was induced by alloxan (180mg/kg) by intravenous route. Glibenclamide 0.5mg/kg po was taken as reference drug. The rats with high blood sugar more than 200mg/dl plasma glucose were selected for study. The result showed that on oral administration (120 mg/kg body weight) of ethanolic extracts of fruit, bark and aerial roots of *F. bengalensis* for a period of 21 days produces remarkable decrease in blood glucose level (BGL) for fruit extract decrease of 31.72%, for bark extract decrease of 18.33% and for aerial root extract decrease of 28.84%. Oral administration of reference drug Glibenclamide shown maximum reduction of 34.43% in BGL. The present study indicates that out of extracts of all parts taken, fruit extract shown maximum reduction in BGL with comparison of bark and aerial root extract. (Sharma S. *et al.*, 2007).

## 3.FICUS CARICA

### 3.1 Aqueous leaf extract

Laboratory-bred Sprague-Dawley rats of male sex weighing 200-250 g were taken for study. Diabetes was induced by drug Streptozotocin and diabetic rats (glucose level≥250mg/dl) were used for the experiment. The rats were divided into eight groups (4 normal and 4 diabetic). Group 1 normal rats were treated with vehicle (distilled water) and served as control, while Group 2, 3 and 4 normal rats were treated with aromatic water of *F. carica* leaf extract at a doses of 0.05, 0.1, and 0.4 mg/dl respectively; Group 1 diabetic rats were treated with vehicle and served as diabetic control, Group 2, 3 and 4 diabetic rats were treated with aromatic water of F. carica leaf extract at a doses of 0.05, 0.1, and 0.4 mg/dl respectively. At time12, 24 hours after the administration of 0.05 and 0.1 mg/dl decreased blood glucose levels significantly. 0.4 mg/dl decreased blood glucose levels throughout the experiment significantly. At time 3, 6, 12 hours after the administration of 0.1 and 0.4 mg/dl decreased blood glucose levels significantly. At time 24 only 0.4 mg/dl decreased blood glucose levels significantly. The results show that aromatic water leaves of F. carica reduces normoglycemia in normal rats and hyperglycaemia in diabetic ones in this dose dependent experiment. (Rashidi AA *et al*., 2011).

### 3.2 Methanolic leaf extract

Albino-Wistar rats (200-250g) and Swiss albino mice (20-25g) of either sex were used. Alloxan Monohydrate was injected intra-peritoneally to induce the diabetes by damaging the insulin secreting cells of the pancreas leading to hyperglycaemia. Metformin (500 mg/kg p.o) was given as standard drug and Methanolic extract of *F. Carica* (MEFC) was given in dose of (100 & 200 mg/kg, p.o). MEFC administered at doses of 100 & 200 mg/kg to alloxan-treated diabetic rats caused significant ($p < 0.01$) reduction of blood glucose levels which was related to dose and duration of treatment. Maximum reduction was observed on day 21. Gradual increase in body weight was also observed. MEFC 200 mg/kg exhibited maximum glucose lowering effect in diabetic rats. Metformin exhibited significant reduction in blood glucose levels at the end of the study when compared to diabetic control. MEFC showed a dose related significant ($p < 0.01$) reduction in triglycerides compared to pre treatment levels. MESR at the doses of 100 and 200 mg/kg was dose dependently reduced the Total cholesterol, LDL, VLDL, TG levels than diabetic control rats (Stalin C. *et al*., 2012).

## 4.FICUS EXASPERATE

### Aqueous leaves extract

The plants were collected from the wild around the Biological Garden of the University of Lagos, Akoka, Lagos, Nigeria. Adult Sprague-Dawley (SPD) rats of both sexes weighing 180-200g were taken for study. Fructose induced glucose tolerance method was applied on experimental rats for evaluation of glycaemic activity of extract, briefly, a glucose load of 3.0g/kg b.wt. was delivered into the stomach of 18-hour fasted rats as 30% glucose solution or as glucose extract solution (GES). The GES was constituted such that the dose of the extract was 250.0 mg/kg while the glucose load was 3.0 g/kg with an administration volume of 1.0ml/100g b.wt. The results showed that the fasting blood glucose (FBG) of rats of normal control was 5.6+ 0.4 mmol/l, a value that was comparable to that of the animals fed with fructose (fructose-fed) which was 5.0+ 0.3 mmol/l ($P>0.05$). After 30 minutes of OGTT, the blood glucose concentration reached a peak level of 8.0+0.3 mmol/l in the normal control group while the peak (7.9+0.3mmol/l) was attained 30 minutes later in the fructose-fed rats. 6.7+0.6 mmol/l; however, the corresponding value was lower ($P<0.05$) in the normal control (4.7+0.8 mmol/l). The pattern of glycaemic response of the fructose-fed animals treated with fructose-extract was similar to that of normal control, but the 120- minute blood glucose was lower in the normal control. Determination of glucose tolerance index (GTI) showed that treating fructose-fed animals with extract of *F. exasperata* (fructose-extract caused higher GTI which was 182.0+25.0 mmol.min/l when compared to the normal control group with mean GTI of 110.7+35.0 mmol.min/l but significantly lower ($P<0.05$) when compared to the GTI of the fructose-fed group (262.5+50.0 mmol.min/l). (I A Taiwo *et al*., 2010).

## 5.FICUS HISPIDA

### Aqueous suspension of water soluble portion of alcoholic extracts (ASWSAE)

Wistar albino rats of either sex weighing 100-200 g were taken for present study. Glibenclamide 0.01% w/v with 3% Tween-80 was used as reference drug while diabetes was induced by alloxan monohydrate solution at a dose of 40 mg/kg body weight. *F. hispida* and glibenclamide significantly reduced the fasting blood sugar level in normal albino rats at 2 h with a percentage decrease of 7.3 and 14.1 respectively. In alloxan-induced diabetic rats, the percentage decrease recorded at 2 h was 14.75 and 25.37 for *F. hispida* and glibenclamide respectively. The results of the present study showed that ASWSAE of F. hispida significantly decreased fasting blood glucose (FBG) levels both in the normal ($P<0.01$) and alloxan-induced diabetic ($P<0.001$) rats at 2 h as compared to controls. (R. Ghosh *et al.*, 2004).

## 6.FICUS MICROCARPA

### 6.1 Methanolic leaves extract

Leaves of *F. microcarpa* have been collected from Sri Venkateshwara University, Tirupati, India. Wistar male rats (180-220g) were taken for study, diabetes was induced by alloxan monohydrate (150mg/kg) by single intraperitoneal injection while drug glibenclamide was taken as standard. The doses of extracts for the anti-diabetic study were selected as 100mg/kg, 200mg/kg and 400mg/kg based on the ratio 1/20, 1/10 and 1/20 of safest dose. In chronic study, there was significant increase in blood glucose level ($P <0.001$) in diabetic control animals compare to normal animals while extract treated animals at 200mg/kg and 400mg/kg have shown significant ($P <0.001$) reduction in blood glucose concentrations at $14^{th}$ and $21^{st}$ day when compare to diabetic control animals. The concentration of insulin was found to be declined significantly ($P <0.001$) in diabetic control animals compare to normal animals due to the administration of alloxan. In animals treated with Glibenclamide and extract (100mg/kg and 200mg/kg) there was significant ($P<0.001$) increasing in blood insulin level compare to diabetic control animals and the results were comparable to normal animals. There was increasing in the concentration of liver enzymes in the blood was found in diabetic animals compare to normal animals. The increase in SGOT concentration was more significant ($P<0.001$) whereas increase SGPT concentration was less significant ($P<0.01$). In therapeutic animals treated with Glibenclamide and extract (200mg/kg), there was significant. The concentration of serum cholesterol and triglycerides in the blood was significantly ($P<0.01$) increased in diabetic animals compare to normal animals and there was reduction in the serum cholesterol and triglycerides concentration found in Glibenclamide and extract (400mg/kg) treated animals when compare to diabetic control animals but the effect was less significant ($P<0.01$). It is found that there is no significant

change in blood urea ($P$>0.01) concentration in animals of diabetic control compare to normal animals and in therapeutic animals treated with Glibenclamide and extract when compare to diabetic animals. The present study suggests that the methanolic extract of *F. microcarpa* possess significant antidiabetic activity in alloxan induced diabetic animal model. (Ravichandra V.D. and Padmaa M Paarakh, 2013).

### 6.2 Petroleum ether leaves extract

Leaves of *F. microcarpa* were collected from Tirumala hills, Tirupati, Andhra Pradesh. India. Albino rats (150–200 g) of either sex were taken for study, Glibenclamide (2.5 mg/kg), alloxan monohydrate (150mg/kg) by single intraperitoneal injection while drug Glibenclamide (2.5 mg/kg) was taken as standard. Rats were considered diabetic when the blood glucose level was raised beyond 200 mg/100 ml of blood. This condition was observed at the end of 48 h after Alloxanisation. There were observable changes in BGL and lipid profile of treated and untreated rats. Treatment of diabetic rats with pet–ether extract of *F. microcarpa* and Glibenclamide significantly decreased the BGL compared to untreated diabetic rats. Dose dependent reduction in BGL, TC, LDL, VLDL, HDL and TG was observed in Alloxan induced diabetic rats treated with petroleum ether extract of F. microcarpa. During prolonged study (14 days), the PFM (200 or 400 mg/kg) produced a significant ($P$>0.01) in BGL of the diabetic rats compared to control. PFK at the dose of 400 mg/kg body weight exhibited better BGL reduction than 200 mg/kg body weight and that produced by the standard drug, Glibenclamide 2.5mg/kg at the same period.

Effects of PFM on serum lipids, HDL, LDL, VLDL, one of the major cardiovascular risk factors in type 2 diabetes mellitus, can be observed from lipid related data. Compared with the control values, the PFM (200 or 400 mg/kg) groups showed significant reduction ($P$>0.01) in the serum levels of total cholesterol, LDL, VLDL and triglycerides. At the same time PFM significantly increased the HDL in Alloxan induced diabetic rats. (S. Mohana Lakshmi *et al*., 2010).

## 7.FICUS RACEMOSA (SYN. F. GLOMERATA)

7.1 Twenty five of each, male and female, diabetic patients, selected from the outdoor of Fatima Jinnah Medical College, Lahore, Pakistan, taking oral hypoglycaemic drug were included in this study, Mean age of both sexes was in a range of 45-60 years. The 5 mL extract of bark of *F. racemosa* (about 100 mg) was given orally two times for 15 days. Blood samples were collected before administration of the herb (only used sulfonylurea) and after 15 days of herb administration (herb + sulfonylurea). It was observed that only on hypoglycaemic drug, the level of blood sugar in males before fasting and after breakfast were 243 and 266 mg/dL, respectively. However, after taking the herb in combination with drug, the level was markedly decreased (200 and 211 mg/dL) but significant ($p < 0.05$) difference was only observed in sugar level after 1.5 h of breakfast. In females, level of blood glucose only on hypoglycaemic drug i.e., before fasting and after breakfast was 176 and 226 mg/dL, respectively. However, after taking the herb in combination with drug, the level was markedly decreased but it showed non-significant ($p > 0.05$) difference. This result suggests also that hypoglycaemic effect of the extract of bark of *F. racemosa* is stronger on diabetic patients. (Gul-E-Rana et al., 2013).

### 7.2Aqueous stem-bark extract

*F.racemosa* Linn. Stem-bark was collected from Mukkadahally, Chamarajanagar district of Karnataka, India. Healthy adult male Wistar rats between eight and nine weeks of age and weighing 140-160 g were taken for study. Diabetes was induced in the experimental groups by a single intramuscular injection of Streptozotocin (55mg/kg body weight). The experimental rats were planned in to 6 groups, control group contains: non diabetic rats, FRP group contains: *F. racemosa* powder-treated diabetic rats, FRAE group contains: *F. racemosa* aqueous extract-treated diabetic rats, DC group contains: Untreated diabetic rats, GB group contains: Glibenclamide-treated diabetic rats (400 µg/day/kg body weight) and IN group contains: Insulin-treated diabetic rats (5 U/day/kg). In FRP and FRAE group there was a significant reduction ($P \leq 0.05$) of fasting blood glucose (FBG) (54 and 66% respectively) but not to control levels. The antihyperglycemic effect of FRP and FRAE group did not differ statistically ($P \leq 0.05$) with the antihyperglycemic effect of FRAE group being comparable to that of Glibenclamide. The standard antidiabetic agents, insulin and Glibenclamide, reduced the FBG levels to the control levels. The percent reduction shown by insulin and Glibenclamide were found 78% and 74% respectively. (Ahmed F *et al*., 2009).

### 7.3 Ethanolic bark extract

Sprague-Dawley rats weighing 200-220 g of either sex were taken in investigation. Diabetes was experimentally induced by tail vein injection of Alloxan monohydrate. Standard drug Tolbutamide was used and diabetic rats exhibiting blood glucose level in range of 250-280mg/dl were selected for studies. The dose of 400mg/kg/p.o. of alcoholic and aqueous extract of bark of *F. racemosa* were given to diabetic rats. The fasting blood glucose level of normal rats shows a decrease of 22.3% with alcoholic extract and decrease of 20.6% with aqueous extract while the fasting blood glucose levels of Alloxan induced diabetic rats shown a decrease of 62.5% with alcoholic extract and decrease of 50% with aqueous extract. The study shows that the Ethanolic extract of *F. racemosa* is having potential of being used for antidiabetic activity in herbal treatment. (Sachan NK *et al*., 2009).

### 7.4 Ethanolic fruit extract

Young Swiss-albino mice aged 4-5 weeks, average weight 20-25 gm were used for the experiment. Diabetes was induced experimentally by Alloxan, standard drug Metformin hydrochloride (600µg/kg) was taken and Ethanolic fruit extract of *F. racemosa* in dose of 100 & 200mg/kg were given. The results obtained showed that at a dose of 100 mg/kg body weight, the extracts significantly lowered blood glucose level and showed maximum reduction of 33.85% on day 14. The extracts, at 200 mg/kg body weight produced maximum reduction of 41.91% on day 14 whereas inhibition of 45.49% was found for Metformin on day 14 as a peak. The extract showed considerable antioxidant activity in DPPH free radical scavenging activity and total antioxidant capacity when compared to standard as ascorbic acid. The findings suggest that ethanolic fruit extract of F. racemosa has both hypoglycaemic and in vitro antioxidant activity. This study also establishes a correlation between antidiabetic and antioxidant potential and may be of considerable interest in preventing the ill effects of diabetes and oxidative stress in vivo. (Md. Zulfiker AH *et al*., 2011).

## 8.FICUS RELIGIOSA LINN.

### 8.1 Aqueous bark extract

The antidiabetic effect of F. religiosa was compared with Glibenclamide, a well-known hypoglycaemic drug. F. religiosa aqueous bark extracts (25, 50 and 100mg/kg, p.o.) was studied in normal, glucose-loaded and experimentally Streptozotocin (STZ) induced diabetic rats. The three doses caused significant reduction in blood glucose levels in all the rat models. The effect was more pronounced in 50 and 100mg/kg than 25mg/kg. Extract also showed significant increase in serum insulin, body weight and glycogen content in liver and skeletal muscle of STZ-induced diabetic rats while there was significant reduction in the levels of serum triglyceride and total cholesterol. The results indicate that aqueous extract of Ficus religiosa bark possesses significant anti-diabetic activity. (Pandit R et al., 2010).

### 8.2 Ethanolic leaves and fruit extract (ELFE)

Healthy and 2-3 months old albino Wistar rats of either sex (140-160 gm) were taken for study, diabetes was induced by Alloxan monohydrate intraperitoneally and ELFE of *F. religiosa* was administered orally (100, 250mg/kg, p.o.). The blood glucose levels of different groups of rats were measured on day 1, 15 and 30. Blood glucose level was significantly ($p< 0.001$) increased in diabetic control group as compared to vehicle control group. Administration of F. religiosa fruit extract (100 and 250 mg/kg body wt.) and Glibenclamide significantly ($p< 0.001$) decreased the diabetic blood sugar level as compared to diabetic control group and both the doses of fruit extracts worked similarly as standard drug, Glibenclamide (insignificant difference). Maximum effect was observed at 250 mg/kg of fruit extract on day 30, while leaves had no effect on blood glucose level. The groups treated with extract alone, at a dose of 250 mg/kg of leaf and fruit extract found to be insignificant when compared with vehicle control group. The study shows that the drug can be used as an adjuvant in the diabetic therapy and can be further more screened for the chemical entity responsible for the activity. (Chaudhary Sheetal *et al.*,2011)

### 8.3 Methanolic bark extract

Adult albino Wistar rats (200 to 250 gm) were used for the study, Diabetes mellitus was induced by single intraperitonieal injection of Streptozotocin and Methanolic extract of *Ficus* religiosa bark extract

was given (100mg/kg, p.o.). The extract shown 54.36% reduction in blood glucose level while standard drug Glibenclamide shown 56.49% reduction in blood glucose level. The results clearly indicate that the methanolic extract of Ficus religiosa bark exhibited significant hypoglycaemic activity in STZ diabetic rats. (Verma Nishant *et al*., 2012).

## 9.FICUS SYCOMORUS

### 9.1 Aqueous stem-bark extract

Stem barks of *F. sycomorus* were collected from their natural habitat in Makunguru village in Siakago division of Mbeere North district in Embu County, Kenya. 4-6 weeks old healthy Swiss albino male mice weighing 23-27 g were used for the study. Diabetic condition was induced in mice by intraperitoneal injection of Alloxan monohydrate (150mg/kgbw). The animals were treated with 450 mg /kg body weight of the aqueous stem bark extract of *F. sycomorus*. The percent reductions of blood glucose levels in mice by the aqueous stem bark extract of *F. sycomorus* at the three dose levels (50 mg/kg body weight, 100mg/kg body weight and 150 mg/kg body weight) during the 1st hour was found 30%, 28 % and 49%, respectively compared to the diabetic control.. During the 2nd hour the glucose lowering effect by the three dose levels was also observed, as the percentage reduction of blood glucose was 54%, 58% and 61% respectively. The extract lowered blood glucose levels to normal ($P$>0.05). In the 3rd hour the extract lowered blood glucose levels by 59%, 65% and 70% respectively. At this hour the extract lowered blood glucose levels as effectively as insulin (P<0.05) especially by the 150 mg/kg body weight dose range. The same trend was observed during the 4th hour where the three dose levels lowered blood glucose levels lower than even insulin. The percentage blood glucose reductions were 72%, 73% and 78% respectively (P<0.05). The aqueous stem bark extract of *F. sycomorus* caused a steady decrease in blood glucose levels in the diabetic control mice during the 1st and 2nd hours and then a steep decrease during the 3rd and 4th hours for all the doses. The present study concludes that aqueous stem bark extract of *F. sycomorus* has significant antidiabetic potential. (Njagi JM *et al*., 2012).

### 9.2 Methanolic stem-bark extract

This study was carried out on alloxan-induced diabetic Wistar albino rats, to evaluate the hypoglycaemic effect of the methanol extract of stem-bark of *F. sycomorus*. 24 Wistar albino rats (n = 6) of both sexes were taken for study. Fresh stem-bark of *F. sycomorus* was collected from the outskirt of Mashi town in Mashi Local Government area of Katsina State, Nigeria. It was found that, the methanolic extract of *F. sycomorous* is very less toxic even at a dose of 5000 mg/kg/bw. The LD50 was calculated as 30% of the highest dose which in this study is 1500 mg/kg. The glucose concentration in diabetic rats changes at different time intervals after interaperitoneal administration of stem-bark extract of F. sycomorus at doses of 250, 500 and 1000 mg/kg, but the change was significant ($P$<0.05) at 250 mg/kg at 8 and 24 h. The dose of 250 mg/kg (bw) brought the blood glucose level in diabetic rats almost to the normal as compared to diabetic control. The phytochemical analysis results of the methanolic extract of the stem-bark of *F. sycomorus* revealed the presence of flavonoids, saponins, alkaloids, reducing sugars, glycosides, etc. This study establishes that methanolic extract of stem-bark of *F. sycomorous* at the dose of 250 mg/kg had a significant hypoglycaemic activity. (Oumar A. Adoum *et al*., 2012).

## CONCLUSION

With increasing rates of diabetes and having a medical system with fewer and fewer effective options, new ideas and approaches are required. According to a WHO estimate more than 80% of the world's population relies on traditional medicinal practice for primary health care needs. An increasing reliance on the use of medicinal plants in the industrialized societies has been traced to the extraction and development of several drugs and chemotherapeutics from these plants as well as from traditionally used herbal remedies. The hypothesis of exploring naturally available plants & their products may have abundant opportunity in ailing diseases. Based on anti-diabetic evaluations with different parts of plants of Ficus species, further studies are required in search of possibility for alternative hypoglycaemic drugs.

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