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Potentiating Effect of *Ficus gibbosa* Blume Extracts in Experimental Type II Diabetes in Sprague Dawley Rats



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ABSTRACT

Hydroalcoholic extract of Leaves and stem bark of *Ficus gibbosa* Blume were evaluated for their potentiating action in Streptozotocin – Nicotinamide induced type 2 diabetes in Sprague Dawley rats. The extracts were administered at dose of 100, 250 and 500 mg /kg body weight along with sub effective dose (2.5 mg/kg body weight) of standard antidiabetic drug (Glibenclamide) for a period of 5 weeks. The test extracts potentiated the antidiabetic activity of standard drug by significantly reducing the elevated blood glucose levels and the effect was almost comparable with solitary efficacy of therapeutic dose (5 mg/kg body weight) of standard drug Glibenclamide during 5th week of the study.

INTRODUCTION

Ficus gibbosa Blume (Fig.1) commonly known as dye fig belongs to family moraceae. It's an epiphytic shrub with prop roots. Its leaves are asymmetric alternatively arranged and gibbosed at the end. The juice of the bark and leaves of dye fig or humped fig plant is used for grinding the pills and making a decoction in toxicology. Plant pacifies vitiated kapha, pitta, skin diseases, ulcers, hepatopathy, diabetes, ulcerative stomatitis, leucorrhoea and gynaecological problems (Gamble, 1935). Bark decoction of *Ficus gibbosa* Blume and stem bark secretion of *Ficus glomerata* Roxb. have been in traditional usage in the management of diabetes (Jayakumar). The present study is an attempt to evaluate hydroalcoholic extract of stem bark and leaves of *Ficus gibbosa* Blume for its potentiating effect of standard antidiabetic drug.



Fig.1. *Ficus gibbosa* Blume

MATERIALS AND METHODS

Animals

Adult male Sprague Dawley rats were procured from Small animal breeding station, College of Veterinary and Animal Sciences, Mannuthy, Kerala and were quarantined for 10 days. Animals were caged individually with access to standard pelleted feed and water ad libitum.

Ethical clearance

The proposal for conducting the present experiment was approved during Institutional Animal Ethics Committee (IAEC) meeting held at National Ayurveda Research Institute for Panchakarma, Cheruthuruthy, Thrissur, Kerala.

Test drug

Leaves and stem bark of *Ficus gibbosa* (FG) were procured from the local area around Cheruthuruthy, Thrissur and were authenticated at Botany division, Kerala Forest Research Institute, Peechi, Thrissur, Kerala. Powdered leaves and stem bark of the test drug were extracted in 50 per cent aqueous alcohol and the process was repeated for extract residue as (API, 2011). The filtrates of *Ficus gibbosa* hydro alcoholic extracts was concentrated, stored at -20°C. (6).

Toxicity studies.

The leaves and stem bark extracts were found to be safe up to 2000 mg/ kg body weight in female rats during acute toxicity study. Repeated administration of the test extracts up to dose of 1000 mg / kg body weight for consecutive period of 28 days did not produce any mortality or clinical signs of toxicity (Sanjaya kumar *et al*, 2019).

Potentiating study.

Based on the results of 28 days repeated dose oral toxicity study, the dose of 1000 mg/ kg body weight was found to be safe and 3 doses below it were selected for potentiating study. Efficacy of different doses of test extracts in potentiating the antidiabetic activity of sub effective dose of standard drug was analysed.

Male Sprague Dawley rats fasted overnight were injected intraperitoneally with solution of Nicotinamide at dose of 195 mg /kg body weight. 15 minutes later, same animals were injected with freshly prepared solution of Streptozotocin (STZ) at dose of 65 mg/kg body weight) intraperitoneally. The animals were allowed to drink 1% glucose solution overnight to overcome the drug induced hypoglycaemia. The animals with blood glucose values above 250 mg/dl on the third day after STZ injection were selected for the antidiabetic study (Bisht and Bhattacharya,2013) Diabetic rats were divided into 9 groups each comprising of 6 animals.

1. Normal Control
2. Diabetic Control.
3. FG Leaves extract – Low dose (100 mg/kg body weight) + Glibenclamide (2.5 mg/kg body weight)

4. FG Leaves extract –Average dose (250 mg/kg body weight) + Glibenclamide (2.5 mg/kg body weight)
5. FG Leaves extract – High dose (500 mg/kg body weight) + Glibenclamide (2.5 mg/kg body weight)
6. FG Stem Bark extract – Low dose (100 mg/kg body weight) + Glibenclamide (2.5 mg/kg body weight)
7. FG Stem Bark extract –Average dose (250 mg/kg body weight) + Glibenclamide (2.5 mg/kg body weight)
8. FG Stem bark extract – High dose (500 mg/kg body weight) + Glibenclamide (2.5 mg/kg body weight)
9. Standard drug group - 5 mg/kg body weight

Test extracts and distilled water were administered to respective groups for a period of 35 days.

Statistical analysis

The data generated during the study was analysed through ANOVA with post tests.

RESULTS AND DISCUSSION

Potentiation of antidiabetic activity of sub effective dose of standard drug was observed with both leaves and stem bark extract. Significant ($P<0.05$) reduction in blood glucose levels were observed in rats which received leaves extract at low dose along with standard drug during 5th week, whereas in average and high dose groups significant ($P<0.05$) reduction was observed from 4th week of the study as compared to diabetic control. Stem bark extracts at high dose along with standard drug significantly ($P<0.01$) reduced the blood glucose level from 3rd week of the study. Stem bark extracts at average and low dose group significantly ($P<0.01$) reduced the glucose levels at 4th week and 5th week respectively. Amongst the animals which received the standard drug group at therapeutic levels. Significant ($P<0.05$) reduction in blood glucose level was seen from 2nd week and the reduction was much significant ($P<0.01$) from 3rd week onwards. The potentiating activity of the test extracts might be attributed to the presences of flavonoids which aids in antioxidant activity (Gini *et al*, 2017). The significant

lowering of the blood glucose level might also be due to the ability of the extract to lower free radical formation induced by streptozotocin (Chandran *et al*, 2015).

Table 1. Blood Glucose levels (mg %) (Mean ± SEM) during potentiating study

	Ctrl	Diab. Ctrl	FG leaves extract group			FG Stem bark extract			Standard drug (Glibenc-lamide)
			Low dose	Average dose	High dose	Low dose	Average dose	High dose	
Initial	99.5 ± 3.8	314.7 ± 9.1	310 ± 10.3	314 ± 9.5	308.2 ± 7.4	311.2 ± 4.5	309.3 ± 4.5	310.5 ± 2.7	311.3 ± 5.4
1st week	101.2 ± 3.2	318.5 ± 12.1	303.5 ± 10.5	315 ± 9.7	300.3 ± 8.2	304.8 ± 3.9	307.2 ± 3.9	304.5 ± 3.4	301.8 ± 1.2
2nd week	96.2 ± 1.7	316.3 ± 13.3	297.7 ± 10.9	304.5 ± 10.6	300.5 ± 6.8	303 ± 3.4	304.7 ± 5.4	299.7 ± 2.9	293.2 ± 2.1*
3rd week	95.8 ± 2.2	312.8 ± 12.7	291.3 ± 10.3	289.7 ± 10.7	291 ± 6.4	298.8 ± 3.9	292.7 ± 3.7	286.7 ± 3.1**	283 ± 2.4**
4th week	95.3 ± 1.7	313.7 ± 15.1	287 ± 8.7	275 ± 10.7*	274.7 ± 6.3*	297.2 ± 3.7	281.5 ± 5.9**	281.2 ± 4.7**	269.5 ± 5.7**
5th week	97.3 ± 1.6	307.5 ± 14.6	271.7 ± 8.8*	262 ± 9.7**	260.3 ± 7.5**	279.7 ± 3.6**	271.8 ± 5.9**	271.5 ± 4.1**	259 ± 4.3**

* P<0.05, **P<0.01.

CONCLUSION

The hydroalcoholic extract of leaves and stem bark of *Ficus gibbosa* Blume significantly potentiated the antidiabetic activity of sub effective dose of standard drug Glibenclamide. Significant reduction in the blood glucose levels were observed in the animals which received the extracts and standard drug as compared to diabetic control. Reduction in the blood glucose levels were observed 3rd week in the stem bark extract group and from 4th week in the leaves

extract group. Stem bark extracts were found to be more effective than leaves extract. The efficacy of the extracts in reducing blood glucose levels when given along with the sub effective dose (2.5 mg / kg Body weight) of standard drug (Glibenclamide) was almost on par with that of standard drug at therapeutic dose (5 mg/kg body weight).

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