RESEARCH PAPER:

Antidiabetic effects of *Ficus racemosa* on blood glucose in alloxan induced diabetic rats

V. SIVAKUMARI

Asian Journal of Environmental Science (December, 2009 to May, 2010) Vol. 4 No. 2 : 155-157

Correspondence to :
V. SIVAKUMARI
Department of Environmental and Herbal Sciences, Tamil University, THANJAVUR (T.N.) INDIA

SUMMARY

The study was carried out to demonstrate anti diabetic effect of *Ficus racemosa* roots extract in alloxan induced diabetic rats with normal and control rats. The blood glucose and urine sugar increased in diabetic animals as compared to control animals. The level of haemoglobin decreased whereas the level of glycosylated haemoglobin increased in diabetic animals as compared to control animals. The level of vitamin-E and C decreased in diabetic animals as compared to control animals. The result indicates the level of blood glucose and urine sugar decreased in diabetic rats compared to control animals.

Key words :
Diabetes mellitus, *Ficus racemosa*, Urine sugar and Haemoglobin

Accepted :
September, 2009

Ficus recemosa (Family: Urticaceae) is a stringent, carminative, vermifuge and an anti-dysentery drug. It is a good remedy for excessive appetite. The extract of roots is used in diabetes. This is a herbal substance that has been reported to have hypoglycaemic activity (Murray and Lopez, 1997). Experimental studies have also reported beneficial effects of roots of *F. recemosa*. Thus, in the present study it has been investigated the anti-diabetic effect of *F. recemosa* in alloxan induced diabetic rats (Thylefors, 1990; Klein *et al.*, 1992).

Diabetes mellitus is a group of diseases characterized by high levels of blood glucose resulting from defects in insulin production, insulin action or both. Diabetes can be associated with serious complications and premature death, but people with diabetes can take steps to control the diseases and lower the risk complication (Cohen and Heikkila, 1974). Diabetes is currently growing at fast rate throughout the world and is the 16th leading cause of global mortality (Taylor and Agius, 1998) and half of world's blind population is due to diabetic cataract (Rajasekharan and Tuli, 1976).

MATERIALS AND METHODS

Ficus racemosa roots were collected, cleaned, dried and powered. Both aqueous and alcoholic extract were prepared. Diabetes mellitus was induced in wistar rats by single intraperitoneal injection of freshly prepared solution of alloxan monohydrate (150mg/kgbw) an in physiological saline after overnight fasting for 12 hrs (Gutteridge and Halliwell, 1990). A total of 14 numbers of rats were divided into 7 groups. Each and every groups containing 1 animal Group-1 animal served as control animal and did not receive any other treatment. Group-2 animals were provided single intraperitoneal injection of alloxan (150mg/kgwt) monohydrate after over night fast 12 hrs. Group-3 and 4 animals received aqueous and alcoholic extracts of *F. racemosa* after the diabetic state was assessed. Group-5 animals received glibenclamide (600/mg/kgbw) for 45 days. Group-6 was provided oral administration of aqueous and alcoholic extract of *F. racemosa* roots alone for 45 days. After the experimental period, all the animals were sacrificed by cervical dislocation and biochemical studies were analyzed.

RESULTS AND DISCUSSION

Diabetes mellitus, a worldwide leading metabolic syndrome, is characterized by hyperglycemia associated with alteration in carbohydrate and lipid metabolism. Diabetes mellitus is basically a disease of glucose metabolism, resulting from dysfuntion of pancreatic â-cells and insulin resistance, but at later stages of the disease the lipid metabolism is also affected (Nadeem and Suraiya, 1969).

In the present study, observed an increase in blood glucose, glycosylated Hb, and reduction in total blood Hb in alloxan induced diabetic rats. The blood glucose and urine sugar

increased in diabetic animals as compared to control animals. Oral administration of aqueous and alcoholic extracts of *F. racemosa* roots revert back the level of glucose and urine sugar to near normal range in diabetic rats. No statistical significance was observed between control groups and rats treated with alcoholic and aqueous extracts of *F. racemosa* alone (Table 1).

The level of haemoglobin decreased whereas the level of glycosylated haemoglobin increased in diabetic animals as compared to control animals. Oral administration of aqueous and alcoholic extracts of *F. racemosa* roots revert back the level of haemoglobin and glycosylated haemoglobin to near normal range in diabetic rats. No statistical significance was observed between control groups and rats treated with alcoholic and aqueous extracts of *F. racemosa* alone (Table 2).

The level of vitamin-E and C decreased in diabetic animals as compared to control animals. Oral administration of aqueous and alcoholic extracts of *F. racemosa* roots revert back the level of vitamin-E and C to near normal range in diabetic rats. No statistical significance was observed between control groups and rats treated with alcoholic and aqueous extracts of *F. racemosa* alone (Table 3).

The results clearly indicated that aqueous and alcoholic extracts of *F. racemosa* roots at a dose of 400mg/kgbw had shown significant antihyperglycemic in alloxan induced diabetic rats. In alloxan diabetic rabbits, the blood glucose levels are raised due to permanent destruction of pancreatic β cells (Akhtar, 1992). Moreover, the serum insulin levels are decreased in alloxan diabetic rabbits due to destruction of pancreatic β cells.

Table 1 : Blood glucose and urine sugar of control and experimental animals in each group

Groups	Fasting blood glucose (mg/dl)	Urine sugar
1. Control	80.1 ± 6.2	Nil
2. Diabetic control	269.8 ± 20.8	+++
3. Diabetic + Aqueous *F. racemosa* roots	92.9 ± 8.4	Nil
4. Diabetic + Alcoholic *F. racemosa* roots	94.5 ± 8.6	Nil
5. Diabetic + glibenclamide	100.8 ± 10.1	Nil
6. Control + Aqueous *F.racemosa* roots	79.6 ± 5.3	Nil
7. Control + Alcoholic *F. racemosa* roots	78.7 ± 5.9	Nil

Values are expressed as mean ±SD (n=6); a – significantly different from control animals $^{a}p < 0.001$; b – significantly different from control animals $^{b}p < 0.01$; NS – Non-significant

Table 2 : Levels of total haemoglobin and glycosylated haemoglobin in control and experimental animals in each group

Groups	Toyal haemoglobin (mg/dl)	Glycosylated haemoglobin HbA1%
1. Control	14.61 ± 1.1	2.79 ± 0.18
2. Diabetic control	8.8 ± 0.69	7.9 ± 0.83
3. Diabetic + Aqueous *F. racemosa* roots	13.8 ± 1.2	3.13 ± 0.24
4. Diabetic + Alcoholic *F. racemosa* roots	13.6 ± 1.5	2.98 ± 0.3
5. Diabetic + glibenclamide	12.9 ± 1.3	3.42 ± 0.22
6. Control + Aqueous *F. racemosa* roots	14.3 ± 0.9	2.88 ± 0.19
7. Control + Alcoholic *F. racemosa* roots	14.7 ± 1.6	2.83 ± 0.21

Values are expressed as mean ±SD (n=6); a – significantly different from control animals $^{a}p < 0.001$; b – significantly different from control animals $^{b}p < 0.01$; NS – Non-significant

Table 3 : Levels of total Vitamin C and Vitamin E plasma of control and experimental animals in each group

Groups	Vitamin C (mg/dl)	Vitamin E (mg/dl)
1. Control	1.42 ± 0.07	1.39 ± 0.09
2. Diabetic control	0.71 ± 0.05	1.09 ± 0.12
3. Diabetic + Aqueous *F. racemosa* roots	1.32 ± 0.11	1.26 ± 0.14
4. Diabetic + Alcoholic *F. racemosa* roots	1.38 ± 0.13	1.22 ± 0.09
5. Diabetic + glibenclamide	1.28 ± 0.14	1.20 ± 0.13
6. Control + Aqueous *F. racemosa* roots	1.48 ± 0.09	1.40 ± 0.07
7. Control + Alcoholic *F. racemosa* roots	1.45 ± 0.11	1.36 ± 0.06

Values are expressed as mean ±SD (n=6); a – significantly different from control animals $^{a}p < 0.001$; b – significantly different from control animals $^{b}p < 0.01$; NS – Non-significant

It has been reported that aqueous extracts of the plant produced a significant reduction in the blood glucose levels in rabbits (Chakraharty *et al*., 1981). These constituents also have the ability to reduce the blood glucose levels of normal rabbits but they have no effects on blood glucose levels of alloxan diabetic rabbits.

The data revealed that pancreas tonic and compound recipe had no significant hypoglycaemic effect in normal rabbits but they had caused significant blood reduction in blood glucose levels of alloxan diabetic rabbits. These observations revealal that these compounds had action different to that of insulin as insulin causing reduction in blood glucose levels of normal as well as alloxan diabetic rabbits. These observations suggest that these compounds possibly regenerate the pancreatic beta cells that secrete insulin that is responsible for reduction in blood glucose levels.

REFERENCES

Akhtar, M.S. (1992). Hypoglycaemic activities of some indigenous medicinal plants traditionally used as anti-diabetic drugs. *J. Pakistan Med. Asso*., **2** (11) : 271-277.

Chakrabarty, B.K., Gupta, S., Gambhir, S.S. and Gode, K.D. (1981). The prophylactic action of (-) epicatechin against alloxan induced diabetes in rats. *Life Sci*., **29**: 20-43.

Cohen, G. and Heikkila, R.E. (1974). Genaration of hydrogen peroxide, superoxide radical by 6-hydroxyldopamine, dialuric acid and related agents. *J. Biol. Chem.,* **49**: 2447-2452.

Gutteridge, J. and Halliwell, B. (1990). Involvement and mechanism of lipid peroxidation in biological system. *Biochem. Sci.,* **15** : 129-135.

Klein, R., Klein, B.E. and Moss, S.E. (1992). Epidemiology of proliferative diabetic retinopathy. *Diabet. Care,* **15** : 1875-1891.

Murray, C.J. and Lopez, A.D. (1997). Mortality by cause for eight regions of the world: Global burden of disease study. *Lancet,* **349** : 1269-1276.

Nadeem, M.S. and Suraiya, O. (1969). Studies of the hypoglycemic properties of *Eugenia jambolana*. *Pakistan J. Med. Res*., **2** : 148-155.

Rajasekharan, S. and Tuli, S.N. (1976). Vijayser' (*Pterocarpus marsupium*) in the treatment of 'madhumeha' (diabetes mellitus) – A climical trial. *J. Res. Ind. Med. Yoga Homeop.*, **9** : 76-78.

Taylor, R. and Agius, L. (1998). The biochemistry of diabetes. *Biochem. J.,* **250** : 625-640.

Thylefors, B. (1990). The World Health Organization's program for the prevention of blindness. *Internat. J. Ophthalm*., **14** : 211-219.