



EFFECT OF ETHYL ACETATE EXTRACT OF *ACANTHOSPERMUM HISPIDUM* DC. ON REGULATION OF LIPID METABOLISM IN DIABETIC INDUCED RATS

Biochemistry

J. Vasundharamma* Research Scholar, Department of Botany, Rayalaseema University, Kurnool -7. * Corresponding Author

Dr. Sk. Mahmood Professor, Department of Botany, Osmania University, Hyderabad-500007

ABSTRACT

Today diabetes became a global public health issue. More than 1200 species of plants are identified as herbal remedy for diabetes. In present study, Ethyl acetate and aqueous extract of *Acanthospermum hispidum* DC. was tested on blood glucose levels (mg/dl) at different time intervals of diabetic induced rats and found that the blood glucose levels are decreased and also able to alter the levels of lipid metabolites including TC, TG, HDL and LDL cholesterol levels in diabetic rats after 9 hours in all the three groups of rats with body weights of 150mg/kg, 300mg/kg and 450mg/kg that are taken for testing.

KEYWORDS

Diabetes, Ethyl acetate extract, blood glucose, lipid metabolites, *Acanthospermum hispidum*, body weight of rats.

Introduction:

India holds credibility of diverse social, cultural and medical heritage with an unbroken tradition coming down across millennia. Though medical heritage is centuries old, million people in rural area still depend on traditional medicine to congregate their healthcare needs (Ved and Goraya, 2008). Today diabetic mellitus is in alarming rise and became globally an important public health issue. According to world health organization projection, the diabetes population is likely to increase to 300 million or more by the year 2025. The International diabetes federation (IDF) estimates the total number of diabetic subjects to be around 40.9 million in India and this is further set to rise to 69.9 million by the year 2025. (Zimmet, P. 2000).

Ethno botanical studies of traditional herbal remedies used for diabetes around the world have identified more than 1200 species of plants. There are apparent evidences that bioactive phyto chemicals will reduce the risk of diseases. Thus for the present study ethyl acetate and aqueous extract of *Acanthospermum hispidum* DC. was taken to test on fasting blood glucose levels (mg/dl) at different time intervals of diabetic induced rats.

Materials and Methods:

Leaves of *A. hispidum* were collected from Rangampet and S.V. University, Tirupati campus and surrounding areas of Chittoor district. The plant is identified with the help of floras and voucher specimen was deposited in the herbarium of Department of Botany, S.V. University, Tirupati.

Leaves were shade dried in the laboratory and made into powder. The powdered plant material was extracted in a Soxhlet's apparatus with ethyl acetate. The extract was distilled and used for the experiment.

Healthy albino wistar rats aged 3 1/2 months with a body weight 150–450 mg were procured from Sanzyme Pvt.Ltd. Hyderabad, Telangana were used in this study. Diabetes was induced into these rats by intraperitoneal administration of STZ. All the animals were allowed to free access to tap water and pellet diet and maintained at room temperature.

Ethyl acetate and aqueous plant extract of *A. hispidum* is dissolved in distilled water and administered orally for 15 days. After an overnight fast the plant extract suspended in distilled water is fed by using a force feeding needle. Group 1 and Group 2 rats are fed distilled water alone. Blood samples are collected for the measurement of blood glucose from the tail vein before plant extract treatment and after plant extract treatment. Blood glucose is measured and the results are compared with those of normal rats.

The rats were divided into 5 groups and each group consists of 6 rats.

Group I – Untreated normal rats

Group II – Untreated diabetic rats

Group III – Diabetic rats with 150mg/kg body weight treated with plant extract.

Group IV – Diabetic rats with 300mg/kg body weight treated with plant extract.

Group V - Diabetic rats with 450mg/kg body weight treated with plant extract.

The blood glucose level was estimated by using dextrostics with Ames Glucometer at different time intervals as 0hr., 1hr., 3hr., 5hr., 7hr., and 9th hr.

In addition to its anti-hyperglycemic effect, *Acanthospermum hispidum* extracts were also able to alter the levels of lipid metabolites including TC, TG, HDL, and LDL cholesterol levels in diabetic rats suggesting a remarkable anti-hyperlipidemic effect. The levels of serum lipids are usually raised in Type2 DM and such an elevation represents a risk factor for coronary heart disease (Sahib *et al.*, 2012).

In this study, there were significant increase in the TC, TG and the LDL levels on diabetic rats. The elevated TG level in diabetic rats might be due to the consequence of increased synthesis of triglyceride rich lipoprotein particles (VLDL) in liver and diminished catabolism. Recent researches have also reported that the elevated TG level-rich lipoproteins could be a consequence of the reduction of LPL activity due to its glycation (Puddu *et al.*, 2013).

The elevated levels of TC, TG and LDL were reduced in *Acanthospermum* extract treated diabetic rats. Administration of 300mg/kg aqueous extract and 450mg/kg ethyl acetate of *A. hispidum* extract were reduced by 62.15±2.99 TC, 25.42±2.72 TG, 24.05 in LDL, and increased by 41.12 in HDL as compared to diabetic group. Administration of aqueous extract 300 mg/kg *Acanthospermum hispidum* extracts were also reduced significantly ($p < 0.01$) by in --- TC, in-- TG and -- in LDL, and increased by --in HDL as compared to diabetic group.

Administration of 450mg/kg *Acanthospermum hispidum* extracts were reduced significantly ($p < 0.001$) by 31.2% in TC, 33.68% in TG and -- in LDL, and increased by --in HDL as compared to diabetic group. Thus, these results suggested that *A. hispidum* extracts would be helpful to the prevention of diabetic complications through improving dyslipidemia and/or hypercholesterolemia. Nevertheless, the maximum reduction in TC, TG and LDL was associated with the concentration of 450mg/kg among the *A. hispidum* leaf extract treated groups, and it was comparable with rats treated with normal control.

Further more, there were an elevation of atherosclerotic index and reduction of Cardio protective index in diabetic rats. These high levels of atherosclerotic index and lower level of cardio protective index are usually found in Type2 DM and such an elevation represents a risk factor for coronary heart disease (Sahib *et al.*, 2012).

However, *A hispidum* leaf extract was able to improve the levels of atherosclerotic index and cardio protective index in diabetic mice suggesting a remarkable cardio protective effect. Administration of the *A hispidum* leaf extract decreased fasting blood glucose, which has a direct and independent relationship with cardiovascular disease, reduced lipid and lipoprotein and decreased the calculated atherosclerotic index and increased cardio protective index. It may be reduced that the *A hispidum* leaf extracts have an overall cardiovascular protective effect and reduce atherosclerotic risk in STZ induced diabetic mice.

Results and Discussion:

Table 1: Haemoglobin and glycated haemoglobin content in normal and diabetic, diabetic induce rats (Mean \pm S.D):

Groups	Mean \pm SD %change	Hemoglobin (%)	Glycosylated hemoglobin (%)
Group1	Mean \pm SD	19.24 \pm 1.42 ^c	6.99 \pm 1.12 ^a
Group2	Mean \pm SD	9.23 \pm 1.21 ^{sa}	15.26 \pm 1.22 ^d
Group3	Mean \pm SD	14.58 \pm 1.13 ^b	11.34 \pm 1.42 ^c
Group4	Mean \pm SD	15.59 \pm 1.35 ^b	7.59 \pm 0.56 ^b
F-Value		895.352	34.156
Significance		0	0

Table 2: Changes in total Protein of plasma, liver and kidney (Mean \pm S.D):

	Mean \pm SD %change	Plasma	Liver	Kidney
Group1	Mean \pm SD	9.32 \pm 1.32 ^c	229.43 \pm 3.42 ^d	226.32 \pm 3.16 ^d
Group2	Mean \pm SD	3.56 \pm 0.56 ^a	125.52 \pm 2.56 ^a	123.23 \pm 3.46 ^a
Group3	Mean \pm SD	6.23 \pm 0.69 ^b	165.42 \pm 4.42 ^b	166.13 \pm 4.16 ^c
Group4	Mean \pm SD	8.12 \pm 0.92 ^b	211.38 \pm 6.13 ^c	192.42 \pm 3.96 ^c
F-Value		32.712	153.355	159.862
Significance		0	0	0

Table 3: Glycogen content in liver and kidney of normal and diabetic induced rats (Mean \pm S.D):

	Mean \pm SD %change	Liver	Kidney
Group 1	Mean \pm SD	14.94 \pm 1.23 ^a	1.56 \pm 0.86 ^d
Group2	Mean \pm SD	6.25 \pm 0.65 ^c	7.12 \pm 0.91 ^a
Group3	Mean \pm SD	9.35 \pm 0.72 ^b	5.06 \pm 0.61 ^b
Group4	Mean \pm SD	12.26 \pm 1.22 ^a	3.44 \pm 0.53 ^c
F-value		46.956	41.456
Significance		0	0

Table 4: Levels of Serum Cholesterol, Triglycerides, HDL, LDL, and VLDL Cholesterol in normal and diabetic induced rats (Mean \pm S.D)

Groups	Mean \pm SD %change	Cholesterol (mg/dl)	Triglycerides (mg/dl)	HDL - Cholesterol (mg/dl)	LDL- Cholesterol (mg/dl)	VLDL- Cholesterol (mg/dl)
Group 1	Mean \pm SD	39.99 \pm 3.49 ^a	8.96 \pm 1.35 ^a	47.29 \pm 3.55 ^d	18.54 \pm 1.52 ^a	1.82 \pm 0.26 ^a
Group2	Mean \pm SD	96.42 \pm 4.82 ^c	46.63 \pm 3.48 ^d	15.22 \pm 1.26 ^a	74.85 ^d \pm 3.86 ^d	8.96 \pm 1.06 ^d
Group3	Mean \pm SD	62.15 \pm 2.99 ^b	25.42 \pm 2.72 ^c	29.42 \pm 1.48 ^b	41.56 \pm 2.25 ^c	6.15 \pm 0.52 ^c
Group4	Mean \pm SD	45.26 \pm 2.55 ^a	15.54 \pm 1.56 ^b	41.23 \pm 2.44 ^c	24.75 \pm 1.63 ^b	2.11 \pm 0.23 ^b
F-Value		152.42	258.12	139.048	565.216	136.026
Significance		0.000	0.000	0.000	0.000	0.000

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