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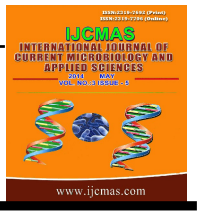

Original Research Article

Effect of *Emblica officinalis* on protien metabolism in allaxon diabetised mice

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Keywords

Allaxon diabtised mice; fruit extract total tissue; proteins; gluconeogensis - G-6-pase - AAT - ALAT.

A B S T R A C T

Diabetes mellitus is a major threat to global public health as the world wide incidences rising day by day and now emerging as global epidemic affecting approximately 285 million people worldwide that will increase to 439 million by 2030. International Diabetic Federation (IDF) has estimated that by 2025 every fifth diabetic subject in world will be an Indian. As the disease progresses, tissue or vascular damage ensues leading to severe diabetic complications such as retinopathy, neuropathy, nephropathy, cardiovascular complications and ulceration and projected as the World's main disabler and killer in the next 25 years. Therefore, the management of diabetes is still challenging one. In last few years, there has been an exponential growth in the field of herbal medicine and gaining popularity both in developing and developed countries because of their natural origin and less side effects. There is a great demand for search on safer and cost effective natural products with anti-diabetic properties. Various scientific studies have confirmed the beneficial effect of plants with antidiabetic effects in the management of Diabetes mellitus in Streptozotocin and Alloxan induced diabetic animal models. Hypoglycemic effect of Fruit Extract of *Emblica officinalis* which is commonly available to common man is intended in the present study.

Introduction

During diabetes, due to insulin deficiency along with disorders of carbohydrate and lipid metabolism, protein metabolism is also disturbed. The diminition of protein synthesis and enhanced utilization of it as a source of energy is evident in diabetes.

There will be an obvious breakdown of protein and increased activity of amino transferases channelizing the carbon skeleton of amino acids into oxidative pathway. The increased transaminase activity and gluconeogenic enzymes and

reduction in protein levels indicate the non-utilization of glucose and deficient secretion of insulin, a characteristic feature of diabetes. Thus the estimation of protein levels, amino transferases such as alanineaminotransferase and aspartate amino transferase activity in the present study will enable to assess whether the hypo or hyper glycemia is caused, which will indicate the efficacy of the extract

Material and methods:

Preparation of plant extract:

The prepared fruit extract of *Emblica officinalis* was obtained from Heritage Bio Natural Products Pvt Ltd, Uppal Hyderabad.

Flow chart for the preparation of the extract

Raw material-Cleaned material Crush Material extract (Extracted with alcohol of graded strength) Concentrated liquid (Volume reduction under vacuum)- Purified Material Liquid extract (Apporx.30% solid) - Thick semi solid extract. The extract was suspended uniformly in distilled water and injected intraperitonially.

Induction of Alloxan Diabetes:

Alloxan Monohydrate of 100mg/Kg body Weight was dissolved in distilled water (Champakam, 1993) and administered using a micro syring to overnight fasted mice. The route of administration was decided based o n the literature (Narender Reddy, 1993.Lauris and Cahill, 1966.)

Experimental set up for evaluation of hypoglycemic activity of the extract in diabateised mice

Three groups of animals 25-30 gm were maintained each comprising of 6 male mice of same age for experimentation. The first group was maintained as control, the second and third groups were diabetised with a dose 100mg/kg body weight of alloxan (ip) and after a time interval of 48 hours blood glucose levels were estimated. To confirm the induction of diabetes, and glucose tolerance test was performed. The third group was administered with *E. officinalis* fruit extract of a dose of 600mg/kg body weight intra pertonially. 3hours after administration of the extract to the third group, blood was drawn from the orbital sinus from all the mice of all three groups for estimation of glucose and insulin levels. Each time three groups of animals were maintained as explained above for estimation of total proteins and transaminases, in slice of liver and kidney and thigh muscle.

Estimation of total proteins

Total protein content was estimated by the method of Lowry *et al.* (1951).

Estimation of transaminases

Estimation of Alanineamino Transferase (ALAT)

ALAT was assayed by the colorimetric method of Reitman and Frankel (1957) as described by Bergmeyer and Bernt (1965).

Estimation of Aspartate Amino Transferase (AAT)

AAT was assayed by the colorimetric method of Reitman and Frankel (1957) as described by Bergmeyer and Bernt (1965).

Results and Discussion

Total proteins

Table 1 and fig 1 shows the levels of total

proteins in control, diabetic and diabetic treated with the fruit extract of *Emblica officinalis.* The total protein in diabetic induced by alloxan is decreased by 62.50% compared with the normal, while in diabetic treated with fruit extract of Emblica officinalis there is a decrease of 18.58% from the normal.

The total proteins in alloxon diabetised kidney decreased by 69.5% and diabetic treated with fruit extract of Emblica officinalis showed a decrease of only 27.27% from the normal.

There is a significant depletion of total protein levels in muscle tissue of diabetic rats, decreased by 44.90%. The protein levels were increased by 1.94% above the normal.

In all the three tissue the protein levels showed depletion while in diabetic treated with the fruit extract of Emblica officinalis showed an increase indicating the recuperation from diabetic state.

Alanine Aminotransferase

The levels of Alanine aminotransferase in control, diabetic and diabetic treated with the fruit extract of Emblica officinalis are presented in table 2 and fig 2. The Alanine aminotransferase level increased in liver tissue of diabetic mice by 11.52% and in the liver of diabetic treated with the fruit extract of Emblica officinalis decreased by 8.5% from the normal (control) indicating enhanced gluconeogenesis from proteins.

Aspartate aminotransferase

The levels of Aspartate aminotransferase are computed in table 3 and fig 3.

Total Proteins

Due to insulin deficiency paralleled by disorders of carbohydrate and lipid metabolism, protein metabolism is also disturbed. This is revealed mainly in the diminution of its synthesis and greater utilization as a source of energy. Intensified breakdown of protein obviously occurs as a result of the activation of proteolytic enzymes accelerating protein breakdown. The inhibition of protein synthesis from amino acids is a prerequisite for forming carbohydrates from them. In diabetes the formation of carbohydrates from protein (gluconeogenesis) considerably increases.

In the present study it has been observed that in alloan diabetised mice there is a significant decrease in the protein levels in liver, kidney and muscle. This decrease in the protein levels may be a consequence of protein degradation in the tissue and due to inflow of amino acids from other tissues which is utilized for gluconeogenesis Exton and Park (1967) have reported that when carbohydrate is lacking and the glycogen reserves are low the supply of glucose is maintained by gluconeogenesis from lactate, pyruvate, glycerol and amino acids as the major essential physiological substrates for production of glucose. As the amino acids are channelized towards the production of glucose, the protein is depleted in the tissues Norman et al. (1980) have reported that liver protein was remarkably reduced during the period of starvation in fish. Owen et al. (1969) have also reported that in rat there was a

Table.1 Levels of Total Protein in Control, Diabetic and Diabetic and Diabetic treated With *Emblica Officinalis* Extract

Tissue		Control	Diabetic	Diabetic treated with extract
Liver	Mean± S.E	31.250±0.44	11.710±0.38	25.460±0.42
	% Variation		62.50%	18.58%
Kidney	Mean± S.E	16.960±0.41	5.250±0.30	12.350±0.40
	% Variation		69.50%	27.20%
Muscle	Mean± S.E	41.150±0.56	22.73±0.66	42.06±0.80
	% Variation		44.90%	1.94%

Fig.1 Levels of proteins in Liver & Muscle of Control, Diabetic and Diabetic treated Mice with fruit extract of *Emblica officinalis*

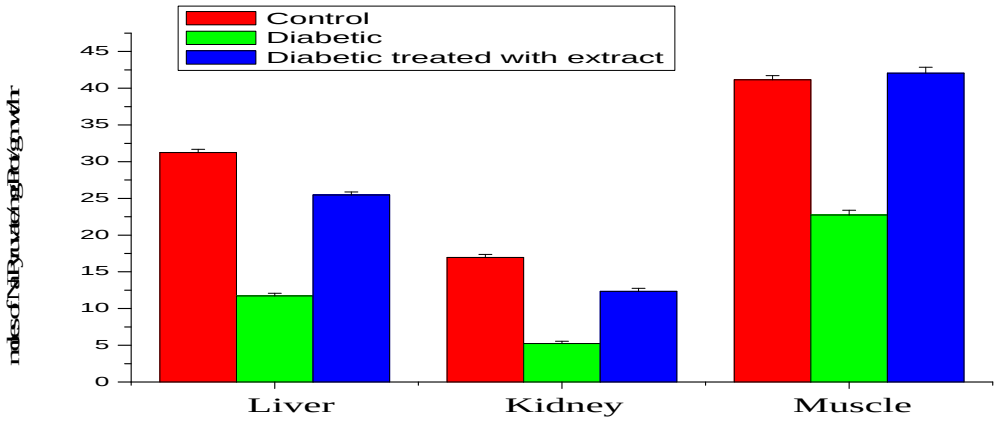


Fig.2 Activity levels of Alanine Amino transferase of Control Diabetic and Diabetic Mice treated with fruit extract of *Emblica officinails*

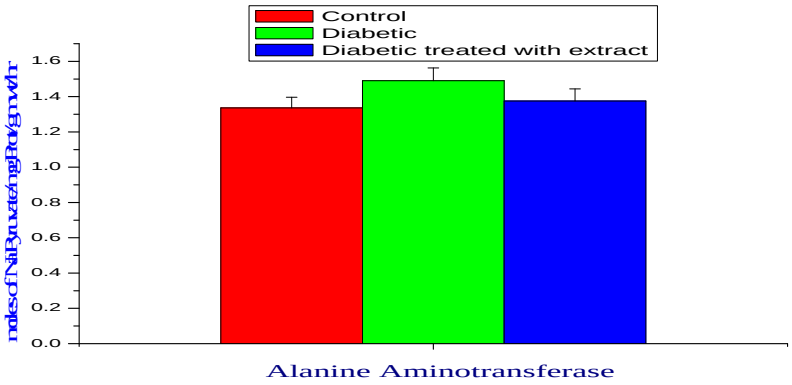


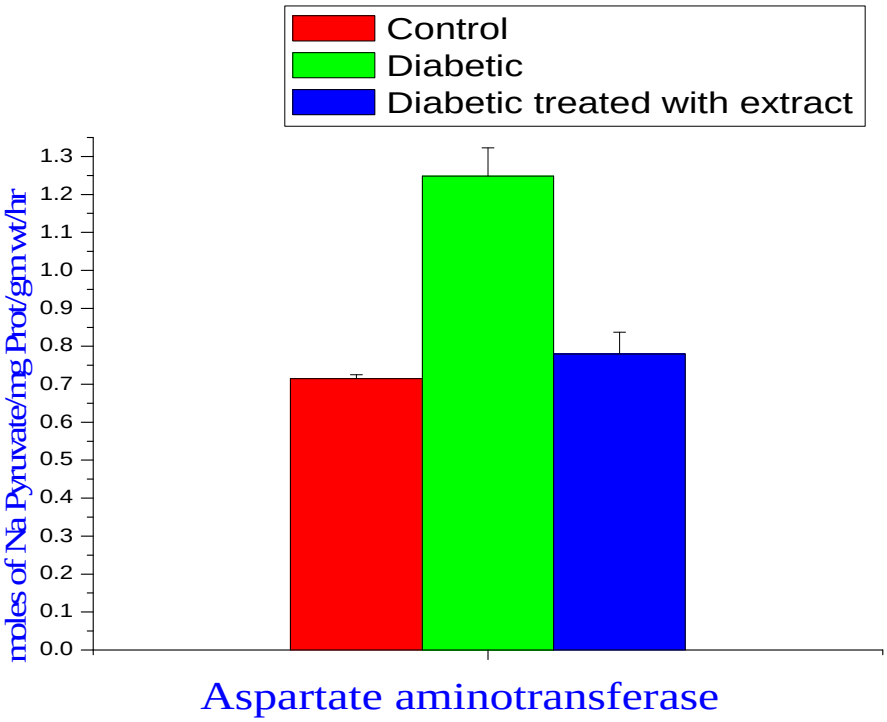
Table.2 Levels of ALAT in Control, Diabetic and Diabetic treated Mice with fruit extract of *Emblica officinalis*

Liver tissue		Control	Diabetic	Diabetic treated with extract
Alanine AminoTransferase	Mean± S.E	1.336±0.061	1.490±0.073	1.375±0.069
	% Variation		11.52%	2.95%

Table.3 Levels of AAT in Control, Diabetic and Diabetic treated Mice with fruit extract of *Emblica officinalis*

Liver tissue		Control	Diabetic	Diabetic treated with extract
Aspartate AminoTransferase	Mean± S.E	0.715±0.010	1.248±0.075	0.780±0.057
	% Variation		74.69%	9.14%

Fig.3 Activity levels of Aspartate Amino Transferase in Liver of Control, Diabetic and Diabetic Mice Treated with fruit extract of *Emblic officinalis*



reduced catabolism and total amount of glucose markedly reduced. A rise in glucose-6-phosphatase activity in rats which were fasted had been reported by Weber and Cantero (1954) indicating increased gluconeogenesis.

As uncontrolled diabetes is characterized by increased gluconeogenesis by activation of ALAT (Rosen et al., 1958; Rosen 1963 and Narender Reddy, 1993). This indicates that the transamination of alanine enrouting it towards the production of glucose. Increased activity of aspartate amino transferase (Narender Reddy, 1993) in mice during diabetes also shows the occurrence of gluconeogenesis during diabetes from proteins hypoglycaemic sulphonyl urea derivatives. Pentill (1966) also has observed the effect of insulin chloropropanide and tolbutamide on metabolism of branched chain amino acids and demonstrated the inhibition of transamination between branched chain amino acids and alpha-ketoglutarate.

Protein in diabetic animal treated with Extract

Increase in the protein level in diabetic animal treated with the extract indicates the recovery from the diabetic state. Probably the extract administered would have induced the activity of B-cells to release insulin and hence reversal of protein to control level in all the tissues (liver, kidney and muscle). Insulin is reported to stimulate the transport of amino acids in the isolated rat diaphragm Kipnis and Noall (1958), Manchester and Young (1958) have also reported the role of insulin in incorporation of amino acid into protein of normal rat diaphragm. Recently, Narender Reddy (1993) has also reported that the proteolytic action during the streptozotocine induced diabetes is retreated by sepia shell extract which was used as hypoglycaemic agent in treatment of diabetic animal, which is evident from the decrease in concentration of free amino acids in blood and liver. The increase in the protein observed in the present study in all the tissues is consistent with the observations of Lotspeich (1949), Sinex et al. (1952), Recent and Fisher (1957) and Dechattet and McDonald (1968).

Narender Reddy (1993) has observed a decrease in alanine amino transferase activity on administering sepia extract to diabetic animal clearly confirms the inhibition of gluconeogenesis. Bronstein (1957) also found that there was an inhibition of alanine transferase by the

Thus, it can be concluded that the depletion of protein levels in alloxan diabetised rats is due to the utilization of protein channelized towards the formation of glucose and the increase in the protein levels in the diabetic animal treated with the extract shows the recuperation of the animal to normalcy. This indicates the hypoglycaemic efficiency of the Emblica officinalis fruit extract which is evident from the reversal of the gluconeogenic enzymes activity and the transaminases activity to control level which showed an upsurge during diabetes.

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