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Effect of *Emblica officinalis* Fruit Extracts on Lipid Metabolism in Allaxon Induced Diabetic Mice.

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ABSTRACT

Emblica officinalis (Amla) are widely used in the Indian system of medicine and believed to increase defense against diseases. 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. Various scientific studies have confirmed the beneficial effect of plants with anti-diabetic effects in the management of Diabetes mellitus in Alloxan induced diabetic animal models. The fruit extract of *Emblica officinalis* to allaxon diabetic mice showed an increase in total tissue lipids which was found to be decreased in allaxon diabetic mice which were not treated with the fruit extract. The total lipids showed lowest in diabetic liver tissue, kidney tissue and muscle tissue compared to the other control and diabetic treated with extract. Increase in lipid levels in diabetic treated with extract compared to the diabetic tissue and also recovery.

Keywords: *Emblica officinalis*, Allaxon, Diabetic mice, Fruit extract, Total tissue lipids.

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INTRODUCTION

Diabetes mellitus is the third leading cause of death (after heart disease and cancer) in many developed countries. It affects about 2 to 3 % of the general population. The complications of diabetes affect the eye, kidney and nervous system. Diabetes is a major cause of blindness, renal failure, amputation, heart attacks and Stroke. Almost 3.2 million people die of diabetes across the world every year. Diabetes mellitus is a syndrome characterized by chronic hyperglycemia and disturbances of carbohydrate, fat and protein metabolism associated with absolute or relative deficiency in insulin secretion or insulin action [16, 6]. Fruits of *Emblica officinalis*, commonly known as 'amla' or the Indian gooseberry, are extensively used in the Ayurvedic and Sidha systems of medicine for the treatment of a wide spectrum of diseases [7].The fruit when blended with other fruits, boosted their nutritional quality in terms of vitamin C content [11].

The plasma free fatty acid level is raised in uncontrolled diabetics [1, 2, and 12] and in experimentally induced acute insulin deficiency [17]. According to [14] he has reported that where there is little or no active insulin in the plasma as in fasting or after the injection of anti insulin serum, there is an increase in the rate of glycerol release indicating increase in lipolysis. The present investigation total tissue lipid is estimated whose levels would indicate whether lipolysis is caused by insulin deficiency and reversal after treatment with plant extract.

MATERIAL AND METHODS

Source of plant extract

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

Preparation of the fruit extract

Take the cleaned fruit material and crush material extract with alcohol of graded strength and concentrated liquid (Volume reduction under vacuum) and purified material liquid extract (Apporx.30% solid) will be formed which is converted into 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 [4] and administered used a micro syring to overnight fasted mice the route of administration was decided based on the literature [13].

Experimental set up for evaluation of hypoglycemic activity of the extract in diabetic 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 diabolized 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. Three hours after administration of the extract to the third group slice of liver and kidney and thigh muscle was collected for estimation of total tissue lipids.

Estimation of total tissue lipids

Total tissue lipids were estimated by the method of Barnes and Black stock [3].

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RESULTS AND DISCUSSION

Total tissue lipids

There was a highly significant fall in the total tissue lipids in the liver tissue of alloxan diabetic showing a depletion of 70.3% compared with the controls, and in diabetic animals treated with the extract of *Emblica officinalis* depletion of 0.94%. The total lipids decreased by 38.25% in kidney of diabetic animals while the diabetic treated with the extract showed a depletion of only 3.10% showing an increase of 35.15% above the diabetic.

The diabetic muscle tissue showed a fall of 60.73% from the normal value, but the diabetic administered with fruit extract of *Emblica officinalis*, the levels were less by 18.04% with the normal. However, showing an increase of 42.69% above the diabetics indicate an overall increase in lipid levels in diabetic treated with extract over the diabetic indicating a recovery.

The depletion of lipid in diabetic state could be due to the decrease in lipogenesis due to decreased or insufficient release of the insulin and increased utilization of lipid as gluconeogenic precursor. The same was observed [17] in the rats treated with anti insulin serum. It was reported by [5, 9] that insulin causes a fall in plasma free fatty acids and decrease in rate of synthesis of free fatty acids from adipose tissue. According to [10] has shown that insulin in a glucose free medium prevents the release of glycerol from fat pads, stimulated with epinephrine. Many studies concerning the effect of starvation in different fish species have been published [3].

Lipid in extract treated state

The levels of total lipids in diabetic animal treated with the fruit extract of *Emblica officinalis* showed recovery to the control level. Hence it can be deduced that the extract is effective in controlling diabetes. Insulin greatly stimulates both glucose oxidation and lipogenesis in adipose tissues.

The fatty acid synthesis greatly influenced by the rate at which glucose is broken down in the body and he also stated that glucose oxidised over the pentose phosphate pathway is primarily responsible for this ability of glucose catabolism to stimulate lipogenesis[15]. The major factor mediating in this effect is probably the reduced triphosphopyridine nucleotide generated in this pathway. An increased activity of glucose-6-phosphate dehydrogenase to meet the demands of fatty acid synthesis for reduced NADP [18]. The link between the shunt activity and lipid biosynthetic activity was demonstrated [8]. The increase in total lipid along with the increased glucose-6-phosphate dehydrogenase activity in all the tissues on treatment of diabetes with fruit extract of *Emblica officinalis* shows clearly that it has the controlling effect on diabetic effect on lipid metabolism.

Figure 1: Levels of lipids in liver, kidney & muscle of control, diabetic and diabetic treated mice with fruit extract of *Emblica officinalis*.

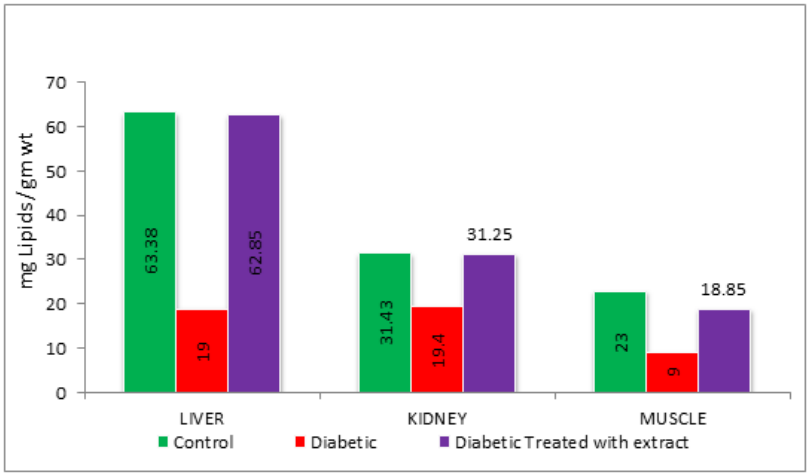

Table 1:- Levels of Lipids in Control, Diabetic and Diabetic treated with *Emblica officinalis* fruit extract.

Tissue		Control	Diabetic	Diabetic treated with extract
LIVER	Mean ±SE	63.38±0.32	19.00±0.22	62.85±0.46
	% variation		70.30%	94.00%
KIDNEY	Mean± SE	31.43±0.31	19.40±0.11	31.25±0.23
	% variation		38.21%	3.10%
MUSCLE	Mean± SE	23.00±0.26	9.00±0.24	18.85±0.25
	% variation		60.73%	18.04%

Note: - values are significant at P<0.05

CONCLUSION

It can be summarized that in diabetic state, the deficiency of insulin causes the lipid as source of energy causing depletion. On treatment with the extract the restoration of lipid to the control level establishes the controlling effect of the extract on diabetes, thus leading to enhancement in glycolysis and pentose phosphate pathway which are responsible for lipogenesis. Insulin in physiological concentrations opposes the stimulating action of the adipokinetic hormones. It is suggested that insulin at these concentrations exerts a restraining effect on a hormone sensitive lipase activating mechanism. Therefore, in insulin deficient state there is an unopposed lipolysis leading to the depletion of the total tissue lipids.

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