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Despite the wide prevalence of diabetes mellitus in India, its research contribution is much less and the disease is progressing unabated\(^1\). Multiple defects in the pathophysiology of the disease and its complications are too complex and are imprecisely understood. Though hyperglycemia is the hallmark of diabetes, the pathogenic links appear to be beyond hyperglycemic consideration. It is now clear that diabetic hyperglycemia leads to oxidative stress and glycation of proteins thereby causing increased production of free radicals and also a sharp reduction of antioxidant defenses. In brief, oxidative stress has been suggested to be the major factor in the pathogenesis of diabetic complications\(^2\).

Reports clearly revealed that people of Indian origin are prone to diabetes\(^3\). India, China and United States of America contain a large number of people suffering from diabetes irrespective of the socioeconomic conditions. Keeping India and China in mind, the deliberations at the International Conference on Health Research for Development held at Bangkok in 2001 emphasized that each country needs to be able to generate knowledge relevant to its own situation to allow it to determine its particular health problems, appraise the measures available for dealing with them and choose the actions likely to produce greatest improvement in health\(^4\). After a thorough analysis, experts opined that India needs to strengthen research on diabetes. A wide variety of therapeutic agents are available today with a range of action to fight against hyperglycemia. The efficacy of these agents is compromised in several ways. Many of the drugs act only on a part of the pathogenic process and only to a partial extent\(^5\). All the available drugs can lower the blood glucose level to some extent for a short time and the effect is also transient. Moreover, all these drugs are expensive and cause toxicity / side effects and fail to control the sequelae and complications of the disease\(^6\). Now people are irritated with thick, sticky extracts that clogged up their syringes and vexed with various emerging and available hypoglycemic drugs and their side effects. Under these
circumstances, the modern approach for the control of multifactorial pathogenicity of diabetes is a multimodal therapeutic approach by choosing and using traditional plants with various effective active principles to treat the whole disease and also the same should provide appropriate caloric and therapeutic nutrients as nutrition plays an important role in diabetic therapy.

Current scientific evidence demonstrates that much of the morbidity and mortality of diabetes can be mitigated by aggressive treatment with diet, exercise and new pharmacological approaches to achieve better control of blood glucose levels. Furthermore, the possibility of preventing the onset of diabetes using dietary supplements and/or herbal medicines has attracted considerable attention. An intact/native preparation may contain dote and antidote probably to mitigate side effect(s), if any, of the active (principles) components. Therefore, a majority (88%) of the global population has turned to plant derived medicines/therapeutic methods. Literature mapping indicates mulberry leaves to be a source of nutrients and innumerable active principles to treat diabetes and the related complications. Since a long time, mulberry (Morus sp.) has been proposed as a potential source of active principles and dietary components for the treatment of lifestyle related diseases such as diabetes and many other manifestations. Traditional Chinese medicine strongly recommends the use of mulberry to prevent "Xiao-ke" (diabetes).

Mulberry is cultivated all over the world including India. Surprisingly, Anantapur district alone constitutes about 50% of the total area of cultivation of mulberry in Andhra Pradesh in spite of very low rainfall. Whenever world silk market is affected, an alternative way is to use mulberry leaves as human dietary supplement and ruminant feed as the leaves are nutritious, palatable and nontoxic.

Very little information is available on biochemical basis related to antihyperglycemic property of mulberry leaves. Virtually no systematic study has been
undertaken so far in this regard. However, very few biochemical studies carried out on the use of mulberry leaves or leaf extracts and some active compounds of mulberry leaves on mice/rats led to differential and ambiguous results. The presence of certain important compounds viz., radical scavengers (flavonoids and isoquercitrins), phyto-sterols (β-sitosterol, campesterol, stigmasterol and isofucosterol), fibre, proteins along with important active principles (1-deoxynojiririmycin–DNJ, fagomine, Moran A) in the leaves which exert antidiabetic property suggesting a coordinated and combined play of the above mentioned components. As there is a search/surge for the discovery of new therapeutic cum dietary methods for the management of diabetes mellitus, in the present study standard diet supplemented with the whole mulberry leaf powder containing all the compounds was used to combat the disease and the related complications rather than one or two isolated principles which can achieve only euglycemia but fail in controlling other diabetic complications.

In addition to humans, spontaneous diabetes is a common occurrence in many animal species such as monkeys, cats, dogs, tree shrews, ground squirrels, foxes, dolphins, hippopotami, antelopes and most farm animals and all these occasionally become diabetic. Besides, animals can be rendered diabetic by a wide variety of experimental procedures. Both spontaneous and experimental models have been used effectively to study etiologies, complications, treatment and prevention of diabetes. Owing to species availability and susceptibility to the diabetogenic effect of streptozotocin (STZ) and based on success achieved in earlier studies, Streptozotocin induced diabetic wistar rat model is recognized as an ideal model for various in vivo nutritional and diabetic evaluation experiments as well as for studies on β cell regeneration/protection. Hence, long term feeding studies using diet along with selective proportions of therapeutic principles in STZ–induced diabetic rats would appear warranted.
Keeping all these in view, the present work was undertaken to study the antidiabetic property and other beneficiary effects, if any, of mulberry (*Morus indica* L.cv. Anantha) leaves when supplemented through diet. The main objectives of the study are:

- To evaluate the influence of mulberry leaf powder supplemented (MLP) diet on blood glucose levels in STZ-induced diabetic rats to find out the maximal glucose lowering dosage of mulberry leaves for further studies.

- To study the effect of MLP diet on blood parameters (hematological profile and metabolic intermediates) and serum insulin levels in STZ-diabetic rats.

- To evaluate antioxidant status and role of defense enzymes in diabetic rats fed with MLP diet.

- To understand the influence of MLP diet on the activity of various enzymes of carbohydrate metabolism in serum, erythrocytes, liver and kidney in diabetic rats.

- To find out the other beneficiary effects, if any, of MLP diet in diabetic rats especially on lipid metabolism and cataract.

- To evaluate the histopathological changes, if any, in diabetic rats receiving MLP diet.

- To analyze the nutritional components of mulberry leaves in order to use the leaves as dietary supplements.
REFERENCES


