PREFACE

Diabetes is a group of metabolic diseases characterized by hyperglycemia resulting from defects in insulin secretion, insulin action, or both. Diabetes is fast gaining the status of a potential epidemic in India. Diabetes mellitus is a genetically and clinically heterogeneous group of disorders that share glucose intolerance in common. It is predicted that the prevalence of DM in adults of which type 2 DM is becoming prominent will increase in the next two decades and much of the increase will occur in developing countries.

Symptoms of diabetes include marked hyperglycemia, polyuria, polydipsia, weight loss, sometimes with polyphagia, and blurred vision. Impairment of growth and susceptibility to certain infections may also accompany chronic hyperglycemia. Acute, life-threatening consequences of uncontrolled diabetes are hyperglycemia with ketoacidosis or the nonketotic hyperosmolar syndrome. Long-term complications of diabetes include retinopathy with potential loss of vision; nephropathy leading to renal failure; peripheral neuropathy with risk of foot ulcers, amputations, and Charcot joints; and autonomic neuropathy causing gastrointestinal, genitourinary, and cardiovascular symptoms and sexual dysfunction. Persons with diabetes have an increased incidence of atherosclerotic cardiovascular, peripheral arterial and cerebrovascular disease.

In parallel with the increase in diabetes, a dramatic increase in the prevalence of diabetic nephropathy has been noted. Diabetic nephropathy (DN) is characterized by excessive deposition of extracellular matrix (ECM) with thickening of glomerular and tubular basement membranes and increased amount of mesangial matrix, which ultimately leads to glomerulosclerosis and tubulointerstitial fibrosis accompanied by the development of albuminuria and a decline in renal function and increase the cystatin C levels in serum, increase in serum creatine levels. The synthetic drugs those were used for the diabetes diseases have side effects. Thus, it is essential to search for a new class of compounds to overcome the diabetic problems. Much attention has been focused on the protective function of natural antioxidants in dietary plants.

Plant derived drugs have been a part of the evolution of human, healthcare for thousands of years. Thus, today the pharmacological studies mainly focus in identifying and validating plant-derived substances for the treatment of various
diseases. Both antioxidant nutrients and Phytochemicals of medicinal plants can be useful in alleviate disease complications. *Xanthium indicum* (Asteraceae) is a coarse annual plant, which is found in India and the wild fallow lands of Bangladesh. The Leaves of *Xanthium indicum* were found to contain alkaloids, anthraquinone, cardenolide, flavonoids, leucoanthocyanin, simple phenolics (catechol), amino acids and triterpenoids. Methanol, ethanol, and acetone extract of leaves was found to contain proteins, carbohydrates, phenol, tannin, flavonoids, saponins, glycosides and alkaloids. *Xanthium indicum* is able to control blood sugar in diabetic patients and for treatment of rheumatic pain. It has demonstrated that methanolic extract of *Xanthium indicum* has anti-bacterial and cytotoxic activities on brine shrimp. The leaves of *Xanthium indicum* have many beneficial properties such as antioxidant and anti diarrhoeal activity, antinociceptive activity, and improving the performance of growth and cocoon characteristics of silkworm larvae. Hence the present study is designed with a focus on characterization of antioxidant property from the hydromethanolic leaf extract of *Xanthium indicum* and its bioactive compound \(\alpha\)-tocopherol on renal protective role against oxidative stress under STZ induced diabetes.

The present investigation has been presented in 5 chapters

1. *In silico* screening of antidiabetic bioactive compounds from *Xanthium indicum* leaves,

2. Preliminary screening of Diabetes,

3. Antioxidant defense system,

4. Oxidative tissue damage markers,

5. Histopathological changes.

These chapters are preceded by a general introduction, material and methods and succeeded by summery and conclusion followed by bibliography.

Though, the present work is preliminary in its nature, the study will certainly contribute much to understand the pathological consequences of diabetic nephropathy and compensatory reposes of kidney tissue during renal protective plant treatment and its bioactive compound \(\alpha\)-tocopherol treatment. The study also likely emphasize the antioxidant effect of *Xanthium indicum* and its bioactive compound \(\alpha\)-tocopherol by
taking into consideration of measurement of specific parameters related to renal tissue damage markers, which play main role during oxidative stress induced by STZ.

The author is aware of the fact that more extensive and in depth studies are essential for a thorough understanding of antioxidant defense mechanism and changes in renal tissue metabolism under STZ induced diabetic condition. Limitations in the availability of chemicals and equipment have precluded the author from bridging some of the lacunae that emerged during the study. However, the present findings may throw some light on the combination of *Xanthium indicum* and α-tocopherol treatment to STZ treated diabetic rats, with reference to Glybenclamide in countering the free radical production and defense.