Preface

Diabetes is a chronic condition occurs due to higher levels of plasma glucose. Several mechanisms are responsible for causing diabetes such as deficiency of insulin in case of type 2 diabetes and insulin resistance in case of type 2 diabetes. Type 2 diabetes is considered as the most prevalent and serious form of diabetes. Under diabetic conditions, higher level of glucose can further lead to increased generation of reactive oxygen species (ROS). Increased level of ROS causes insulin resistance and mitochondrial dysfunction. Increased ROS level also increases ATP to ADP ratio in cytoplasm which results in increased intracellular Ca^{2+} ion levels. Further, activation of mitogen-activated protein (MAP) kinases occurs in increased level of ROS which causes cellular proliferation, inflammatory responses and apoptosis and MAP kinases are inactive in normal conditions. Mitochondria are the major sites of reactive oxygen species (ROS) generation by electron transport chain (ETC). Produced ROS will be neutralized by the antioxidant defence enzymes present in cells such as superoxide dismutase, catalase and glutathione peroxidase. When the level of ROS exceeds the levels of antioxidants, accumulation of ROS occurs. Hence, mitochondria act as target machinery for the treatment of oxidative stress induced diabetes.

The present research is designed to prepare mitochondria targeted nanoparticles loaded with an antioxidant drug. *Ficus religiosa* L. extract possessing both antioxidant activity and antidiabetic activity was incorporated into nanoparticles. Triphenylphosphonium was used as a mitochondrial targeting moiety. The effect of

Ficus religiosa L. extract loaded mitochondria targeted nanoparticles on the oxidative stress induced diabetes was studied and the effect was further compared with lupeol (marker compound of *Ficus religiosa* L.) loaded mitochondria targeted nanoparticles *in vivo.*

The entire research work was carried out systematically in four sequential steps. First, standardization of ethanolic extract of *Ficus religosa* L. was done by isolating and characterizing the marker compound present in it. Second, preparation and characterization of *Ficus religiosa* L. loaded nanoparticles were carried out. Third, preparation and characterization of lupeol loaded nanoparticles were carried out. Further, as the fourth step, comparison between *Ficus religiosa* L. loaded nanoparticles and lupeol loaded nanoparticles was done for the effective management of oxidative stress induced diabetes.

The purpose of this study was to introduce a effective oral drug delivery system which can target mitochondria and produce its action for the management of oxidative stress induced diabetes. The proposed drug delivery system can decrease both increased levels of glucose and ROS and their associated complications.