Title of Thesis

Studies on the protective effect of aqueous bark extract of *Terminalia arjuna* against copper-ascorbate induced oxidative stress in human placental mitochondria

Submitted by Mousumi Dutta

Abstract

*Terminalia arjuna* (TA) is a medicinal plant of considerable therapeutic relevance. Very recently, we have shown that a number of compounds isolated from plants and their parts having medicinal importance are capable of providing protection against copper-ascorbate induced oxidative stress mediated damages in isolated mitochondria *in vitro*. The results demonstrated that these compounds appear to be potentially effective in ameliorating mitochondrial dysfunction associated with oxidative stress. In the present study, we investigated, in individual experiments, the protective effects of the aqueous bark extract of *Terminalia arjuna* (TA) or benzoic acid, as its major constituent, against copper-ascorbate induced oxidative stress mediated damages to mitochondria obtained from human placenta, *in vitro*. The composition of the aqueous bark extract of TA was analyzed by GC-MS analysis. Human placental mitochondria were used as a model organelle to investigate whether the aqueous bark extract of TA or benzoic acid protects against copper-ascorbate-induced oxidative stress, *in vitro*, by spectro-photometrically measuring the levels of biomarkers of oxidative stress, the activities of antioxidant
enzymes and the enzymes associated with energy metabolism, and evaluating the status of morphology of mitochondria through studies using scanning electron microscopy. In separate experiments, aqueous bark extract of TA or benzoic acid were found to protect against copper-ascorbate-induced alterations in the level of biomarkers of oxidative stress in a dose-dependent manner. Moreover, the alterations in the activities of antioxidant enzymes, conjugated diene level, tryptophan and di-tyrosine fluorescence, mitochondrial swelling, thiolase activity and NADH autofluorescence, mitochondrial membrane potential and morphology were found to be protected when the mitochondria were co-incubated with copper-ascorbate and the aqueous bark extract of TA or with benzoic acid in a dose-dependent manner. Although the aqueous bark extract of TA or benzoic acid independently can protect the placental mitochondrial from copper ascorbate-induced oxidative stress mediated damages but the degree of protection provided by benzoic acid was found to be more compared to the aqueous bark extract of TA. Based on these findings it can be concluded that the aqueous bark extract of TA containing benzoic acid as its major constituent may serve as a potential medicinal resource for future use in situations associated with oxidative stress.