Potable water in many countries is contaminated with fluoride intentionally or naturally through the fluoride reservoirs. Chronic intake of fluoride causes skeletal, dental and soft tissue fluorosis. Fluorosis is a debilitating disease which has no medicines other than water purification. Most defluoridation techniques are expensive and not within reach of millions of people across the world.

The work presented in the thesis primarily focuses on exploring the potential of fruits of *Emblica officinalis* (G), *Mangifera indica* (L), *Limonia acidissima* (L), *Averrhoa carambola* (L), leaves of *Tamarindus indica* (L) as dietary supplements and as a means of dietary intervention in ameliorating fluoride induced alterations in carbohydrate, lipid and antioxidant metabolism in laboratory rats. Fluoride intake results in appearance of diabetes like symptoms, hyperlipidemia and oxidative stress.

All the selected plants are well known for their use in folklore traditions and Ayurveda and, well studied for their medicinal and pharmacological properties. Since no reports are available on their utility in fluoride toxicity, the present work was carried out to investigate the beneficial effects of fruits/leaf powder feeding on hepatic carbohydrate, lipid and antioxidant metabolism.

Fluoride toxicity was induced in laboratory rats by addition of fluoride (100 ppm sodium fluoride) in drinking water for a four week period. This exposure resulted in hyperglycemia, hyperlipidemia and oxidative stress in terms of increased tissue lipid peroxidation and reduced enzymatic and non-enzymatic antioxidants. In general, all the fruit/leaf powders when incorporated into the diet individually as dietary supplements (at 2.5, 5 and 10% dose level) appeared to normalize hyperglycemia, hypercholesterolemia and reduced the oxidative stress induced by fluoride intake. Among the doses tested (i.e., 2.5, 5 and 10 gm%), 10 gm% dose administration significantly improved hyperglycemic, hyperlipidemic conditions and decreased
tissue lipid peroxidation and enhanced the antioxidant profile in fluoride exposed rats. A comparative evaluation of these plants demonstrated that E. officinalis was most potent in mitigating the fluoride toxicity, followed by M. indica, T. indica, A. carambola and L. acidissima.

Moreover, when fluoride exposed rats were fed with three different formulated multigrain diets (viz., basal, high carbohydrate low protein and high protein low carbohydrate diet), the high protein low carbohydrate diet was found to be more beneficial as it normalized carbohydrate, lipid metabolism and the antioxidant profiles in fluoride exposed rats.

The phytochemical analyses of the fruits and tamarind leaves revealed the presence of phytosterols, saponins, polyphenols, flavonoids, ascorbic acid and fibers and all these phyto-metabolites are well known for their antihyperglycemic, antihyperlipidemic and antioxidant properties. The reduced levels of plasma glucose, lipid profiles and the increase in antioxidant levels in fluoride exposed rats fed fruit or leaf powder supplemented diets indicate a composite/individual effect/s of the phytoconstituents present in the diet. It is noteworthy that traditionally the fruits of E. officinalis, M. indica, L. acidissima, A. carambola and leaves of T. indica are consumed with no known toxic effects.

Dietary modifications thus appeared to normalize the physiological functions under fluoride induced stress and help maintain the normo-glycemic, -lipidemic and antioxidant status. Therefore in light of the results obtained it can be summarized that high protein contained dietary formulations and, plant based products as food supplements could promote the health of the populations residing in endemic fluoride areas as a means to ameliorate fluoride induced oxidative stress.