Chapter 5

Summary and Conclusion
Plants are the richest resource of drugs of traditional systems of medicine, modern allopathic medicines, nutraceuticals and food supplements. An interest in medicinal plants as a re-emerging health aid has been fuelled by the rising costs of prescription drugs in the maintenance of personal health and well-being, and bioprospecting of new plant-derived drugs. The world market for plant derived phytochemicals-pharmaceuticals, fragrances, flavours and colour ingredients alone exceeds several billion dollars per year. Several medicinal plants have been used as dietary adjunct and in the treatment of numerous diseases without proper knowledge of their phyto constituents and function. Although, phytotherapy continues to be used in several countries, many plants have not received scientific or medical scrutiny. One such medicinal plant, which lacks scientific evidence for its folklore use is *P. dulce* species. It received special attention because of wide range of pharmacological as well as beneficial activities found to be present in its fruits.

The present study was carried out to scientifically validate the hypoglycemic, hypolipidemic, antioxidant properties of pod pulp (an edible part of *P. dulce* fruits) on streptozotocin induced experimental diabetes in rats. The antimicrobial potentials of pod pulp (an edible part of *P. dulce* fruits) was also evaluated.
The qualitative phytochemical screening of *Pithecellobium dulce* pod pulp extract showed the presence of biologically active ingredients such as Alkaloids, Flavonoids, Glycosides, Saponins, Tannins, Phytosterol and Triterpenoids.

From the HPLC analysis, it is evident that *P. dulce* pod pulp was found to contain biologically important flavonoids such as Rutin, Quercetin, Myricetin, Luteolin, Apigenin and Kaempferol.

Oral administration of *Pithecellobium dulce* pod pulp extract to control group of rats at graded doses for a period of 30 days established the non-toxic nature of *Pithecellobium dulce* pod pulp extract. The optimum dose of *Pithecellobium dulce* pod pulp extract was fixed as 300 mg/kg body weight for 30 days after assessing its antihyperglycemic effect by the oral administration of graded doses for different time periods.

Oral glucose tolerance test performed in the diabetic rats treated with pod pulp extract indicated the beneficial effect of the pod pulp extract in maintaining glucose homeostasis.

Oral administration of pod pulp extract to diabetic group of rats significantly normalized the altered levels of fasting blood glucose, plasma insulin, hemoglobin, glycosylated hemoglobin,
total protein, blood urea, serum creatinine and uric acid. The normalization of altered biochemical parameters upon extract treatment resulted in improved glucose homeostasis.

- Studies on the activities of pathophysiological enzymes such as aspartate transaminase, alanine transaminase and alkaline phosphatase in the serum establishing the tissue protective nature of pod pulp extract in experimental diabetic rats.

- Assay of carbohydrate metabolizing enzymes evidently indicates the establishment of glucose homeostasis by pod pulp extract administration by the optimization of both glycolytic and gluconeogenic enzyme. The reduced glycogen content together alterations in glycogen metabolizing enzymes observed in the hepatic tissues of diabetic group of rats were also restored to near control levels in diabetic rats administered with the pod pulp extract. The improved activity of glycogen synthase reveals the improved glycogen content in the liver.

- The abnormalities of lipid and lipoprotein metabolism are the main causative factor for the progression of vascular complications in diabetes. The altered lipid profiles such as total cholesterol, triglycerides, phospholipids, free fatty acids and lipoproteins in diabetic group of rats were restored to near
normal level by extract treatment, which establish the hypolipidemic efficacy of the *P. dulce* pod pulp extract.

- Hyperglycemia mediated oxidative stress resulted in increased lipid peroxidation and decreased levels antioxidant vitamins and antioxidant enzymes in diabetic rats. The elevated oxidative stress markers and declined antioxidant status observed in diabetic group of rats were restored upon oral administration with pod pulp extract exemplifying the antioxidant potential of pod pulp extract. The histological observations made on pancreas, liver and kidney indicated the tissue protective role of the *Pithecellobium dulce* pod pulp extract.

- The activity of antioxidant enzymes (SOD and catalase) were also observed by means of activity staining using native PAGE, where a similar results were obtained in which the activity was determined by observing the band width. In diabetic rats, the width of the band is less compared to normal; whereas in treated rats, it showed a normal band width as that of normal rats. Thus, the pod pulp extract treated rats showed an increased activity of SOD and catalase, preventing the accumulation of free radicals in liver.
The antibacterial activity of *P. dulce* pod pulp was assayed in terms of MIC and MBC tested against both Gram positive and Gram negative bacteria indicates that the extract possess significant bactericidal effect.

The antifungal properties *P. dulce* pod pulp was determined against human pathogenic fungal strains which revealed that the extract has potent antifungal activity which was assessed in terms of MIC and MFC.

In conclusion, the results of the study established that the *Pithecellobium dulce* pod pulp extract possess significant hypoglycemic, hypolipidemic and antioxidant properties. The observed antidiabetic as well as antimicrobial properties of the pod pulp might be due to the presence of flavonoids as evidenced from the HPLC analysis which indicates that pod pulp may be considered as a major source of flavonoids such as Rutin, Quercetin, Myricetin, Luteolin, Apigenin and Kaempferol.

The efficacy of the pod pulp extract was comparable to reference drugs used in the present study. The data obtained are statistically significant and discussed in the light of the relevant literature. Thus, the present study provides the scientific rationale for its use in the traditional system of medicine.