Summary and Conclusion

In the present study, we investigated the therapeutic potential of the hydroalcoholic extracts of *Clitoria ternatea* seed and root at 500 mg/kg, p.o. for anti-inflammatory, hepatoprotective, anti-hyperlipidemic, immunomodulatory, and wound healing activities using various experimental models. The preliminary phytochemical study showed presence of phenolic and flavonoid compounds. The hydroalcoholic extracts of seed and root were found to contain total phenolic (26.00±0.58 and 12.33±0.88, g GAE/ g of extract) and flavonoids (22.67±0.67 and 10.66±1.45, g CE/g of extract) respectively. The HPTLC fingerprinting and standardization study also confirmed the presence of flavonoid in seeds. The results of different activities were summarized below,

A. Hydroalcoholic extracts of seed and root showed significant anti-inflammatory activity against carrageenan-induced rat hind paw edema, carrageenan-induced pleurisy, and cotton pellet granuloma models as evident from significant increase in percentage inhibition of edema, significant reduction in pleural exudates volume, and significant decrease in weight of granuloma as compared to respective control group animals. The results were also comparable with reference standard indomethacin.

B. The hepatoprotective activity of seeds and root were investigated against paracetamol and carbon tetrachloride-induced liver toxicities. Seed extract showed significant hepatoprotective activity against both paracetamol and carbon tetrachloride- induced liver injuries, whereas, root extract showed significant reduction of hepatic toxicity only against carbon tetrachloride-induced liver injury. They significantly decreased serum SGOT, SGPT, and ALP. Further, they decreased hepatic lipid peroxidation and antioxidant enzymes, and increased reduced glutathione. Additionally, seed and root extracts significantly decreased hepatic collagen contents, and prevented mast cell infiltration.

C. Hydroalcoholic extracts of seed and root showed significant anti-hyperlipidemic activity against P-407-induced acute hyperlipidemia and diet-induced hyperlipidemia in rats. They showed significant reduction in serum lipid levels when compared with the control group of animals, and is
Summary and Conclusion

evident from the reduction in serum TC, TG, VLDL-C, LDL-C, and atherogenic index, along with increase \((p < 0.05)\) in serum HDL-C levels and HDL/LDL ratio. In addition, hydroalcoholic extracts of seed and root also decreased lipid peroxidation and increased antioxidant defense mechanism, as evident from decrease in hepatic MDA, SOD, and catalase, and an increase in hepatic GSH, and serum vitamin-C levels. Further, they significantly increased fecal cholesterol and bile acid excretion.

D. The immunomodulatory activity of seed and root extracts were investigated against various experimental models. The effects on humoral immunity were studied against SRBC-sensitized antibody titers in rats. The effects on cell-mediated immunity were studied by measuring SRBC sensitized delayed type of hypersensitivity response. The effects on neutrophil recruiting and phagocytosis were estimated using neutrophil adhesion test and carbon clearance test respectively. CT seed and root extracts showed significant immunosuppressive activity by affecting humoral, cell-mediated, and non-specific immune responses, as observed by significant decrease in primary and secondary antibody titers, DTH response, neutrophil index, and \emph{in vivo} carbon clearance.

E. The wound healing activity was investigated against experimental wound models viz., incision wound model, excision wound model, and dead space wound model in rats. In the present study, the CT seed and root extracts, when administered orally as well as applied topically, showed significant improvement in percentage wound healing, tensile strength, and granuloma formation.

The findings of phytochemical screening of plant showed presence of phenolic compounds, and flavonoids. The seeds were found to contain flavonoids in glycoside forms. Flavonoids are known to possess anti-inflammatory and anti-oxidant potential. The anti-inflammatory activity and antioxidant property of CT seed and root could be correlated with the presence of phenolic and flavonoid compounds. Anti-inflammatory activity of our plant can be
attributed to inhibition of inflammatory mediators and migration of leukocytes at the site of inflammation. This activity of CT plant could be playing major role for protection or prevention of hepatotoxicity, hyperlipidemia, immunomodulation, and wound healing activity. In addition to inhibition of inflammation, anti-oxidant properties observed in different models under the present study could also be important mechanism contributing to the pharmacological activities of CT plant. Flavonoids are known to possess anti-inflammatory and anti-oxidant potential. Besides anti-inflammatory and anti-oxidant mechanisms, modulation of immune response by CT plant could not be ruled out as possible mechanism. Thus the present investigation demonstrated the therapeutic potential of CT against inflammation, hepatic dysfunction, and related conditions; and provided evidence for the therapeutic uses of CT in traditional Indian system of medicine.