7. Conclusion

- Based on our experimental studies on the three plants i.e. *Achillea mellifolium*, *Rubia cordifolia* and *Saussurea lappa*, and their active constituents, the phytochemicals characterized are achillicin, chamazulene, rubiadin, mollugin, costunolide, dehydrocostus lactone and cynaropicrin. The percentage yield was found to be 6.01%, 5.5%, 0.018%, 0.036%, 0.04%, 0.03% and 0.02%, and the Rf value was found to be 0.3, 0.4, 0.58, 0.3, 0.3, 0.35 and 0.3, respectively in different composition of mobile phases.

- *In-vitro* spasmolytic activity using rat tracheal strip model showed chamazulene, mollugin and costunolide are most effective compounds as compared to achillicin, rubiadin, dehydrocostus lactone & cynaropicrin in counteracting carbachol induced spasm. The pD2 values of chamazulene (5.41), mollugin (5.90) and costunolide (5.90) suggesting that standard drug, isoprenaline (7.2) was more potent compared to all isolated compounds. The order of activity was found to be costunolide ≥ mollugin > chamazulene > rubiadin > cynaropicrin > dehydrocostus lactone > achillicin.

- *In-vivo* characterization using various biomarkers indicated that the costunolide and mollugin were significantly able to reduce recruitment of inflammatory cells (eosinophil & macrophages), EPO, PAF, IL-6, IL-8, TNFα, and NO levels as compared to dexamethasone. Costunolide was found to be more potent than dexamethasone and Mollugin was found to equipotent to dexamethasone in experimentally induced asthma in rats.

It can finally be concluded that most of the inflammatory cytokine explored in the study were increased in response to ovalbumin challenge are supressed due to sesquiterpene (costunolide & chamazulene) and napthoquinone (mollugin) due to their potential JAK/STAT inhibiting properties and further this anti-inflammatory property of these compounds are enhanced due to their COX inhibition and downregulation of iNOS enzyme.

The current study has demonstrated that the treatments used are able to prevent the changes associated with asthma in rats and can be studied clinically for the prevention of asthma. The effect was well supported by the histopathological analysis.
Further work needs to be done by using ligand-binding assay in order to understand the clear mechanism of action of our isolated compounds. The molecular mechanism are also needs to be elucidated using suitable parameters and models. Thus, further pharmacological screening has to been done to explore the pharmacological action of individual compounds at molecular level for further development of these plant derived molecules into highly beneficial therapeutic option in terms of safety, bioavailability, efficacy, availability as well affordability.