CHAPTER V

CONCLUSION

India known for its important heritage of the use of the plant kingdom and other minerals in Ayurveda, Siddha, Amchi as pharmacogenstic products to fight ailments and remain healthy. This science travelled across the world and became the source of development medicinal plants for medicine. With the rising population and the evidence of various new diseases, the plants were used for curing them. Important medicinal plant species suffered due to improproportionate demand in comparision to regeneration capacities and status.

However, given the kind of impetus that the herbal industry has been provided in the last few decades, a number of species of wild are facing a severe threat of extraction, to their natural populations, mainly because of over extraction along with the unscientific and destructive harvesting regimes and habitat loss due to various developmental programmes [2]. A concern has also been raised for the immediate conservation and cultivation to save the natural populations of Swertia chirayita and to meet the increasing market demand at various levels both the academician and the researchers besides the Forest Managers.

Swertia chirayita (Roxb. ex Fleming) H. Karst. is one of the oldest medicinal herbs of traditional of Indian system of Medicine. In Vedas and Samhitas, it has been mentioned as “Kirattika” which means that the bitter plant of Kiratas (an outcast race of mountaineers in the north of India). It is also called ‘Anarya-tikta,’ the bitter plant of non-Aryans, which indicates that Kirata tribals were the native of this country. In short, it is also called ‘Kirat’ or ‘Kirayata’. The popular name ‘Chiraayata’ or ‘Chiretta’ appears to be the modified word of ‘Kirayata’ another Sanskrit name of ‘Chirayta’ is ‘Bhunimb’ (Ground-nim) [50].

Swertia chirayita enjoys a good domestic and international market. The plant has a large demand in the medicinal market and is an important factor for the economy of Nepal. Despite its good demand and use potentials in the herbal industry, the supplies are still met with the wild collections. About 45% of Chirayita in Himalayan region is collected from Nepal [169]. Due to the indiscriminate exhaustive exploitation of the natural Indian reserves
of *Swertia chirayita*, by drug industry, its natural populations are severely under threat and to meet the industrial demand, the herb is being adulterated/substituted with many other species of Swertia genus growing commonly and by *Andrographis paniculata*.

The human greed a need for more drugs resulted in the extinction of some of the plant species, even they become rare, critical endangered or threatened. The *Swertia chirayita* of family Gentianaceae has been the victim of such practices, it has been classified as critically endangered species [16]. Furthermore the population of *Swertia chirayita* has suffered from ill effects of developmental work for common road communications and rehabilitation of people and forest fire. Kala (2009) [17] has reported ten sites of *Swertia chirayita* in Garhwal Himalaya. The demand for genuine *Swertia chirayita* drug material is ever increasing with its potential use against dengue, chicken guinea, but the major natural quantity are insignificant quantities as compared to the demand. Adulteration and substitution of this species is reducing the pharmacogenstic effects of the medicine. It is imperative that the population of this species has increased by ex-situ conservation. To select the genuine germplasm, it is necessary that the chemotype be identified for propogation. From the study of various literature it has been assessed that this species is agro climatic zone specific and it needs that the study of area of its natural growth to be identified.

The need of the hour of is to select the area for its ex-situ conservation. Though this plant species has been use in folk medicine, ethanomedical and home remedies as for various ailments from time immemorial. Reassertion its efficiency is also needed.

The comparative quantification of active chemical constituent (Amarogentin) by HPLC of two different sites are clearly to indicate that qualitative superiority of Chakarata site as compared to Kaddukhal. This variation in chemical constituent may be due to different soil properties.

The elemental analysis by ICPMS indicates the presence of 17 main elements in *Swertia chirayita* in different concentration. All these elements have vital importance in human metabolism and that they are required for growth, prevention and treatment of various diseases. The data obtained in present study will be helpful in the synthesis of new modern drugs with various combinations of plants which can be used in the cure of many diseases ethno medicinally and modern medicine system. However, more detailed analysis of chemical composition of these medicinal plants is required.

The result of phytochemical analysis verified the presence of medicinally important constituents (carbohydrates, protein and amino acids, steroids, alkaloids, phenolic,
flavonoids, tannin and saponin) in the plants. Several studies confirmed the presence of these phytochemicals in the treatment of different ailments. Therefore, extracts from these plants could be seen as a good source for useful drugs.

The antimicrobial potential of the plant extract may be due to the presence of these phytochemicals. The result obtained in the present study suggest that the methanol extracts of the whole plant revealed a significant scope to develop a noble broad spectrum of antimicrobial drug formulation [170]. Hence the active extract can be used to carry out further pharmacological evaluation.

This study confirms the antioxidant capacity of methanolic extracts of *Swertia chirayita*, with results comparable to those of the standard compounds such as BHT, gallic acid and can therefore, be proposed as new potential sources of natural additives for the pharmaceutical industries. The data clearly indicated that the methanolic extracts of *Swertia chirayita* showed good antioxidant capacity. However, the components responsible for the antioxidant activities of the extracts could not be identified and further work envisaged conducted to isolate and identify these bioactive compounds.

The present experiment findings suggest that *Swertia chirayita* is a promising analgesic drug and will be able to replace synthetic analgesic drug. Further study is needed to find out the exact mechanism of the extract for its activity and hence it is necessary to evaluate its analgesic activity on human being in clinical conditions.

The antipyretic activities of methanolic extract of *Swertia chirayita* supports that it can be used in the management of fever by traditional medicine practitioners. Hence from the present investigation it may be concluded that the methanolic extract of *Swertia chirayita* plant have antipyretic activity. Further, study regarding isolation and characterization of active principle responsible for antipyretic activity are required.

*Swertia chirayita* has very high potential for being used as antimicrobial, antioxidant, analgesic and antipyretic drug in place of synthetic drug. In order to replace the synthetic drug by *Swertia chirayita* herbal drugs have a potential for generating livelihood by cultivating this species on large scale and thus providing amelioration in habitual area and utilization of its ecological habitat for providing employment to the people. The different pharmacological activities (analgesic and antipyretic) have been verified through animal test. This study will mark a guideline path for the confirmation of the ethanomedical uses of *Swertia chirayita*. 
SCOPE FOR FURTHER STUDIES

The following recommendations are made to enrich the resourceful applications in pharmaceutical/drug industry:

A- To increase the awareness of *Swertia chirayita*, utilization in drug industry:

1- To conduct the human tests for analgesic, antipyretic, antioxidantal properties be carried out to test it as a safe medicine for human consumption.
2- Chemical examinations for the authenticication of *Swertia chirayita* drug for the treatment of diabetes type II and the regulation of drug quantity and frequency.
3- Verification of utility of *Swertia chirayita* drug against dengue, chicken guinea and even encephalitis.
4. Making scientific research for the reassertion and authenticication of ethanomedicine use of *Swertia chirayita*.

B- To improve the availability of genuine plant drug material with known chemical attributes (To restrict the adultration and substitution by inferior species) to the pharmaceutical industry the following actions are recommended:

1. The policies of the Central and the State Government need to focus on the comprehensive in situ and ex-situ conservation aspects of *Swertia chirayita* along with other associate plant species.
2. The gene pool preservation should be given the top priority and the repositories of gene pool be maintained for the preservation of different populations of *Swertia chirayita* in the country.
3. The best way to conserve this species is through cultivation and the cultivation by seeds of known source at the appropriate sites within its natural zone of occurrence only.
4. The seedling should be raised from the known source of seeds, so that the quality of plants is maintained.
5. The governmental support for research and development of authentic source of the germ plasm be made available.