Conclusion and Recommendations

The study demonstrated that morphological, molecular and biochemical analysis are useful for characterizing genetic diversity and defining relationships between *Eclipta alba* germplasm. It also gave possible indications to the phytochemical variation of different accessions which may be due to the genetic differences. The present study was directed to better understanding of intraspecific variations in *Eclipta alba* (L.) Hassk. for morphology, cytology, biochemical and biology and to suggest appropriate tissue culture techniques and to conservation and utilization/ improvement strategy for the species based on the data generated.

- *Eclipta alba* accessions of North India showed morphological variations on the basis of Habit, height/spread, size and colour of leaves, stem colour, number of nodes and branches, hairiness, inflorescence size and seed colour.
- Since all the accessions were maintained in same environmental and soil conditions at Botanic Gardens, Punjabi University, Patiala the presently observed variability can be related to their genetic makeup.
- Cytologically, all the accessions were at diploid level with same chromosome number 2n= 22 based on basic chromosome number n=11. In majority of the plants, meiosis was normal.
- Biochemical analysis revealed that carbohydrate, protein, phenol, saponins and wedelolactone content show variation among different accessions.
- The correlation study revealed that various biochemical estimates are positively and significantly correlated with morphological characters i.e. plant height/spread and leaf size.
- Among the three morphotypes, the semierect accessions showed higher quantities of various biochemical constituents than the erect and the prostrate types. Similarly, the plants with dark green colour showed higher quantity of phytoconstituents.
Conclusion and Recommendations

- Quantitative and qualitative evaluation of collected germplasm showed that the accessions EPBP1, EPBG3 and EPBG2 (all have high wedelolactone content) and SPBT1, SPBG1 and SPBT2 (with high carbohydrates, proteins, phenol and saponins contents) can be used for commercial purposes.

- The present analysis of the *Eclipta alba* accessions has clearly revealed that plants with normal meiotic behavior should be used for medicinal and commercial purpose as these plants have higher amount of various phytoconstituents than the plants with abnormal meiosis which indicate that these plants might possess aberrant metabolism as well.

- The present study clearly revealed the potential antimicrobial activity of *E. alba*. The synergestic effects of the extracts have potential in combating the bacterial diseases. Among the three morphotypes, the leaf extracts of erect type of plants showed maximum antimicrobial activity against all the bacteria except *Bacillus subtilis* where the extracts of prostrate type showed maximum activity.

- Molecular study has revealed that the genetic distances between various populations were moderate. Accessions PHPS1 and EPBP1 are genetically quite distinct from each other as well as from rest of the accessions.

- Three morphotypes does not have significant genetic differences.

- Correlation analysis has revealed that plant height/spread is positively correlated to various biochemical traits and it can be used for indirect screening and selection of germplasm.

- *In vitro* studies revealed that their exists the possibility of exploiting the somaclonal variability for improvement of the germplasm.

- Cultivation trial favours the use of NPK fertilizers for evaluating the yield over combination of NPK and farmyard manure.
In conclusion, the present study throws new light on the nature of intraspecific variations in an important medicinal plant *Eclipta alba* which have seldom been a subject of investigation. The results of the diversity analysis in *E. alba* have shown that considerable amount of diversity exists in this species with respect to morphology, cytology, biochemical and genetic traits, which offers scope for selection and breeding to the breeder. *Eclipta alba*, otherwise widely distributed faces threat of genetic depletion from over-exploitation due to its wide popularity as a drug to treat a variety of ailments. It is imperative that measures are initiated for the conservation of this species with its varied diversity. By bringing *E. alba* into cultivation conventional and biotechnological plant breeding methods can be applied to improve the herbage as well as pharmaceutical constituents.

In the light of the present findings, it is the well considered opinion of the author that the selection of an improved natural variant or elite genotype for development as cultivar be the best approach. This exercise would be most fruitful for achieving the twin objectives of conservation of existing genetic diversity and sustainable utilisation of this important medicinal resource. The present study not only provides a baseline data on morphogenetic diversity but also encourages cultivation of the highly valuable plant in large scale which may be instructive to further research. The present findings can be applied for domestication and chalk out strategies in *E. alba* and also for management of its genetic resources.