CONCLUSIONS

Morphological discrimination in geographical populations of *D. hatagirea*

Plant descriptor was developed for exact identification of *D. hatagirea* and separation from *D. kafiriana*. Morphometric diversity of *D. hatagirea* was high among the populations. Tirith location showed great morphometric variation as compared to other locations. It implied that Nubra valley population showed great morphological dissimilarity with population of Suru and Indus valley. This may be due to wide geographical range, species richness and environmental factor. Being endangered *D. hatagirea*, Nubra valley showed high variation as compared to Suru and Indus. Therefore, *Dactylorhiza* populations deserve specific conservation attention as regards its habitat fragmentation. Conservation of its population’s ex-situ and in-situ will have greater effects on population richness and status of such an endangered orchid.

**Studies on population genetic structure and differentiation analyses of *D. hatagirea***

Low genetic diversity of *D. hatagirea* was observed due to endangered class of the plant. Significantly moderate level gene flow and genetic differentiation was observed in studied populations. Geographical barrier play a major role in shaping genetic structure of population. We found that Ladakh mountain range (6500 m amsl) act as geographical barrier in the studied population, which separated the two major gene pools. Conservation strategies involving genetic diversity studies are limited for Trans-Himalayan endangered plants and exploration of genetic diversity of this region is required. One primary objective of conservation management is to maintain genetic diversity of *D. hatagirea*. The strategy of conservation for this species should include both in situ and ex situ methods. Taking into account the special habitat of this species, in situ conservation should be given firstly recommended. Small populations are more prone to be extinct for environmental fluctuation and habitat destruction, it is necessary to protect all the existing populations and individuals in situ in order to preserve as much genetic variation as possible. Therefore, habitat protection will ensure the species coexistence with other organisms like fungi and pollinators on which orchids depend for their cycles. For ex situ conservation, we need to seriously design and establish a germplasm bank and conserve germplasm through Plant tissue culture technique.

**Population inventory and vegetation mapping of *D. hatagirea* through Ecological Niche Modelling (ENM)**
On the basis of vegetation analysis and Habitat distribution modelling, it can be concluded that low density of *D. hatagirea* found along with other medicinal plants because of famous tourist place and unexplored research area for researcher. The ecosystems of this area have been subjected to particularly intense pressure for the upcoming tourism activities, so current extinction rates of *D. hatagirea* species are expected to remain high or even. The areas identified in the present study for reintroduction of *D. hatagirea* would not only help in eco-restoration of degraded forests and habitats where the species had existed before but also in rehabilitating the species population and improving its conservation status. Therefore, there is a need to overcome with this problem with the help of research communications, policy implementation in some areas and also needs to promote cultivation, awareness of this species through participation and conserving overall biological diversity in the region by *in-situ and ex-situ* method.

**Optimization of tissue culture techniques for *in vitro* multiplication of endangered orchid *D. hatagirea***

In the present study a successful attempt has been made to culture immature seed embryo of *D. hatagirea* for developing protocorms, shoot regeneration and its mass multiplication. The growth and multiplication of plants further continued after their transplantation in the glass house in potting mixtures, thereby resulting in the development of a micropropagation technology to meet the demand of *D. hatagirea*. This technology will help not only in multiplying the plantlets but can also play a major role in its conservation.