7. Conclusion

The study's finding emphasizes the diverse biological and pharmacological properties of *Cordyceps* species collected from the select area Eastern Himalayan region. Moreover, the finding highlight the importance of accurate species identification and comprehensive analysis of medicinal fungi for their potential therapeutic applications. The study confirmed that all the batches of sample collected from Sikkim to be *Ophiocordyceps sinensis*, this is the first scientific validation with the use of modern molecular phylogenetic approach along with micromorphological and microscopic studies on the identification of the species from the region of Sikkim. Similarly, sample collected from Arunachal Pradesh is identified as *Ophiocordyceps liangshanensis* which is a first report of the species from India. The biochemical and metabolomics study of the sample revealed that *Ophiocordyceps liangshanensis* contain at par nutritional, biochemical and medicinal attributes in comparison with natural *Cordyceps sinensis* which is highly valued for its potent health benefits. The study further strengthens the practice of its consumption as an alternative to *Cordyceps sinensis* in the region, where it is considered counterfeits by the local herbal healers.

Similarly, the samples collected from Bhutan is identified as *Ophiocordyceps sinensis* and the host larva to be *Hepialidae* spp. The finding in the study is consistent with the study of Wu et al, 2019, where they reported the *Cordyceps* species from Bhutan as an alternative to natural *Cordyceps*. The sample exhibited potent antioxidant and anticancer activity along with GCMS analysis which revealed the identification of potent pharmacologically important bioactive compounds like clofexamide, succinic acid and [1,4] dioxino [2,3-b]-1,4-dioxin, hexahydro-2,2,3,3-tetramethyl which has reported antidepressant, antimicrobial and cytotoxic activities.

Moreover, the study's findings contribute to addressing the issues/challenges associated with the rampant trade of counterfeit *Cordyceps* species lacking scientific validation. By employing molecular techniques for accurate species identification, the study provides a reliable method for distinguishing genuine *Cordyceps* samples from adulterated or counterfeit ones, thus safeguarding consumers' health and interests.

In conclusion, the study represents a significant contribution to the understanding of *Cordyceps* diversity and pharmacology, particularly in the context of the select area Eastern Himalayan region. By employing a multidisciplinary approach encompassing molecular biology, biochemistry, and pharmacology, the study sheds light on the nutritional, medicinal, and ecological significance of *Cordyceps* fungi. Moving forward, continued research in this field is essential for harnessing the full therapeutic potential of *Cordyceps* species and promoting their sustainable utilization for human health and well-being. Further research in this field is crucial for unlocking the full therapeutic potential of *Cordyceps* species and addressing global health challenges.