Chapter: 5

Conclusions and future perspectives
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Conclusions

Chemotherapy using cytotoxic anti-cancer drugs is being practiced but has lots of side effects and offers little survival benefit for patients. So there is a need to use alternative medicine with lesser side effects to cure cancer. Cordycepin is such a natural bioactive metabolite with a promising therapeutic potential based upon the following key points:

- The present study investigated cultural and nutritional conditions for the production of cordycepin from *C. militaris* 3936.
- The extraction method employed in the study holds the potential to be used for cordycepin extraction in bulk from liquid culture of *C. militaris*.
- Extraction rate of cordycepin more than 90% was obtained with a solvent ratio 1:2 (v/v), contact time 90 minutes and temperature 40°C.
- In this study, *C. militaris* derived fractions and cordycepin, demonstrated a broad-spectrum activity against not only gram-positive and gram-negative bacteria but also against fungus as well.
- MTT assay showed that cordycepin significantly inhibits cell proliferation of A549 human lung cancer cell lines with a IC$_{50}$ value of 64µg/ml.
- The FCM analysis of cordycepin treated cells showed that apoptosis rates increased with the increase in dosage.
- Anti-angiogenetic studies for extracted cordycepin showed that 40 µg/egg dosages were sufficient to inhibit the branching of blood vessels (~50%).

Future perspectives

*Cordyceps militaris* is an excellent source of bioactive metabolite, cordycepin that exhibits many clinically approved benefits for human health. There is a strong urge to use interdisciplinary biotechnological and chemical tools to isolate and enhance the bioactivity of
the metabolites from this entomopathogenic fungus. The structure of cordycepin suggests that it has five N and three O atoms which one can imagine could form transition metal complexes in the form of di-, tri- and tetra-dentate ligands as metals can accommodate donor atom’s lone pair of electrons into their empty d orbital. Complexity of the resulting compound and its molecular mass can be predicted with the help of spectroscopic tools like IR and mass spectroscopy, respectively, which can further improve the bioactivity of the compounds. Future studies should focus on the synergistic association of cordycepin with metal-containing anti-cancer drugs. Additionally, drug delivery strategies using nanoparticles containing cordycepin are promising tools for assessing the therapeutic potential of this bio metabolite.

More sincere efforts will be required to identify most of the pharmacologically active compounds in *Cordyceps* and to understand their structure-function relationship as well as to realize the full potential of this wonderful mushroom for commercialization and ethnomedicinal use.