Chapter 7

Conclusion and scope for future work

7.1 CONCLUSION

The phytochemical analysis revealed the presence of phenolics and flavonoids in the leaf extracts of *E. sphaericus* and *P. wallichiana*, prepared through pressurized liquid extraction. The content of phenolics was significantly higher in the extracts of *E. sphaericus* leaves when compared to the extracts of *P. wallichiana*. HPTLC analysis indicated the presence of ascorbic acid, quercetin, gallic acid and hesperidin in the extracts of *E. sphaericus*. Whereas, *P. wallichiana* extracts showed the presence of ascorbic acid and quercetin. GC-MS analysis of methanolic extracts of *E. sphaericus* and *P. wallichiana* have indicated the presence of various compounds, which are important for pharmaceutical and cosmetic industry. Extracts prepared from both of the plants have shown presence of phenolics, flavonoids and other bioactive molecules.

Only methanolic extract of *E. sphaericus* depicted the antimicrobial potential against various bacterial strains used in the present study. *P. wallichiana* extracts did not show antimicrobial properties. The extracts of *E. sphaericus* have shown good antioxidant potential through DPPH, ABTS, FRAP and TRP assays. *P. wallichiana* extracts have shown relatively lower level of antioxidant properties.

Aqueous extracts of both plants have shown promising anti-proliferative activities against human cervical cancer cell line, HeLa. Whereas, the extracts showed very low cytotoxicities against normal cell line, Vero. The expression levels of two important factors responsible for cancer progression, HIF-1α and VEGF, were analyzed through qRT-PCR. Aqueous extract of *E. sphaericus* have down regulated the HIF-1α and VEGF almost completely (similar to the known drug doxorubicin), whereas the aqueous extract of *P. wallichiana* have downregulated the expression of both genes at relatively lower extent.

Toxicity and in vivo antioxidant potential of the extracts were also analyzed in yeast model (*Saccharomyces cerevisiae*). Both aqueous extracts were found nontoxic to yeast cells and rescued the cells from the lethal effect of oxidative stress.

In conclusion, both plants have potential to be developed as effective natural anticancer agents. Overall, therapeutic potential of the extract of *E. sphaericus* is found higher than that of *P. wallichiana*.
7.2 SCOPE FOR FUTURE WORK

Both plants extracts has shown promising antioxidant and anticancer potential. Following are the future scope of the current research to develop these herbal extracts as a drug.

- Same method may be applied for extraction of plant material from same species from different geographical area and the extracts may be analyzed for phytochemical and biomedicinal properties.
- Further studies are required in animal model for the analyses of efficacy and toxicity to develop these extracts as natural antioxidant and anticancer drugs.
- If these extracts found effective and safe in animal models, clinical trials are required before licensing these extract as drug.
- Both plant extracts affecting various molecular pathways are needed to be analyzed.
- These herbal extracts may be used as a source of various neutraceutical supplements or herbal pharmaceuticals.