CHAPTER-V
SUMMARY AND CONCLUSIONS

The qualitative phytochemical analysis of various solvent crude leaf extracts of Terminalia chebula and leaf, rhizome extracts of Dryopteris Boehmiana revealed that it was a good source for variety of phytoconstituents. The results of phytochemical screening showed the presence of saponin, phenols, tannin, glycoside, flavonoid, steroid, anthraquinones, alkaloid and oils in most of the tested extracts. The acetone extract of both leaf and rhizome of D. Boehmiana and leaf of T. chebula contains rich phytochemicals especially, phenols, tannins and flavonoids which possess several biological activities including antioxidant and antimicrobial activity.

The results of quantitative estimation of phytometabolites showed that acetone extract of D. Boehmiana and T. chebula were promising sources of both primary and secondary metabolites. The acetone extract of rhizome of D. Boehmiana harbour significant high amount of all tested metabolites (phenols, flavonoid, flavonols, tannin, carbohydrate, protein and vitamin C). Due to the high content of phenolics of D. Boehmiana and T. chebula it may be used as potent antioxidant/antimicrobial agents.

Various solvent crude leaves extracts of T. chebula and leaf, rhizome extracts of D. Boehmiana expressed remarkable antioxidant activity on DPPH, ABTS, NO, OH, O₂⁻ radicals and also possess great reducing power, lipid peroxidation inhibition, ferrous ion chelating ability. The rhizome acetone extract of D. Boehmiana followed by leaf acetone extract of T. chebula revealed the highest antioxidant
activity with lowest IC₅₀ values in all tested methods. The rhizome acetone extract of D. cochleata and leaf acetone extract of T. chebula exerted highest OH radical scavenging ability than other radical scavenging activities.

LIBS results clearly indicated the presence of several essential elements such as calcium, magnesium, oxygen, carbon, silicon, aluminium, iron, nitrogen, sodium, hydrogen and potassium. D. cochleata and T. chebula contains many nutrient elements hence, it may be used in nutrient supplements and food stuffs.

All crude extracts of D. cochleata and T. chebula exhibited broad spectrum antibacterial and antifungal potential against most of the tested organisms in agar well method. Rhizome acetone extract of D. cochleata showed higher antimicrobial activity against all the tested pathogens followed by leaf acetone extract of T. chebula. Rhizome acetone extract showed highest activity against E. faecalis and C. albicans. The leaf acetone extract of T. chebula showed maximum activity against E. faecalis and C. albicans. D. cochleata and T. chebula may be used in traditional medicines to treat the various infections caused by selected microorganisms.

The results of GC-MS analysis exhibited the presence of 38 compounds present in leaf acetone extract of T. chebula, in which ellagic acid was a major constituent (8.29%). Six major compounds were identified in leaf acetone extract of D. cochleata by GC-MS analysis among them phytol was a major constituent (56.09%). A total of 58 phytochemicals were present in rhizome acetone extract of D. cochleata. Ferulic acid (16.52%) was identified as major constituent in rhizome acetone extract of D. cochleata. The presence of various bioactive compounds in D. cochleata and T. chebula justifies the use of these plants in the treatment of various ailments in traditional medicine.
According to results of phytochemical analysis, antioxidant and antimicrobial activities, the acetone extract of T. chebula and rhizome acetone extract of D. cochleata were subjected to isolation and structural elucidation of individual bioactive compounds were characterized. One compound (compound 1) from the acetone extract of T. chebula and two compounds (compound 2 and compound 3) from the rhizome acetone extract of D. cochleata were isolated by various chromatography techniques. The structural elucidation of isolated compounds was done using various spectral studies such as, LCMS, elemental analysis, UV, IR, $^1$H-NMR, $^{13}$C-NMR, DEPT, HMBC, HSQC and $^1$H-$^1$H-COSY.

Based on the spectral studies and previous literatures it was confirmed that compound 1 was ellagic acid (class: phenolic), compound 2 was quercetin (class: flavonoid) and compound 3 was rutin (class: flavonoid). T. chebula and D. cochleata serves a new source of quercetin, rutin and ellagic acid. Hence, these compounds possess potent therapeutic properties always serve as eveready, economic and safe. The in vitro antioxidant and antimicrobial studies were carried out for better understanding of their biological applications.

The antioxidant potential of isolated compounds form leaf acetone extract of T. chebula and rhizome acetone extract of D. cochleata were determined for DPPH, nitric oxide, hydroxyl, super oxide, ABTS radical scavenging activity, reducing power, activity. All three isolated compounds exhibited good antioxidant activity in all tested methods in a concentration depended manner. Overall results of antioxidant activities showed that quercetin exhibits higher antiradical ability followed by rutin and ellagic acid. Among all the tested radicals the hydroxyl radicals were most effectively scavenged by the quercetin followed by rutin and
ellagic acid. Concerning all the results, the quercetin, rutin and ellagic acid may be used as a source of natural antioxidants in order to replace the synthetic ones.

All isolated compounds showed significant broad spectrum of antimicrobial activity against all the tested pathogens range in dose depended manner. Rutin possessed higher antimicrobial ability followed by quercetin and ellagic acid. The antimicrobial results of isolated compounds suggested great interest in the development of new antimicrobial drug from T. chebula and D. cochleata.

In conclusion, T. chebula and D. cochleata are natural rich source for phytoconstituents, nutrient minerals, antioxidants and antimicrobials. The finding of the present work supports the ethanomedical use of T. chebula and D. cochleata to promote good health in traditional medicine. T. chebula and D. cochleata could be used as raw materials in the development of new drugs to treat the radicals mediated diseases and infectious pathogen diseases. Hence, these natural antioxidants being safe, it may serve as potential pharmacological agents.