CHAPTER-VII

7. CONCLUSION

Significant number of individuals around the world prefer herbal medicines rather than conventional medicines. The present survey it was concluded that a total of 40 plants from 26 families and 40 genus hepatic inducing medicinal plants have been in constant use. Leaves recorded to be highest in use (29 types) followed by roots (10 types). Indigenous communities/ healers have their own conventional medicine system which may use single or combination of different plant parts.

Presence of various phytochemicals viz: phenols, flavonoids, tannins, resins, terpenoids, glycosides and steroids have been detected from the selected plants in qualitative test. In the quantitative test, higher contents of phenolics, flavonoids, total antioxidant capacity and higher activity in total reducing power assay were obtained especially in the RoMi-EE and RoAc-EE. Increase in radical scavenging activity was observed with increase in concentration in the *in-vitro* antioxidant tests of DPPH, ABTS and H_2O_2 having lowest IC_{50} values observed in the RoMi-EE, RoAc-EE and RoAc-EE respectively. In case of ICC and FRAP assay, the lowest EC_{50} value and highest $FeSO_4.7H_2O$ concentration was observed in RoPt-EE (535.16 ± 121.56 µg/mL) and RoAc-AE (2512.7 ± 157.37 µM/mg) respectively.

The GC-MS analysis have revealed the presence of various bioactive compounds that were reported for the first time from the root extracts of *M. indica*, and were reported to have various biological activities such as antibacterial, anti-inflammatory, anti-diabetic, anticancer, anti-arthritic, hepatoprotective, block HIV-1 entry and infection, anti-asthma, etc.

In an *in-vivo* study, the elevated levels of liver serum enzymes (ALT, AST and ALP) induced by CCl_4 as compared to normal group was markedly decreased after treatment with RoMi-EE. After the CCl_4 administration, there was significant increase in the concentration of TC, TG, LDL, VLDL and decrease in the HDL level. However after treatment with test drug RoMi-EE, decrease in the TC, TG, LDL, VLDL and increase of HDL levels were observed.

The serum bilirubin, GGT and creatinine level in the CCl_4 treatment was significantly increased as compared to normal group. After the treatment with RoMi-EE, there was decrease in the levels of bilirubin, GGT and creatinine concentration. In the silymarin group, creatinine level was almost back to the normal. Protein and albumin levels were found to be

low in CCl_4 group. However, the albumin level showed significant increase in RoMi-EE and silymarin group, whereas no significant change was observed in the total protein level.

Meanwhile, significant increase in the antioxidant enzymes viz: SOD, CAT and GPx was noted in the RoMi-EE and silymarin treated groups which was decreased due to CCl_4 treatment. The GSH activity was also improved by 25% upon treatment with two dose of RoMi-EE and were comparable with that of silymarin group. The activity of RoMi-EE and silymarin also reduced the MDA content significantly, which was elevated by 48% upon treatment with CCl_4.

The histopathological reports also revealed that CCl_4 induced severe hepatocyte necrosis, inflammation, biliary cirrhosis, vacuolation, microvesicular steatosis and infiltration of kupffer cells around the central vein than the normal liver architecture observed in healthy rats. CCl_4 group kidney cross section also showed vacuolation, glomerular atrophy, widening of capsule space, cell layer thickening and degeneration of cells. After treatment with different concentrations of RoMi-EE, the severity of CCl_4 induced liver and kidney intoxication was reduced in a dose-dependent manner, although the treatment with silymarin showed much better result.

The *in-silico* molecular docking results (also support *in-vivo* and histopathological study) conducted on 1NFK and 3LN1 proteins have revealed that the compound 2, 6, 10-Dodecatrien-1-Ol, 3, 7, 11- trimethyl-9- (phenyl sulfonyl) –(E,E)- showed best docking score among the selected ligands with -4.958 & ΔG binding affinity of -45.35 kcal/mol in 1NFK and docking score of -9.78 & ΔG binding affinity of -27.8173 kcal/mol from that of 3LN1. However, silymarin showed -5.956 better docking score than the ligands with ΔG binding affinity of -54.79 kcal/mol in 1NFK protein, but didn't show any binding affinity with that of 3LN1 protein. The ligand 2, 6, 10-Dodecatrien-1-Ol, 3, 7, 11- trimethyl-9- (phenyl sulfonyl) –(E,E)- was also in acceptable range of Lipinski's rule of five, indicating their potential for use as drug-like molecule.

From the finding, it was concluded that the *Morus indica* root, which is used traditionally by the local tribe of BTAD, Assam, have shown high contents of antioxidant and *in-vivo* activity can be an alternative for treating liver disorders.