CONCLUSIONS

1. *Cardiospermum halicacabum*, commonly known as Balloon vine contains berberine, an alkaloid which imparts anti-inflammatory property to this plant.

2. Berberine binds to the active site of the enzyme PLA$_2$ involved in the inflammatory pathway.

3. Berberine inhibits functioning of phospholipase A$_2$ competitively by binding to its active site and prevents the binding of substrate.

4. Biotransformation of berberine, by a fungus *Rhizopus oryzae*, leads to its demethylation and formation of hydroxyl derivatives, namely monohydroxyberberine and dihydroxy berberine. The complex polycyclic nature of many alkaloids and the presence of various functional groups can make chemical modifications a difficult and time consuming process that often results in poor yields. Microbial transformations offer the use of enzymes with high stereo specificities, eliminating the need to protect and deprotect exposed functional groups.

5. The derivatives of berberine formed have a higher PLA$_2$ inhibitory activity than native berberine, as revealed by Surface Plasmon resonance analysis and enzyme kinetic studies.

6. The derivative of berberine binds to PLA$_2$ in a longitudinally inverted orientation, forming new hydrogen bonding interactions and increased number of van der Waal’s contacts with the protein. This was suggested by *in silico* molecular docking and experimentally proved by X-ray crystallography.

7. It was concluded that berberine can serve as a lead compound for the development of anti-inflammatory drugs.