6.1 Conclusion

The findings of the thesis are described below:

- Three different PHA producing bacterial isolates BPC1, BPC2 and BP2 were isolated from the crude oil contaminated soil site of Assam and Assam Arakan Basin, ONGC, Assam.
- BP2 was previously identified by our laboratory and confirmed by IMTECH, Chandigarh to be Bacillus circulans MTCC8167.
- 16s rDNA analysis was performed for molecular characterization of the selected biopolymer producing bacterial isolates BPC1 and BPC2. Subsequently the 16S rDNA gene sequence was deposited in GenBank of NCBI data library and they were named as Pseudomonas aeruginosa JQ796859 and Pseudomonas aeruginosa JQ866912 respectively.
- The optimum conditions of the bacterial strains for the growth and production of PHA was found to be at pH 7.0, 37°C temperature and 72 h culture period.
- The glycerol byproduct of kitchen chimney dump lard (KCDL) was found to be good carbon source for the highest PHA accumulation by the bacterial strain P. aeruginosa JQ866912 in comparison to other carbon sources used.
- Based on FTIR, GCMS and $^1$H and $^{13}$C NMR, their characterization lead to identification of the biopolymers isolated from P. aeruginosa JQ796859, B. circulans MTCC8167 and P. aeruginosa JQ866912 to be poly (3-hydroxyvalerate) co- (5-hydroxydecanoate) (P-3HV-5-HDE), poly-3-hydroxybutyrate-co-3-hydroxyvalerate (P-3HB-3HV) and poly-3-hydroxyvalerate-co-5-hydroxydecanoate-co-3-hydroxyoctadecenoate(P-3HV-5HDE-3HODE), respectively.
- The average (number) molecular weight of the biopolymers is in the range of 5.6x10$^3$ to 4.2x10$^4$ Da and the polydispersity index bears a narrow value in the range of 1.05 to 1.21.
- All the biopolymers possessed high degree of thermal as well as melting stability.
- XRD data revealed that the polymers are crystalline in nature having large crystal size. The polymers possess luminescence property.
- The biopolymers are biodegradable when exposed to microbial action.
The PHA of *B. circulans* MTCC8167 is useful enhancing the stabilization of colloidal solution of SNP.

By incorporating the metal oxide nanoparticles with biopolymer, the intensity of the emission peak could be increased. The increase in concentration of metal oxide nanoparticles, the PL intensity of the polymer metal oxide hybrid material becomes increase. The resulting nanocomposites could be used for further application as sensors.

A selective and sensitive PHA/AuNPs/HRP/ITO biosensor based nanocomposite probe is developed for direct determination of artemisinin in bulk and spiked human serum. The proposed method has distinct advantage over other existing methods regarding sensitivity, selectivity, time saving and minimum detectability.

The resultant specific 540-bp PCR product has represented the presence of mcl biosynthesis genes phaC1/C2 in the bacterial strains *P. aeruginosa* JQ796859 and *P. aeruginosa* JQ866912.

**6.2 Future projections**

- Sequencing of PCR amplified product of pha synthase gene has to be taken up.
- Gene expression studies for pha synthase gene to be carried out using *E. coli* model system.
- Techno-economic evaluation/comparison of the biopolymer has to be taken up for future application.