Synthetic plastics being non-biodegradable are a major cause of environmental nuisance. Another factor which goes against it is their synthesis from petroleum products. These unfavorable characteristics have caused an increasing interest in biodegradable plastics such as polyhydroxyalkanoates (PHA). Ability of microorganism to produce PHA from cheap and renewable sources has made it preferable over other biopolymers. The use of biowastes as feed has the potential to reduce the cost of production of PHAs. In the present study, pea-shells (PS) were demonstrated as potential substrate for PHA production. Bacterial strains isolated from different environments such as contaminated food, nitrogen rich soil, activated sludges from pesticide and oil refineries effluent treatment tested for their metabolic and biochemical activities previously in our lab were used in the study. PS slurry (PSS) hydrolyzed with mixed cultures were subjected to fermentation by six *Bacillus* strains, which were found to produce PHA on synthetic medium supplemented with glucose. Combination of PSS (hydrolyzed with undefined culture from cattle dung) slurry as biowaste (BW) in combination with medium (M) (BW:M::7:3) incubated with *Bacillus* strains was found to produce in polyhydroxybutyrate (PHB) production in the range 0.1-0.18% of cell dry weight (cdw) after 96 h of incubation. In the next step to improve the efficiency of hydrolysis, defined mixed hydrolytic cultures (MHC1-MHC11), prepared using 11 hydrolytic strains were used. Of these selected strains, 8 belonged to *Bacillus*, 2 to *Proteus* and 1 was a marine bacterium. These strains had high hydrolytic enzyme activities and good metabolic characteristics such as the ability to utilize a wide range of sugars. Hydrolysis with defined mixed culture proved beneficial for PHB production as compared to hydrolysis with undefined mixed culture. Here, PHB production could be achieved from PS, as the sole feed without addition of synthetic medium or nutrients especially nitrogen. Hydrolysis of PSS with two (MHC2 and MHC5) out of the 11 defined mixed hydrolytic cultures, followed by incubation with *Bacillus cereus* EGU44 lead to enhancement in PHB production to 1685 mg/L from PSS (equivalent to 62.5 g/kg TS fed). Subsequently, to ensure sustainability of PHB production process, a total of 57 mixed culture
combinations (MCs) were prepared with these six selected *Bacillus* strains. These combinations of PHB producers were tested on GM2 medium. Out of these 57MCs, the top nine PHB producing combinations were selected and tested for PHA production on PSS hydrolyzed with MHC2. Maximum PHA of 1643 mg/L was achieved with 5MC2 in comparison to 232 mg/L on GM2 resulting in final yield equivalent to 71 g/kg TS fed. Since copolymers are known to have better strength, it was of interest to look for copolymer of PHB-HV. On PSS as feed, 3HV content was observed in range 0.8-6.5% of total PHA. It improved to 7.6-9.7% by addition of copolymer precursors with mixed cultures. Reproducibility and efficiency of the process was observed to be maintained from 250 ml to 5.0 L reactor volume. Value addition to the process of waste to PHB production was demonstrated by utilizing these *Bacillus* strain to produce hydrogen (H$_2$). The medium subjected initially to H$_2$ production under anaerobic conditions, which resulted in the production of 1.67 to 1.92 mol H$_2$/mol glucose with *B. cereus* EGU44 and *B. thuringiensis* EGU45. The residual medium containing the residual glucose and *B. thuringiensis* EGU45 was found to produce PHB at the rate of 11.3% of dry cell, under shaking conditions (200 rpm). This is the first report among the non-photosynthetic microbes, where *B. thuringiensis* and *B. cereus* strains have been shown to produce H$_2$ and PHB in same medium under different conditions. This study demonstrated the use of defined bacterial cultures for hydrolysis and PHA production. Biowaste as feed helps to reduce the production cost. Use of defined bacterial culture ensures sustainability of the process as it alleviates the threat associated with single bacterial culture, which may get eliminated due to competition from contaminants. In addition use of same strains for production of both H$_2$ and bioplastic further improve the economics of the process.