The current research deals with the production, recovery and characterization of polyhydroxyalkanoates (PHAs) from fruit waste using *Bacillus subtilis*. Different strains of *Bacillus sp* were collected and then qualitatively screened by Sudan black and Nile Blue staining for the detection of PHAs. The strains were then further quantitatively screened for the production and out of five *Bacillus* isolates including *Bacillus subtilis, Bacillus licheniformis, Bacillus cereus, Bacillus clausii and Bacillus halodurans, B. subtilis* was confirmed for the maximum production of PHAs by utilizing orange peel substrate. Various physico-chemical parameters were optimized to enhance the production of PHAs. The *Bacillus subtilis* showed maximum PHA accumulation of 22.9% (w/w) of CDW basis in 72h incubation period, pH 7, 37°C temperature, 4% orange peel concentration, 24h inoculum age under nitrogen source presence. Maximum productivity was achieved by sodium hypochlorite+ chloroform+ methanol extraction method. The adsorption bonds were observed at 667.26 cm-1, 113.24 cm-1, 1422.71 cm-1, 1728.95 cm-1, 2920.14 cm-1 and 3436.33 cm-1 displayed that the recovered biopolymer was PHA. TGA analysis exhibited that the extracted PHA polymer was stable below the temperature 245°C. The fruit wastes were proved as cheap carbon source and thus considered as cost-effective substrate for PHA production. The recovered PHA is considered as suitable alternative to petrochemical based plastics due to its bio-friendly and bio-degradable properties.