ABSTRACT

The ever-increasing bulk of fruit wastes produced internationally presents an important conservation challenge, as well as a prospect for inventive waste management solution. This thesis emphasizes on the potential of using fruit waste as a substrate for the fermentative production of microbial pectinase, which is an enzyme of extensive industrial importance. By leveraging fruit waste, this research addresses both waste management and the maintainable production of pectinase. The study initiated with the maintenance of pectinase-producing microorganisms and among the strains, *Aspergillus niger* and *Bacillus subtilis* were known as the most effective producers. Parameters of fermentation, such as pH, temperature, incubation period, and substrate concentration, were adjusted using fruit waste. Research reveals that a pH of 6.0, a temperature of 35°C, and a fermentation period of 6 days yielded the highest pectinase activity. This optimization proved that fruit waste is a worthwhile and cost-effective substrate for pectinase production. The calculated Km value was 0.8 mg/mL, indicating a relatively high affinity, while the Vmax was 1.2 µmol/min/mg, shows effective catalytic activity. Moreover, the optimized fermentation settings and full characterization of the enzyme recommend its potential for various industrial uses, such as clarification of fruit juice, textile processing, and manufacturing of paper. In conclusion, this thesis determines the effective production, characterization, and kinetic analysis of microbial pectinase from fruit waste. The consequences offer a strong basis for further research and industrial application, proposing a supportable solution to waste management while bringing a commercially valuable enzyme. Future work could focus on improving enzyme stability, exploring additional waste substrates, and scaling up the production process to fulfill industrial demands.