ABSTRACT

The current study deals with the comparative microbial production of pectin lyase (E.C 4.2.2.10) from prokaryotic and eukaryotic sources for oil extraction and docking analysis of enzyme catalysis with a substrate. The solid-state fermentation was performed while using orange peeling as substrate. The *Bacillus subtilis* 01-21 and *Aspergillus niger* ISL-09 were optimized for several parameters viz. substrate level (10 g), moisture content (5 and 25 ml), time of incubation (48 and 72 h) and inoculum size (10%) respectively. In optimized conditions, *A. niger* ISL-09 produces an enzyme 1.52-fold higher than *B. subtilis* 01-21. The enzyme was partially purified from the crude extracts with ammonium sulfate saturation at 80%. The purified enzymes of *B. subtilis* 01-21 and *A. niger* ISL-09 have a specific activity of 7 and 7.4 U/mg, respectively. The optimal temperature and pH of *B. subtilis* 01-21 enzyme were 50°C and 8.5 while for *A. niger* ISL-09 were 60°C and 8, respectively after incubation of 30 min. The enzyme extracts were tested for oil extraction of corn oil. Compared to control, yield of oil extraction treated through both kind of enzymes were 10.72% (*B. subtilis* 01-21) and 15.2% (*A. niger* ISL-09). Different parameters of oil extraction viz. dry weight of corn seeds (12.5 and 10 g), enzyme concentration (2 ml) and agitation intensity (160 rpm) were optimized. In-silico analysis of the pectin lyase sequences was performed. Mechanistic detail of enzyme-substrate catalysis shows that charged amino acids such as Asp154, Arg176 and Arg236 plays a significant catalytic role. This study concluded that *Aspergillus niger* ISL-09 (2.45 U/ml) is a good source of pectin lyase production compared to *B. subtilis* 01-21(1.61 U/ml).

Keywords: *Bacillus subtilis*, *Aspergillus niger*, comparative study, pectin lyase, oil extraction, *in-silico* analysis