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# Enhanced pectinase and β-glucosidase enzyme production by a *Bacillus subtilis* strain under blue light-emitting diodes

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*Bacillus subtilis* B22, a chemotrophic and aerobic bacterial strain was isolated from homemade kimchi, identified by 16S rRNA gene sequencing. B22 was primarily screened by biochemical, carbon source utilization tests. B22 was used to produce pectinase and β-glucosidase by submerged fermentation under different light sources. B22 was incubated in pectin media and basal media (pH 7.0) under blue, green, red and white light-emitting diodes (LEDs), fluorescent white light, and in darkness at 37 °C, orbital shaker 150 rpm for 24 hours. Fermentation under blue LEDs maximized pectinase production (71.59 ± 1.6 U/mL at 24 h) and β-glucosidase production (56.31 ± 1.6 U/mL at 24 h). Further, the production of enzyme increased to pectinase (156 ± 1.28 U/mL) and β-glucosidase (172 ± 1.28 U/mL) with 3% glucose as a carbon source. Activity and stability of the partially purified enzymes were higher at pH 6.0 to 8.0 and 25-55 °C. The effect on the metal ions $Na^{+}$ and $K^{+}$ and (moderateactivity) $Mn^{2+}$ and $Ni^{2+}$ increased activity, while $Hg^{2+}$, $Cu^{2+}$, $Fe^{3+}$, and $Fe^{2+}$ inhibited activity. EDTA, phenylmethylsulfonyl fluoride and 5,5-dithiobis(2-nitrobenzoicacid) reduced activity, while tetrafluoroethylene and 1,10-phenanthroline inhibited activity. The amylase was highly tolerant of the surfactants TritonX-100, Tween-20, Tween-80 and compatible with organic solvents methanol, ethanol, isoamylalcohol, isopropanol, t-butylalcohol and the oxidizing agents hydrogen peroxide, sodium perborate and sodium hypochlorite, although potassium iodide and ammonium persulfate reduced activity. These properties suggest utility of pectinase and β-glucosidase produced by *B. subtilis* B22 under blue LED-mediated fermentation for industrial applications.

Key words: *Bacillus subtilis*, Pentinase, Glucosidase, Blue-LEDs, Metal ions

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