Abstract

The extending insistence of bio-energy production has put an emphasis on the establishment and development of sustainable procedures to enhance the yield of cellulosebased biomass deconstructing enzymes. In current study, optimization of cultural conditions and growth parameters was performed in order to enhance production of a precloned thermostable and cellulolytic enzyme RtBglA. It was primarily belonged to thermophilic isolate *Ruminiclostridium thermocellum* and during a previous research work it was cloned in mesophilic expression system *Escherichia coli* BL21 CodonPlus. Sustainable induction approaches and establishment of optimized cultural conditions such as growth media (inducing and auto inducing), temperature, pH, Inducer concentration (IPTG and lactose), agitation speed, pre-induction cell density, incubation time period and inoculum size were attained by following 'One Factor at a Time' (OFAT) approach. Catalytic activity of recombinant RtBglA was augmented by **4.71-folds** after using **ZYBM9** inducing medium, with lactose induction. And **ZYM-5052** auto-inducing medium also showed increased activity by **2.67-folds**. Induction strategy by employing naturally present non-toxic lactose inducer has successfully enhanced expression as compared to expensive and toxic IPTG inducer and this is a remarkable aspect of current research work. After optimizing cultural conditions, expression analysis of over expressed RtBglA was performed by applying SDS-PAGE technique and its approximate molecular weight was 50 kDa. The present research work provided valuable information about optimization of cultural conditions for obtaining high production of recombinant *RtBglA*