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Biotechnological Production of Cellulolytic Enzymes by *Aspergillus niger* in Solid State Fermentation

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Cellulose is the most abundant renewable natural biological resource, and the production of biobased products and bioenergy from less costly available lignocellulosic materials is important for the sustainable development of human beings. Effective utilization of cellulosic materials through bioprocesses will be an important key and a challenge to overcome the shortage of foods, feed and fuels, which the world may face in the near future, because of the explosive increase in human population. In this connection, the production of cellulolytic enzymes by *Aspergillus niger* on wheat bran in solid state fermentation in a laboratory scale was compared. Czapek Dox liquid broth amended with cellulose (0.5%) was used to moisten the substrate for cultivation of *Aspergillus niger*. The production of filter paperase, carboxymethyl cellulase and β-glucosidase were monitored at daily intervals for 5 days. In the present investigation, the effects of fermentation conditions, such as different substrates, carbon, nitrogen sources, moisture content, pH, temperature, inoculum size, depth of the substrate and optimization of downstream processing parameters for higher production of cellulolytic enzymes were studied. The peak production of the enzymes occurred within 3 days of incubation. The maximal production of filter paperase 28.60 FPU/g, carboxymethyl cellulase 40.90 U/g and β-glucosidase 0.13 U/g of wheat bran were obtained under optimal conditions.

Key words: Cellulolytic enzymes, *Aspergillus niger*, solid state fermentation, wheat bran, downstream process

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Anticarcinogenic Activities of a Glycoprotein Conjugated with Isoflavones on Human Breast Cancer MCF-7 Cells

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The mechanism for the anticarcinogenic activities of a glycoprotein conjugated with isoflavones (gluvone) extract from the submerged-liquid culture of *Agaricus blazei* murill, was studied using human breast cancer MCF-7 cells *in vitro*. Cells were maintained with Dulbecco's Modified Eagle Medium/Ham's F-12 nutrient mixture (DMEM/F12) supplemented with 10% fetal bovine serum (FBS) at 37°C in a humidified 5% CO_2. For cell proliferation experiments, cells were seeded in 90 mm dishes, treated with the various concentrations (0, 10, 50, 100, 150, 200, 250 uM) of the gluvone (10 mg/ml) for the different time course. Gluvone induced anti-proliferative activity dose dependently, with an IC_{50} of 200 uM. Gluvone inhibited the cell proliferation of MCF-7 by arresting the G_1 phase of its cell cycle after 96 h of incubation as shown by flow cytometry. In addition, MCF-7 cancer cells treated with Gluvone were associated with decreased expression of proteins cyclin D, A and anti-apoptotic Bcl-2 protein and increased expression of tumor suppressor proteins p53, p21, pro-apoptotic Bax protein and caspase-8, 9, 3 activated. This study shows that gluvone can inhibit the proliferation of MCF-7 by cell cycle arrest and apoptosis induction.

Key word: *Agaricus blazei* murill (AB), glycoprotein conjugated with isoflavones (gluvone), cell cycle arrest, apoptosis, MCF-7 cells.