J Biotechnol Biomater 2012, 2:6
http://dx.doi.org/10.4172/2155-952X.S1.020

OMICS Group Conferences
Accelerating Scientific Discovery

3rd World Congress on
Biotechnology

September 13-15, 2012 Hyderabad International Convention Centre, Hyderabad, India

Effects of pentavalent arsenic toxicity on germination, seedling growth and peroxidase activity in black eyed bean

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Arsenic is one of the most toxic environmental pollutants because of its chronic and epidemic effects on human health through widespread water and crop contamination. There are concerns that arsenic can be absorbed by plants and can bioaccumulate in the food chain. Large numbers of studies indicated that low concentrations of arsenic can stimulate the growth of plants; but excessive arsenic can be detrimental for plant growth and survival. The objective of the study was to investigate the effect of pentavalent arsenic on the germination of Black eyed bean (Vigna unguiculata, variety: KH 11, PUSA), an important crop of northern India. The germination of the seeds were studied in presence of sodium arsenate solutions (As V) (0.5 ppm., 1 ppm., 1.5 ppm. and 2 ppm.). The sequestration of arsenic in different parts of the seedlings was estimated by using AAnalyst 200 atomic absorption spectrometer (Perkin Elmer, MA, USA) fitted with a FIAS-100 flow injection system. The root and shoot lengths were measured to study the changes in growth patterns. In order to assess the oxidative stress, Guiacol peroxidase (GPX) activity was estimated in different parts of the seedlings (root, shoot and seed parts) and were expressed in enzyme activity/min./gm. fresh tissue. The lengths of the roots and shoots of the seedlings increased significantly with the increase in concentrations of arsenic solutions after seven days of incubation. Peroxidase activity was found to be highest in the root parts, followed by seed and shoot parts. One possible reason for that is the direct exposure of the root and seed part with arsenic solutions, whereas shoot part emerges out of the culture plate and thus was not under the direct exposure of arsenic. Interestingly, peroxidase activity gradually decreased in the seed parts with increase in the concentrations of arsenic solutions, whereas in the root parts, peroxidase expressions decreased upto 1.5 ppm. arsenic solution and then the activity further increased in presence of 2 ppm. arsenic solution. However, no specific pattern of peroxidase expressions was found in the shoot parts. The study reveals that arsenic may have some interference with the growth factors and enzyme systems in Black eyed bean, which deserves further attention in future researches.

Biography

Sayan Bhattacharya is a faculty in the department of Environmental Science, Asutosh College, Calcutta. For the last five years he has been engaged in his doctoral research in Department of Environmental Science in University of Calcutta. He has published 17 International Conferences proceedings and several National Conference proceedings, 6 book chapters and 5 international journal papers. He has received young researcher awards from Govt. of India and IUPAC. He has more than 3 years of teaching experiences in 4 colleges and universities in West Bengal, India and has experiences as a reviewer in international peer reviewed journals.

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Molecular docking studies of potent adsorbed receptors of amino acids: A new target for biodegradation of indigo dye particles

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The present work investigated the biodecolorization and degradation of indigo dye particles using mixed adapted bacterial strains. The results of the identification of indigo degrading bacterium were analyzed by 16sRNA sequence. The nucleotides were distantly related to Staphylococcus aureus and Pseudomonas mendocina of these species showing 98% and 99% sequence similarity respectively with several uncultured bacteria in the BLASTn search. Staphylococcus aureus and Pseudomonas mendocina produced 7- methyl transferase and Thrh enzyme products respectively, when carbon and nitrogen (0.1%) were used as food supplements under aerobic condition. These enzymes were isolated by ammonium sulfate fractionation and purified to homogeneity using size exclusion and ion exchange column chromatography (DEAE- Sepharose A-50). The molecular masses of 7 methyl transferase and thrh gene product were ~ 28 kDa and ~ 23 kDa respectively serve differentially as saturates that have significant roles on indigo degradation. The optimum temperature for the enzyme activity was 80˚C at pH 6.5. Also we studied decolorization of indigo dye particles interaction between these amino acids together with theoretical analysis (model as a Glide flexible Docking program in Schrodinger) of three dimensional structures of enzyme molecules and proved that certain combination of enzymes had hydrophobic domins on their surface. The results of H-NMR spectrum and FTIR stretching of the treated dye output of the bioreactor indicated the non aromatic region at different time intervals (8, 16, 24, 32, 40, 48, 56 upto 72 hours). This work will be an initiative for the degradation of environmental hazards using amino acids.

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