Poster Session 4

MGH 241, Easel 126

4:00 PM to 6:00 PM

Effect of Chemical Fertilizers on Plant Growth-Promoting *Bacillus subtilis* Populations

Hillary Smith, Sophomore, Chemistry, North Seattle College
Kim Tran, Sophomore, Biochemistry, Mathematics, North Seattle College
Ying Xu, Sophomore, Biochemistry, North Seattle College
Sophia Herrmann, Sophomore, Soil Science, North Seattle College
Junfei Chen, Sophomore, Biochemistry, North Seattle College
Tristan Reni, Non-Matriculated, Finance, North Seattle College
Mentor: Ann Murkowski, Math and Science, North Seattle College
Mentor: Kalyn Owens, Chemistry, North Seattle College

Conventional farming techniques involve large quantities of chemical fertilizers, which often leach into bodies of water causing eutrophication. The influx of excess nutrients from fertilizer results in rapid increase of aquatic algal populations followed by dissolved oxygen depletion. This process creates regions of low oxygen that negatively impact the water quality of many major lakes and coastal regions. To address this problem, the sensitivity of plant growth-promoting bacteria (PGPB) to excess fertilizer was investigated. We hypothesize that the addition of high amounts of fertilizer will result in smaller, less productive plants and diminished rhizosphere colonization of the PGPB, *Bacillus subtilis*. A modified Kirby-Bauer disk diffusion test was performed as an initial assessment of the effect of varied fertilizer concentrations on *B. subtilis*. Roots of romaine lettuce seedlings were then inoculated with *B. subtilis* and grown in soil treated with the same range of fertilizer concentrations. The effects of each treatment on plant growth were determined using total leaf area, quantification of the rhizosphere colonization by *B. subtilis*, and carbon assimilation measured with a LI-6800 Portable Photosynthesis System. These results are an important step towards establishing guidelines for appropriate application of agricultural fertilizer in order to mitigate the frequency and severity of eutrophication events in aquatic systems.

Poster Session 4

MGH 241, Easel 125

4:00 PM to 6:00 PM

Polyethylene Glycol-Mediated Transformation of *P. ostreatus* with the Human Insulin Gene

Noah Biru, Non-Matriculated, Biochemistry, North Seattle College
Karen Gaffney, Non-Matriculated, Bioengineering, North Seattle College
Dylan Yu, Recent Graduate, History, North Seattle College
Uchechi Esonu, Recent Graduate, Biology, North Seattle College
Amelia Reesman, Non-Matriculated, Biomedical Engineering , North Seattle College
Mentor: Ann Murkowski, Math and Science, North Seattle College
Mentor: Kalyn Owens, Chemistry, North Seattle College

In the US more than 100 million people are living with diabetes or pre-diabetes. The economic burden caused by these conditions, including medical costs, is approximately $322 billion annually as of 2013. Conventionally, transgenic *Escherichia coli* has been the primary source of commercial insulin production, a process that requires extensive purification to ensure shelf stability and complete removal of contaminants. This study seeks to establish an alternative mode of insulin production using polyethelyne glycol (PEG) to transform the oyster mushroom, *Pleurotus ostreatus*, with the human insulin gene. *P. ostreatus* is a valuable target for genetic transformation due to its lack of endotoxins and fully sequenced genome. *P. ostreatus* was transformed using PEG with a plasmid containing the human insulin gene and a carboxin resistance gene. Transformed cells were selected using carboxin, extracted, and regenerated on plates composed of yeast extract, malt extract, and glucose (YMG). Integration of the human insulin gene in to the mushroom genome was confirmed through PCR analysis of the transformants. Successful PEG transformation of *P.ostreatus* offers a new avenue for insulin production, potentially diversifying the market and treatment options for diabetics.

Poster Session 4

MGH 241, Easel 124

4:00 PM to 6:00 PM

The Effects of Environmental Stress on Streptomycin Resistant *E. coli*

Michelle Clarissa, Sophomore, Biology, North Seattle College
Danny Alvarez, Sophomore, Biology, North Seattle College
Lindsay Owings

Abdullah Farajallah, Sophomore, Biology, Chemisrty, North Seattle College
Janet Lynn Nickels,
Mentor: Ann Murkowski, Math and Science, North Seattle College
Mentor: Kalyn Owens, Chemistry, North Seattle College

The overuse of antibiotics by the health and agriculture industries has resulted in an increase of antibiotic resistance in bacteria, leading to a wide range of untreatable illnesses. The U.S. Department of Health and Human Services Centers for Disease Control and Prevention estimates that at least two million illnesses and 23,000 deaths each year have been caused by antibiotic resistance. Understanding the mechanisms and potential reduction of fitness associated with antibiotic resistance is therefore essential for addressing the ongoing battle with disease-causing bacteria. This study investigates streptomycin resistance in *E. coli* and explores how resistance may affect the bacteria's fitness under two stresses, temperature and pH. Mutant strains of *E. coli* were isolated and exposed to a range of temperatures (30-42C) and pH levels (4.0-5.0). The results suggest that while antibiotic resistance is a beneficial mutation in the presence of streptomycin, it may impact fitness under environmental stress. Understanding the potential costs of antibiotic resistance could ultimately help us create better models to predict and combat the rapid evolution of drug resistant bacteria.