

Undergraduate Research Symposium May 19, 2017 Mary Gates Hall

Online Proceedings

POSTER SESSION 2

Balcony, Easel 117

1:00 PM to 2:30 PM

Determining the Amount of Imidacloprid and a Soil Sample Using GC-MS

Aaron Lang, *Sophomore, Chemical Engineering, Chemistry, Engineering, Bellevue College*

Mentor: Grady Blacken, *Chemistry, Bellevue College*

Mentor: Sonya Remington-Doucette, *Science Division, Bellevue College*

Each year bee specialists report detection of larger numbers of bee colonies suffering from colony collapse disorder. One of the suggested causes is the increasing use of neonicotinoid pesticides in farming agriculture. To study the effects these pesticides have on the environment, it is necessary to establish a method to quantify the amount of imidacloprid in an environmental sample. Previously, we found that off-line C-18 cartridges were suitable for enriching imidacloprid from complex matrices and for preparing samples for analysis in GC-MS (gas chromatography-mass spectrometry). Our previous work primarily focused on achieving a reliable calibration curve by enhancing signal-to-noise in the GC-MS. To further evaluate our findings, a spiked environmental sample was subjected to C-18 extraction and analyzed. This method resulted in a limit of detection as low as 160 micromolar, which is similar to the 120 to 320 micromolar range for limits of detection achieved by other research groups using more complex extractions. This is important to the future study of imidacloprid because it allows us to progress towards the analysis of environmentally relevant concentrations of imidacloprid in soil, plant and honey samples.

POSTER SESSION 3

Commons West, Easel 25

2:30 PM to 4:00 PM

Influence of pH and Temperature on Growth of Lactic Acid Bacteria

Bridget Wittke, *Junior, Psychology, Bellevue College*

Mentor: Sonya Remington-Doucette, *Science Division, Bellevue College*

Mentor: Grady Blacken, *Chemistry, Bellevue College*

Probiotics are living microorganisms that, when administered in adequate amounts, confer health benefits on the host. Many studies indicate that there are several ways in which probiotics, which include lactic acid bacteria (LAB), have health benefits. These bacteria survive in a wide range of temperatures and pHs, from storage to digestion. In this study, I investigated the effect of varying pH and temperature on LAB growth in a model stomach with MRS broth, one of the most common growth mediums used by microbiologists to grow LAB. I isolated LAB from Yogourmet@yogurt starter, which contains *L. Bulgaricus*, *S. Thermophilus*, and *L. Acidophilus*, and grew the bacteria in MRS broth at temperatures of 4C, 22C, and 37C to imitate conditions under which various probiotic products are stored. I also grew LAB at pHs of 2, 4, 6.2, and 8 to replicate variations of pH that come with digestion. I measured bacterial growth at optical density (OD) 600 after 24 hours for all trials. I found that optimal LAB growth at the standard pH of the MRS broth (6.2 ± 0.2) and at the standard temperature of the human stomach (37C) was expected and confirmed through several trials. When conditions deviated from standard, there was always less LAB growth. I concluded that variations in pH and temperature from standard stomach conditions result in smaller amounts of probiotic growth. This finding is important because a smaller amount of bacterial growth in the stomach will result in reduced health benefits on the host.

POSTER SESSION 3

Commons West, Easel 26

2:30 PM to 4:00 PM

Comparison of C18 and QuEChERS for the Isolation and Detection of Imidacloprid in Honey Samples Using GC-MS

Maxwell Runyon, *Sophomore, Chemical Engineering, Bellevue College*

Mentor: Richard Glover, *Science, Lane Community College*

Mentor: Grady Blacken, *Chemistry, Bellevue College*

Neonicotinoid pesticides have been identified as a possible contributor to colony collapse disorder (CCD), decimating honeybee populations. Development of methods to extract neonicotinoids from environmental matrices are important in exploring the correlation between pesticide exposure and CCD. Imidacloprid was chosen as representative neonicotinoid given it is the most commonly used agricultural pesti-

cide in its class. Two extraction methods, QuEChERS and SPE C18, were evaluated for their effectiveness in quantifying imidacloprid concentrations in honey and water. The effectiveness of each extraction method was evaluated using gas chromatography-mass spectrometry (GC-MS). QuEChERS kits use a buffered extraction technique to absorb excess water and stabilize the pH of the solution and cleanup with weak, anionic and cationic exchange resins to remove complex sugars/macro organic molecules. The SPE C18 extraction method used a non-polar solid phase to isolate Imidacloprid from other undesirable solutes in the solution. Preliminary experiments have indicated the SPE C18 extraction method appeared to have better performance with water based solutions. However, honey solutions were ineffective due to more organic interference. Additionally, QuEChERS extraction appears to be more efficient for isolating analyte, but did not concentrate as efficiently compared to SPE C18 extraction. We hypothesize that QuEChERS and SPE C18 extraction methods will be more effective in tandem, as QuEChERS will remove organic interference, while SPE C18 extraction will concentrate the samples. The impact of pH adjustment of samples on peak area and shape was also investigated in both polar and non-polar GC-MS columns. The results obtained will help identify best practices for extraction and detection of imidacloprid in honey samples.