CALIFORNIA STATE SCIENCE FAIR
2011 PROJECT SUMMARY

Name(s)

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Project Number

S1110

Project Title

Investigating Air Pollution Patterns in Southern California Using Isotope and Elemental Analysis of Lichen

Abstract

Objectives/Goals

To utilize the isotope and element signatures of lichen tissue to identify air pollution patterns across Southern California.

Methods/Materials

Some of the lichen samples were accessed from lichen archives across a Southern California gradient while some were collected from field sampling. Place lichen samples in a large cylindrical airtight container connected to the Flexi Dry MP freeze dryer. Maintain the freeze dryer temperature to be less than -80º C and pressure less than 40 millibars. The microbalance, Sartorius ME 5, was used to weight 2.00-3.00 mg of lichen into 3.5mm x 5mm tin capsules. Exact weights were recorded. The samples were placed oin the Delta V Advantage isotope ratio mass spectrometer. The Isodat 2.4 software was used to report data. SigmaStat was used to test correlation between elements and nitrogen and ammonia deposition values.

Results

The strongest correlations relating to deposition was the %N in lichen tissue ratio in the lichen tissue and the dry ammonia deposition with an R2 value of 0.3467. Another strong correlation was between the total wet deposition with the ä13C # and the total wet deposition with an R2 value of 0.5625. As I was organizing the results I also noticed that the element against the isotope correlations were also fairly strong such as the %N vs. ä15N #, %N vs. ä13C #, %C vs. ä15N #, %C vs. ä13C #, and ä13C # vs. C/N

Conclusions/Discussion

The strongest correlations that were found between the sites across Southern California have nitrogen isotopic signatures that reflect nitrogen composition in lichen tissue. The correlation between %N and dry ammonia suggest that lichen in mountain areas with more dry ammonia deposition have less nitrogen in their bodes. This finding suggests that ammonia hurts the lichen. Thus, the analysis of isotope and elemental analysis of lichen tissue can be used as indicators for anthropogenic inputs of ammonia to the environment.

Summary Statement

My project investigates air pollution patterns in Southern California using istope and elemental analysis of lichen.

Help Received

Used lab equipment at University of California, Riverside under the supervision of Dr. James Sickman; Dr. Sarah Jovan and Mr. Kerry Knudsen gave me lichen archives