

2002 TAIWAN INTERNATIONAL SCIENCE FAIR

CATEGORY : Earth & Space Sciences

PROJECT TITLE : Still Ain't Lichen This

AWARD : First Award

SCHOOL : Kelly Road Secondary School

FINALISTS : Alex Thomson

COUNTRY : Canada

“Still Ain’t Lichen This”

Purpose:

To measure the air quality of the city of Prince George by using lichen as bio-indicators of pollution.

Procedure:

To begin, 75 Usnea lichen samples were obtained from Bear Lake, located 25 km north of the city of Prince George. Each of these lichen samples were of uniform: genus; size; mass; colour; shape. These samples were dried and separated into 5 groups of 15 lichen samples each. These samples were then placed in 5 areas around the city of Prince George. The sites for placement are as follows: Bear Lake; Glenview; Northwood; Downtown and the British Columbia Railway Industrial Site (BCR site). Five lichen samples were placed on three different trees all of the same species at each of the 5 sites. The lichen samples were then left at those sites for 4 months, November 19 to March 1.

Part 1:

This part of the procedure involves the weighing of all 75 lichen samples at 3 separate times. The samples were weighed on the day of placement and again on the 7th of January, and finally on the 1st of March.

Part 2:

This area of testing involves the measurement of Carbon Dioxide to determine the rate of photosynthesis and respiration. For this part of the experiment 10 lichen samples were used. 5 samples from the Bear Lake location were used, as well as 5 samples from the BCR Industrial site. These samples all had withstood the 4-month transplantation period in their respective areas. This test involved the use of an environmental chamber, and an infrared gas analyzer.

Part 3:

This part involves the analyzing of the lichen samples for total Sulfur, and other trace elements. For this part 20 lichen samples were used. 4 samples were used from each of the 5 testing locations. The samples were burned and measurements of the inorganic compounds were taken.

Observations:

Part 1:

It was found that, upon measuring the masses of the lichen samples, that the BCR Industrial Site had the lightest lichen samples and that the Bear Lake location had the heaviest samples.

Part 2:

It was found, surprisingly, that the BCR lichen samples photosynthesized and respired at a faster rate than the lichen samples from Bear Lake. This may be explained by the fact that the BCR lichen were under stress. During respiration the BCR lichen samples again are carrying out the process at a faster rate.

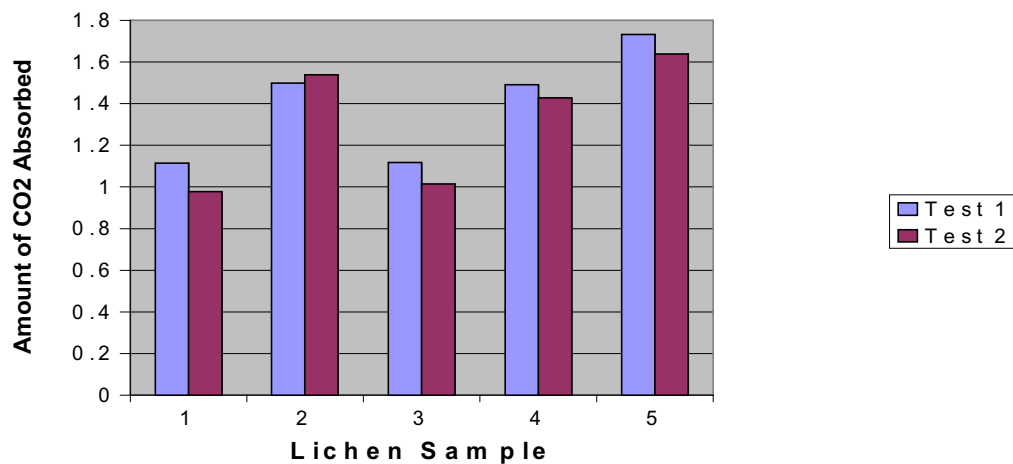


Figure 1. Absorption of CO₂ in 300umols of light for BCR Industrial site

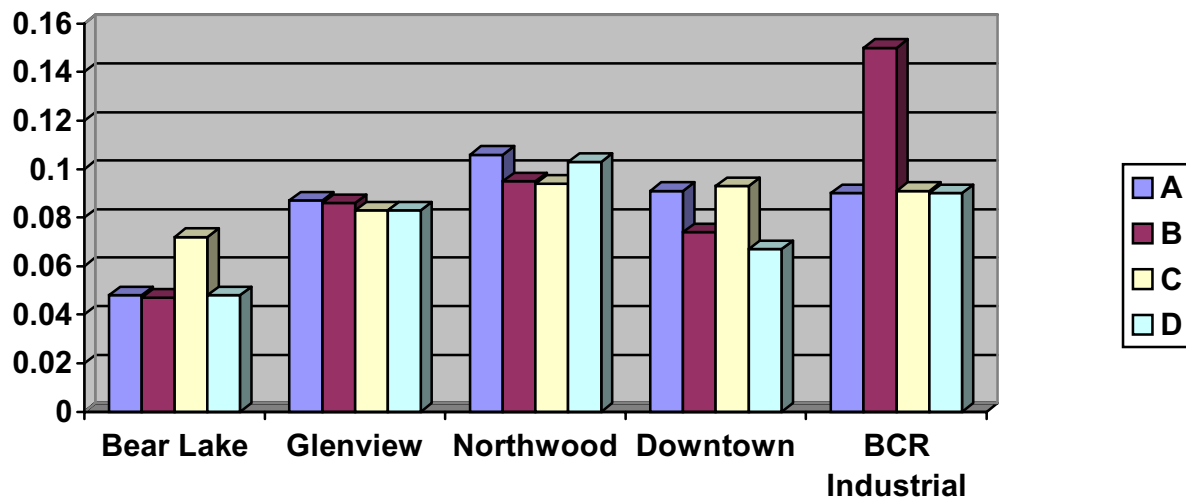


Figure 2: Graph showing the total amount of sulfur on lichen samples at each respective testing location (A, B, C, D, are representative of the lichen sample tested at each station)

Part 3:

It was observed that the BCR lichen samples had the highest total Sulfur levels. The lowest level of Sulfur was 0.047%, this sample was from Bear Lake.

Conclusion:

In conclusion it was found that the lichen samples which were transplanted to the BCR Industrial Site were the least healthy. These samples had: the lowest masses; the highest levels of photosynthesis and respiration; and the highest levels of Total Sulfur. Conversely it was found that the Bear Lake samples were the healthiest. These samples were found to have: the highest masses; a lower rate of photosynthesis and respiration; and the lowest levels of Total Sulfur.

評 語

本作品研究加拿大 Prince George 市附近地衣類作為空氣污染之指標作者展現現在不同地區地衣類(同一種屬)吸收大氣中 SO_2 之量有所變化。在工業區之地衣類其所吸收之 SO_2 最高而未受污染地區地衣類吸收之 SO_2 之量測較少，本作品實地探討分析地衣中 CO_2 吸收量及 SO_2 之含量等且有學術水準作者在加拿大全國科展中得到最佳環境獎