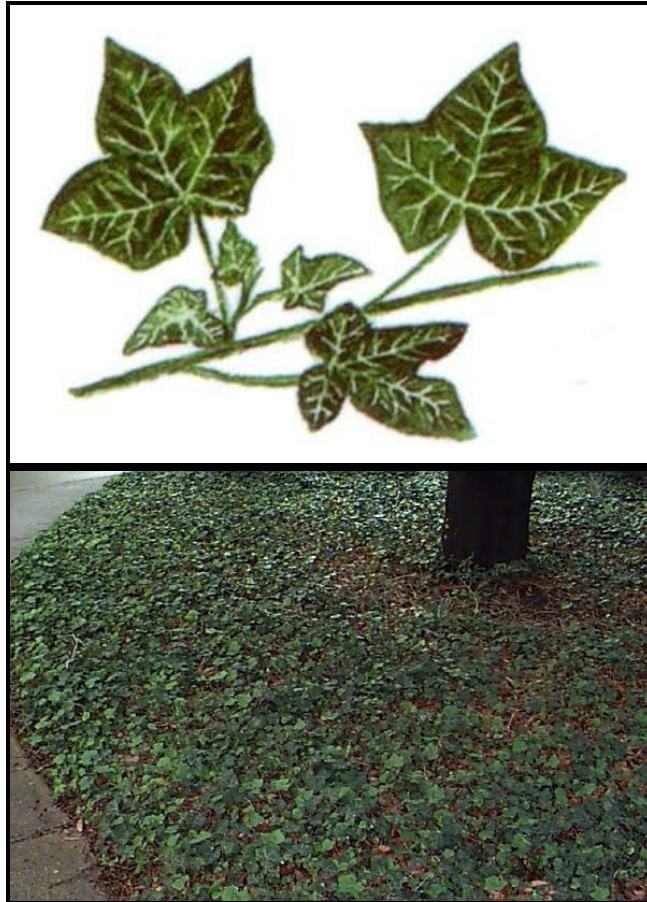


visit www.cottondew.net/ to see this paper go to Webz, Sweet Home Oregon.

How arsenic in the soil affects the growth of English Ivy



Crescent Valley High School
Field Biology First Semester
Teacher: Daniel Bregar

January 2004
By Luke Cotton

visit www.cottondew.net/ to see this paper go to Webz, Sweet Home Oregon.

Abstract

Enclosed is a study done on the effects of arsenic on English Ivy. Other researchers have found in their studies of Sweet Home that there are abnormally high amounts of arsenic in Sweet Home by the Ames Creek. We wondered how could those high amounts make an impact on Sweet Home's plant life. Sixteen pots were taken, eight filled with Sweet Home soil and eight filled with Crescent Valley soil in Corvallis. Instrumental Neutron Activation Analysis (INAA) analysis was used to determine how much arsenic was in the samples. We planted the English Ivy plants one in each pot. After five weeks we came up with the average height of Sweet Home plants and Crescent Valley plants. Sweet Home average growth was 1.35 in. which overall is not a bad average, But Crescent Valley plants grew an average of 1.74. Crescent Valley plants averaged .39 in. more growth than the Sweet Home plants.

Introduction

The goal of this project was to see if there is any difference between plants grown in Sweet Home's arsenic laden soil and Corvallis soil. We will determine the differences between the growth and maturity rate of each plant. The plants will be tested many times and the data will be written down so the class after us can continue any other studies on this subject further.

Arsenic is a hazardous element to animals, but is it to plants? Many studies have shown that arsenic content was found in six garden crops: lettuce, onion, beetroot, carrot, peas and beans. In one survey, various vegetables were analyzed and the amounts of arsenic, on a fresh weight basis, were reported. The amounts in corn averaged, 1.8 mg/kg and the amount averaged in potatoes were, 0.86 mg/kg (#1). This meaning that the corn plant absorbed more arsenic than the potato. The information helped us understand what effect arsenic has on the plants in the community. His information also helped us find out what the effects of arsenic are to humans and animals.

Arsenic was used in many things like wood treatment and insecticide. This was to kill bugs but it also affected other things like, plants and animals. One of these plants could be English Ivy or many other plants like it.

The plant studied is known as English ivy (*Hedera helix*). This plant is from England, it traveled here by boat then it was sold as an ornamental plant. Now it has spread as a weed across the northwest (Bregar). Even though it was hard to grow our group believes that it was a perfect specimen for the test.

The information that we found would be very useful to the people in Sweet Home. If I were to live in Sweet Home and grow a garden, I would like to know what plants the toxic element affects, so I could grow a garden without problems. What I hope to find is that there is no difference between soil with arsenic and soil without arsenic. If we did discover that there was a difference in the plants, we could help stop it from affecting anyone.

The information we collected could be very useful to a scientist because it could help find answers to very big questions in the future. It could help a scientist solve a major weed problem. Or it could be used in some experiment on different varieties of plants. Although arsenic is toxic to humans there is always a use for it.

The site of exploration will be at an accessible near by park called Sanky Park. We needed to first access the land and get a permit to dig there. There were many possibilities of places for us to work at in Sanky Park one was Ames Creak or a hill by Ames Creek. The amount of possibilities was endless.

We expected to see that the plants will have no difference externally but internally we saw no true visual difference. We think this was because arsenic levels tend to increase in

visit www.cottondew.net/ to see this paper go to Webz, Sweet Home Oregon. the plant tissue with increasing amounts of arsenic in the soil (#1). This would be a cause for concern in Sweet Home's arsenic laden soil. Sometime I hope that the findings will benefit Sweet Home citizens in the future.

Methods

In order to find out if arsenic levels in the soil affect the plant growth, our plant is English Ivy. We retrieved soil samples from Crescent Valley High School, Corvallis Oregon and Sweet Home Oregon. First Sweet Home Oregon we collected the soil samples. The Soil samples were four-six inches deep the seventh inch was the soil that we gathered (Jim Childs 1999). We found the exact position with a GPS so this can be duplicated. Then after the soil had been collected we put the soil evenly into eight jars, filled to 6 inches uncompressed. Then label each jar S1, S2 ext. up to eight. Then put the soil in a box so when you put the lids on the jars they don't get any sun, like what we did. Store the samples in a room at a normal room temp. Repeat this procedure at Crescent Valley High School Corvallis Oregon the next day.

After the samples were collected and stored in the same spot, then you take the jars and pore the entire contents into the sixteen pots labeling each. Then take the English Ivy sprouts and plant one in each pot. Place the pots in an outside room with ventilation to the outdoors and a sunroof. Then analyze the growth every Friday. The way we are analyzing is by measuring the growth and comparing the plants too each other. Water them with the same amount of water (about 50ml) every other day from the first day on. While you are doing this also send a sample down to the OSU reactor to have it analyzed.

Materials

- 16 flowerpots
- 50ml water measurer
- Sixteen English Ivy Sprouts
- A ruler in inches
- Tap water
- Soil from Sweet Home enough to fill 8 jars 6in.
- Soil from Crescent Valley enough to fill 8 jars 6in.
- A large steal hand shovel
- GPS
- A reactor to get the soil tested in
- Sixteen large glass jars with lids
- Room with sunlight and outside ventilation

visit www.cottondew.net/ to see this paper go to Webz, Sweet Home Oregon.

Results

Sweet Home Soil Data

Sample #	Original Sample ID	Sample Type	Easting	Northing	Mass of Drying dish (grams)	Mass of Drying Dish + Wet Sample (grams)	Mass of Wet Sample (grams)	Mass of Dry Bulk Sample + Drying Dish (grams)	Mass of Dry Bulk Sample (grams)	% Moisture in Sample (%)	Sample #	Mass of Small Vial (grams)	Mass of Small Vial + Sample (grams)	Sample Mass for Reactor (grams)	Large Vial #
19	C15S01	soil	0521960	4915360	30.979	87.503	56.524	75.130	44.151	28.024%	19	1.220	1.698	0.478	X04

Arsenic AS-76

Sample Nr Spectrum 559.1

19 2u69719.ufo 18.0

CV Soil Data

CV Sample #	Small Vial #	Large Vial #	Empty Small Vial Mass	Full Small Vial Mass	Sample Mass	Large Vial #	Bottom Small Vial #	Top Small Vial #
C15S03	967-109	X94	1.215	2.25	1.035	X63	119	138

CV Sample # Small Vial # ppm Arsenic-76 Error

C15S03 967-109 Unknown ----- -----

Sweet Home Plant Data then Crescent Valley plant data

Sample ID	12/12/2003	12/26/2003	1/9/2004	1/20/2004	Avg. weekly growth
D06S01	3.4	3.5	3.5	4	.12 in
D06S02	2	2.5	3.25	4	.4 in
D06S03	4.5	5.3	3.5	5.5	.2 in
D06S04	3.3	3.5	4.5	5	.34 in
D06S05	2.5	3	4	4	.7 in
D06S06	2	2	3	3.5	.3 in
D06S07	3.5	4	5	4.5	.2 in
D06S08	3	3.5	4.5	4.5	.3 in
D06S09	1.5	2	0.75	3.5	.4 in
D06S10	2.5	3	3.5	4.5	.4 in
D06S11	3.5	3	5	5	.3 in
D06S12	1	3.3	2	2.25	.25 in
D06S13	1.5	2	2.5	3.5	.4 in
D06S14	6	7	7.5	8	.4 in
D06S15	3.4	3.5	4	4.5	.22 in
D06S16	2.4	3	4	4.5	.42 in
Avg weekly Growth Of Sweet Home soil plants			.32 in	Avg Growth of Sweet Home soil plants	1.35 in

visit www.cottondew.net/ to see this paper go to Webz, Sweet Home Oregon.

Avg weekly growth of Crescent Valley Soil plants	.348 in	Avg Growth of Crescent Valley soil Plants	1.74 in
--	---------	---	---------



Discussion

In the course of this investigation of the effects of arsenic in the soil it can be seen that there were differences in growth. The average growth for Sweet Home was 1.35 overall and the average for Crescent Valley was 1.75 overall. Tests of the soil can lead you to conclude that Sweet Home had a higher amount of arsenic than Crescent Valley but CV's INAA information didn't make it back from the reactor. So the data was based on the average arsenic amounts for Corvallis, which was .2 ppm of arsenic, so that is what we used to base our data. This confirmed that our group's hypothesis, that there would be a difference in the soils and that would effect the plants. Over the entire hypothesis was correct but there is room for a reasonable doubt.

Since results for the arsenic Corvallis test were not received we cannot be 100% sure that the two soils were different at all. The experiment had some other problems as well we had two people measuring what could have resulted in measuring differences. This is also true with watering and the amount of soil put in each pot. From this experiment it can be seen that there is a difference in the two soils and the plants grown in those soils, the percent for error (30%) is much higher than desired. My hope for, if there is a, next time is that we will be able to be more precise and have more solid evidence.

The results we got from this experiment were somewhat solid with the plant height in inches. The overall outlook of the results is that it is great looking through page four you see that it is evident that sweet home had a smaller growth rate then Crescent Valley all though the inconclusive results of the arsenic tests I have firm confidence in the project results that we came up with.

visit www.cottondew.net/ to see this paper go to Webz, Sweet Home Oregon.

Literature used as references

1. Florian Kaspenberg, Nicole Dowdell, and Chris Chambers. 2003. Elevated Arsenic Levels -- Finding the Source in Sweet Home, <http://www2.corvallis.k12.or.us/cvhs/science/Florian-Chris-Niki.doc> January 2004
2. Paul Briskey and David Kemp. 2003. An Analysis of Arsenic Concentration in the Sweet Home Region, <http://www2.corvallis.k12.or.us/cvhs/science/David-Paul-Report.doc> January 2004
3. Ian Meyer, Aaron Rudolph, and Andy Stark. 2003. Elevated Arsenic Concentrations in Soil and Water Around Sweet Home, Oregon <http://www2.corvallis.k12.or.us/cvhs/science/andy-ian-aaron-compiled.doc> January 2004
4. Pam Allen and Margaret Hendrick. 2003. Analysis of Arsenic Concentration in Sweet Home, Oregon <http://www2.corvallis.k12.or.us/cvhs/science/pamandmargaretreport2003.doc> January 2004
5. Swan Lee and Jessica Serisky. 2003. Arsenic in Sweet Home -- A Study <http://www2.corvallis.k12.or.us/cvhs/science/Swan-Jessica-MAIN-PAPER.doc> January 2004
6. Tim Klein and Alyssa Palmer. 2003. The Arsenic Concentration In Sweet Home, Oregon <http://www2.corvallis.k12.or.us/cvhs/science/Tim-Alyssa-Report.doc> January 2004
7. 2003. Sample Data Locations / Weights / Results <http://www2.corvallis.k12.or.us/cvhs/science/sampledataspring2003results.xls> January 2004
8. David E. Stilwell. March 2002. *Excerpts on Uptake of Arsenic by Plants Grown Near CCA Preserved Wood* <http://www.noccawood.ca/stilwell1.htm> January 2004
9. Jim Childs, October 1999. *Garden Gate* Issue 29, www.ext.colostate.edu January 2004
10. Dan, Bregar; 2004. Dan Bregar's fabulous writing tips, Outline and Sweet Home Arsenic Information (In Class Discussions ext.) <http://www2.corvallis.k12.or.us/cvhs/bregard/index.htm> January 2004