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AIR QUALITY ASSESSMENT WITH LICHENS

COMPARISON OF AIR QUALITY IN THE
CITY AND IN THE COUNTRYSIDE

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Project aim

Aim of my project is to assess the air quality with the help of lichens and to compare the air quality in the city and in the countryside.

Lichens are composite organisms consisted of a symbiotic relationship between a fungus and an algae or a cyanobacteria.

Lichens are very sensitive to air pollution, especially to sulphur dioxide which comes mainly from burning fossil fuels.

Lichens don't have roots or protective surface and because of that, they are not able to filter the air which they absorb. These harmful gases can accumulate in their bodies and become very toxic for them.

That's why lichens can be used as bioindicators for air pollution.

In my project, I visited few places in the city (Lublin) and in the countryside (Komarówka Podlaska) to look for lichens and then to compare the air quality in these places. The outcome of my research may be a crucial point for people who want to live in a place that is beneficial for their health.

To assess the air quality at selected locations, I used Hawksworth & Rose scale according to which there are 7 lichens zones where different species of lichens can be found. The greater zone number means lower sulfur dioxide concentration and less polluted air.

Planning

Doing this project required me to learn new knowledge:

- I had to learn more about the structure of lichens to be able to better understand the essence of the project
- I had to learn how to recognize individual lichen species
- I had to get to know the lichen scale and learn how to match species to it, so that I could assess air quality based on it

Before I started working on my project, I did some research. I read many articles about lichens, their structure and places of occurrence.

My next action was to decide what final product I would make. I chose film, because from my point of view it is the best way to show the outcome of my research. In film I'm also able to show some information about lichens.

In the next step, I chose few spots in Lublin and in Komarówka Podlaska to look for lichens. In Lublin, I decided to visit Niccolo Paganiniego Street (Czechów), Ogród Saski, Tomasza Zana Street (Rury), Lublin Old Town and Plac Litewski.

In Komarówka Podlaska I decided to visit a housing estate and the forest and the swamp behind it.

Then, I planned my work for 3 days:

- day 1 - looking for lichens in Lublin
- day 2 - looking for lichens in the countryside
- day 3 - creating the final product - film

Taking action

day 1

Firstly, I went looking for lichens on Czechów, then in Ogród Saski, Tomasza Zana Street, Lublin Old Town and Plac Litewski at the end. I looked for lichens mainly on tree bark and rocks. I used my phone to take pictures of them.

day 2






I went looking for lichens in Komarówka Podlaska. I used my phone to take pictures of them. The search in the forest was challenging because it had been raining the day before and it was boggy there.

day 3



I started creating my final product. First, I selected the lichens photos which I wanted to include in the film. Then I wrote the text of narration. My next step was to edit the film and record the narration for which I used iMovie and Canva.



Results

Lichens found in city

	lichen species	lichen zone	where the lichen was found
	<i>Desmococcus viridis</i> (not a lichen, but algae)	1	Niccolo Paganiniego Street (Czechów), tree next to the road; Tomasz Zana Street (Rury); Ogród Saski; Lublin Old Town; Plac Litewski
	<i>Lepraria incana</i>	2	Niccolo Paganiniego Street (Czechów), tree next to the road; Tomasz Zana Street (Rury); Ogród Saski; Lublin Old Town; Plac Litewski
	<i>Xanthoria parietina</i>	3	Niccolo Paganiniego Street, Czechów, small city park; Tomasz Zana Street (Rury); Ogród Saski; Lublin Old Town; Plac Litewski
	<i>Hypogymnia physodes</i>	4	Niccolo Paganiniego Street, Czechów, small city park; Tomasz Zana Street (Rury); Ogród Saski
	<i>Parmelia saxatilis</i>	5	Ogród Saski

Lichens found in the countryside

	lichen species	lichen zone	where the lichen was found
	<i>Xanthoria parietina</i>	3	tree bark, tree next to the house
	<i>Parmelia sulcata</i>	4	tree bark, tree next to the house
	<i>Hypogymnia tubulosa</i>	4	tree bark, forest, swamp
	<i>Evernia prunastri</i>	5	tree bark, tree next to the house
	<i>Tuckermanopsis chlorophylla</i>	6	tree bark, forest, swamp

	<i>Xanthoria polycarpa</i>	7	tree bark, forest, swamp
	<i>Sticta limbata</i>	7	tree bark, forest, swamp

Desmococcus viridis - type of greenhouse. It takes the form of a green bloom. It can be found on walls, rocks and tree bark. It can survive in heavily polluted environment. According to lichen scale, it is located in zone 1, where lichens can grow at SO₂ concentrations greater than 170 µg/m³.

Lepraria incana - crustose lichen. It can be found on all continents, except Antarctica. Its widespread occurrence is due to its high resistance to air pollution. According to lichen scale, it is located in zone 2, where lichens can grow at SO₂ concentrations between 100 and 170 µg/m³.

Xanthoria parietina - fruticose lichen. It can be found on all continents, except Antarctica. Its widespread occurrence is due to its high resistance to air pollution. According to lichen scale, it is located in zone 3, where lichens can grow at SO₂ concentrations between 70 and 100 µg/m³.

Hypogymnia physodes - fruticose lichen, common in Poland. According to lichen scale, it is located in zone 4, where lichens can grow at SO₂ concentrations between 50 and 70 µg/m³.

Parmelia saxatilis - fruticose lichen. It can be found on all continents, except Australia. It was on the list of strictly protected species in Poland until 9 October 2014. According to lichen scale, it is located in zone 5, where lichens can grow at SO₂ concentrations between 40 and 50 µg/m³.

Parmelia sulcata - fruticose lichen. It can be found on all continents, except Antarctica. According to lichen scale, it is located in zone 4, where lichens can grow at SO₂ concentrations between 50 and 70 µg/m³.

Hypogymnia tubulosa - fruticose lichen. It was strictly protected in Poland and has been under partial protection since 17 October 2014. According to lichen scale, it is located in zone 4, where lichens can grow at SO₂ concentrations between 50 and 70 µg/m³.

Evernia prunastri - fruticose lichen. It can be found on all continents, except Antarctica. In Poland, it was a partially protected species and as of 9 October 2014, it was removed from the list of protected lichen species. According to lichen scale, it is located in zone 5, where lichens can grow at SO₂ concentrations between 40 and 50 µg/m³.

Tuckermanopsis chlorophylla - fruticose lichen. It can be found on all continents, except Antarctica. In Poland, under species protection. According to lichen scale, it is located in zone 6, where lichens can grow at SO₂ concentrations between 30 and 40 µg/m³.

Xanthoria polycarpa - fruticose lichen, common in Poland. According to lichen scale, it is located in zone 7, where lichens can grow at SO₂ concentrations lower than 30µg/m³.

Sticta limbata - foliose lichen. According to lichen scale, it is located in zone 7, where lichens can grow at SO₂ concentrations lower than 30µg/m³.

In Lublin, the lowest concentrations of sulphur dioxide are found in Ogród Saski, while the highest in the Old Town and on Plac Litewski. In Komarówka Podlaska the air quality in the forest is higher than in the housing estate.

Comparing town and countryside, the air in the countryside has definitely lower concentrations of sulphur dioxide. This is due to the fact that this area is less inhibited and less industrially used.

Conclusion

My research showed that air quality in the countryside is better than in the city. There are also slight differences in air quality in different zones of both the city and the countryside. In less crowded places, with a large presence of trees, the air is cleaner.

Reflection

I encountered few problems while working on this project. First of all, finding lichens in the forest wasn't easy because the ground there was boggy after the rain. Secondly, matching a specific lichen species to a photo is often very challenging.

Nevertheless, I really enjoyed working on this project. From now I will pay more attention to how beautiful lichens we can find in our surroundings.

What I have learned

- I improved my knowledge about lichens
- I know how to assess air quality with a simple method - using lichens
- I have increased my sensitivity to what surrounds me and how much I can learn from it
- I expanded biological terminology in English

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