

Blue algae

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Abstract

We can no longer recreate because of blue-green algae, can we predict and perhaps even prevent blue-green algae? It is important for the future to keep the water clean and to keep checking that it continues to go well, so that we can prevent people from getting sick. We want to control the water with blue-green algae. We want to check if it is possible to predict blue-green algae in advance with measurements and if it is economically cheaper to prevent it.

We want to analyze the water for substances that cause blue-green algae with the right materials. And we want to involve people who have had to deal with blue-green algae before.

We expect to be able to predict blue-green algae. And to find out whether it is also safe for people and the environment and is economically smart if you do something against blue-green algae

Keywords

Blue Algae

Introduction

Because of the global warming it is easier for blue algae to grow so for our experiment we decided to test on blue algae. We examined water from different lakes and searched for phosphate. Later in this report we will tell you why we tested on phosphate. Blue algae is a bacteria that makes people and animals sick. It can be dangerous

when you have been in touch with them and it can cause various health problems. That is why we wanted to investigate whether we could prevent the occurrence of blue algae and whether this was economically smart, it would be nice so we can still use it as recreational pools. We only researched in the Netherlands.

Purpose

We want to see whether we can prevent blue algae and whether that is economically smart. In the Netherlands

we often swim in natural water, so if we could remove the blue-green algae that would be very useful.

Methods

We have tested the phosphate content. That is one of the most important nutrients for blue-green algae. We did this in two ways: 1 with a spectrophotometer and with a briefcase in which the color had to be changed. We did this because we wanted to compare these methods. Of course there are more ways to find out if there is blue-algae. Some of the options are:

- With a so-called fluorobe. You put that device in a water sample and it sends specific light waves through the water. When they hit a blue-algae, they are reflected back. You just don't know what kind of blue- algae it finds.

What is blue alga

Blue algae is probably not what you think it is, because it's not an algae, but it is a cyanobacteria. It is an prokaryote organism which lives of sunlight, carbon dioxide and nutrients that are dissolved in water. It is one of the first organisms on earth that produced oxygen, by photosynthesis. A lot of different nutrients in water can cause blue algae, and phosphate is known to be one of them. That is why we did our research on phosphate. If the blue algae is formed it can come together and create a floating surface on the water. Many species of blue algae are able to form toxics, which are very bad for

How can you find out whether there blue algae or not

You can recognize blue algae by the color, that depends on the circumstances. There are different forms in which blue algae occurs. it can be small blades of grass or some kind of clumps that 'float' through the water. Both ways

- By looking at water samples under the microscope.
- Sometimes you can see it visually. They form blue-green floating layers with sloping strands in them. Sometimes it is a bright green color with less floating layer.
- You can measure for toxins.
- You can also measure on different fabrics. For example, a high pH value. $\text{pH} > 9$, but you still don't know what kind of algae there is.

Most of the options above had some mistakes so that's why we chose to measure the phosphate level.

humans and animals who go in to water a lot, like dogs. If you get in contact with blue algae you can get various health problems because of it. Blue algae does not have cell organelles and they are phototrophic bacteria, which means that they can convert carbon dioxide and inorganic nutrients into biomass under the influence of light. Oxygen is released in this process. Cyanobacteria contain chlorophyll. That is what gives blue algae its color, because chlorophyll can give bacteria different colors from a blue-greenish color to reddish brown.

is not good for the plants and animals because it floats on the water it stops the sunshine from coming true. then the plants can no longer do photosynthesis, so there is little oxygen in the water.

What is phosphate

Phosphate (P_2O_5) is one of the most important resources for food production. It is a compound of phosphorus with oxygen. Humans, animals and plants need phosphate to live. Humans and animals get phosphate in through food. Plants obtain phosphate from the soil. Phosphate compounds play an important role in human DNA and in the energy supply of humans, animals and plants.

Phosphates can be very good for nature, but nowadays too many phosphates end up in our environment, more than necessary. This also has negative consequences. If too many phosphates end up in the water, this causes extreme algae growth. This is to the detriment of the fish, because the water becomes cloudy and a lot of oxygen is extracted from the water. If there is too much phosphorus on the soil in agriculture, this is often washed off into the surface water in many lakes or rivers. This stimulates biodiversity because the water becomes more nutrient-rich, but the enormous growth of algae also kills many plants because hardly any more sunlight can reach the

bottom, plants die. These plants will rot and provide less oxygen. That is why a good phosphate level is of great importance. Phosphorus concentrations are often lower in the winter than in the summer due to temperature influences and equilibrium reactions.

If too much phosphate accumulates in the agricultural land, the phosphate can leach into the surface water. the water becomes more nutrient-rich, they call it eutrophic and that has an effect on the flora and fauna of the water. Eutrophication can stimulate algae growth, reducing less sunlight reaching the bottom. Some algae such as blue algae are also toxic. Eutrophication is excessive enrichment of water resulting in strong growth and increased activity of planned aquatic plants and organisms. Eutrophication can have various causes, such as an excessive use of substances in agriculture, resulting in a situation that arises in watercourses. Another possible cause of eutrophication is the discharge of untreated waste water into surface water.

When is there a lot of phosphate in water

Phosphate is found in many different forms in nature. But sometimes it gets in water because of human activities. There is a lot of phosphate in manure, which is flushed into the water. This also causes an accumulation of phosphate in the soil. Climate change and eutrophication will increase the amount of phosphorus in urban surface water. Climate change, through two processes, leads to a higher phosphorous tax. The first is in the surface water itself, as has already been said by eutrophication. Due to higher temperatures, the degradation of organic matter, which is both in the water and in the soil. The degradation of organic matter releases phosphorus and nitrogen, especially in shallow water, the temperature rises rapidly than double the amount of phosphorus can be released from the sediment. The thicker the sediment is low, the more

phosphorus can be released. If the top layer becomes oxygen-free, additional phosphorus may be released into the water. When the water is stopped, the phosphorus concentration remains high. The second is caused by sources outside surface water, which we call external eutrophication. This is mainly due to changes in precipitation: In winter, the increase in precipitation, in summer the drought, which can cause stagnant water. The increase in phosphorus is mainly caused by sewage deposits, because there is a lot of phosphate in sewage water. Green roofs and trees can also be a source of phosphorus in heavy precipitation. Another way is the increase in nutrients is the inlet of foreign water. If this water comes from the rural agricultural area, there water usually contains large concentrations of nutrients and hence also phosphate.

How is blue algae formed

Blue algae occurs when the water temperature is between 20 and 30 degrees Celsius. Blue algae grows and feeds itself with light and nutrients that are common in the water, such as nitrogen and phosphate. If the conditions are right they can form a floating layer and they are then

in bloom. If after a while the bottom of the floating layer dies, blue-greenish toxins can enter the water. They convert nitrate and phosphate into useful substances for other animals.

Does blue algae have an influence on humans, animals and plants

The short answer is yes. Blue algae does have an influence on humans and animals. An intense flowering of the cyanobacteria is very undesirable. Generally, a floating layer on the water doesn't look very inviting to swim in. Sometimes the layer is paired with a terrible smell varying from a 'sewer smell' to a sulfur-like muffled odor. In addition to that, sometimes so much oxygen is used, that fish die massively. However the greatest danger is in property of the toxins produced by many of the cyanobacteria. Different groups of toxins are distinguished like: neurotoxins, cytotoxins, hepatotoxins and dermatoxins.

Getting in contact or consuming the cyanotoxins given below, can result in irritation to eyes and skin,

headaches, stomach and bowel complains or even worse health problems. For example anotoxin-a can not be enzymatically aborted nor there is an antidote which can lead to death

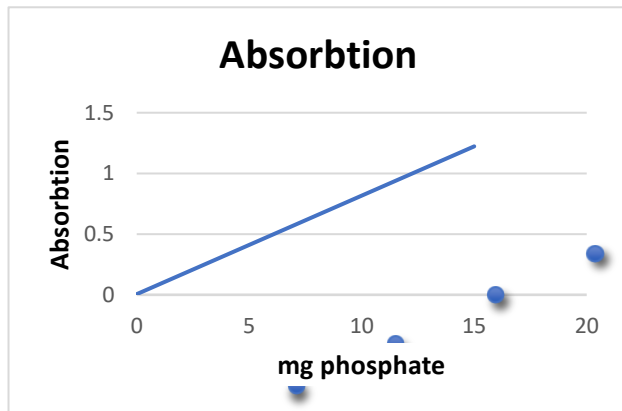
The influence of blue algae in water is big as well. It can lead to less oxygen in the water and that can result in some fish species and plants not being able to live any longer. Blue also reduces sunlight and increases the amount of toxic substances in the water. That is not beneficial for animals and plants, because without sunlight the cold-blooded animals don't have a high enough body temperature and plants are not able to do photosynthesis, which leads to even less oxygen.

How do you know if you should start measuring

When it gets warmer in the spring. Usually from April to the end of September/early October in the Netherlands, because only then the temperatures get high enough. In other countries this is different because of the temperature. After that, it becomes too cold in the Netherlands and the blue-green algae disappear, some of them remain dormant for the winter (for example in the water bottom). It also depends on the type of blue-green algae, some types can be present in abundance well into the winter. In some water systems blue-green algae are more likely to be found than in others. Blue-green algae is formed more easily in standing water than in moving water. When blue algae is trying to arise, grow and develop in moving water it won't be able to grow because the water will destroy the algae before it can do any damage.

Results of the experiment

In this graphic below you can see the absorption of phosphate. As you can see the absorption goes up evenly with the amount of phosphate.



We did measurements of our own in five different places. The first one being the Afgraving in Drunen. It is a recreational lake were loads of people come to enjoy the weather. We thought it was useful to test here, because it was a very hot summer for our climate, so the blue algae had a good shot at growing there. We didn't find blue algae, which wasn't really surprising because a lot of people had recently swum there, but we wanted to check it for good measure.



Figure 1: The Afgraving in Drunen

The second location where we did research is the Surfviijver in Waalwijk. It is a recreational lake were a lot of people come all year round, because there is a forest nearby. We didn't find any blue algae in here, that is probably because the summer has already come to an end and the temperatures are lower.



Figure 2: The Surfviijver in Waalwijk

Here we have location where we actually did expect to find blue algae. As you can see on the picture there is a blue- greenish layer on top of the water which led to this hypothesis. But here is the thing. This picture was taken midsummer. At that time there were signs around the lake giving warnings not to swim there because of blue algae, but when we came to get water the layer had vanished and that resulted in us not finding any blue algae.



Figure 3: Baardwijkse Overlaat

We also went to look for blue algae in a tiny triangle formed lake. We did not expect to find a lot in there, but it was one of the only places we actually had some results. It wasn't a lot, but we think we've found some blue algae in the lake according to research that has already been done by the local authority .

Conclusion

Conclusion. Blue-green algae is harmful to humans, animals and plants. Furthermore, most methods for finding blue-green algae are not very good, because then you do not get to know what type of blue-green algae

you have. We have not yet investigated economically whether it is smart to remove blue-green algae. Only as it seems now, it is very expensive to prevent blue algae.

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