Hello science fans,

We had the chance to do a project about the competition of two species, Lemna minor and Chlamydomonas reinhardtii, for nitrate!

Nitrate, or NO3-, is known to be essential in the proteins production process of many species, especially species undergoing photosynthesis . It exists in the majority of ecosystems and is consumed by their hosts. We are going to present you two species which supply themselves with nitrate and which we chose for our final biosensors project. *Lemna minor*, called “water lentil” or “duckweed” in common language, have air sacs in their leaves, allowing them to float at the surface of ponds water. Curiously, during winter and low temperatures, their leaves eject the air and they sink at the bottom of water.

Chlamydomonas reinhardtii are green algae living in a similar environnement. They have the capacity to move thanks to its flagella or to lose them in some conditions. Moreover, their regeneration time is relatively quick for an organism, which is an interesting characteristic to follow in research. Usually, in aquapony water lentils are introduced in aquarium to fight against algae invasion. In fact, this species is consuming faster the nitrate, dying algae by asphyx. By this way, we chose to see **to what extent the amount of nitrate in water influences Chlamydomonas reinhardtii growth, in case of Lemna minor presence**.

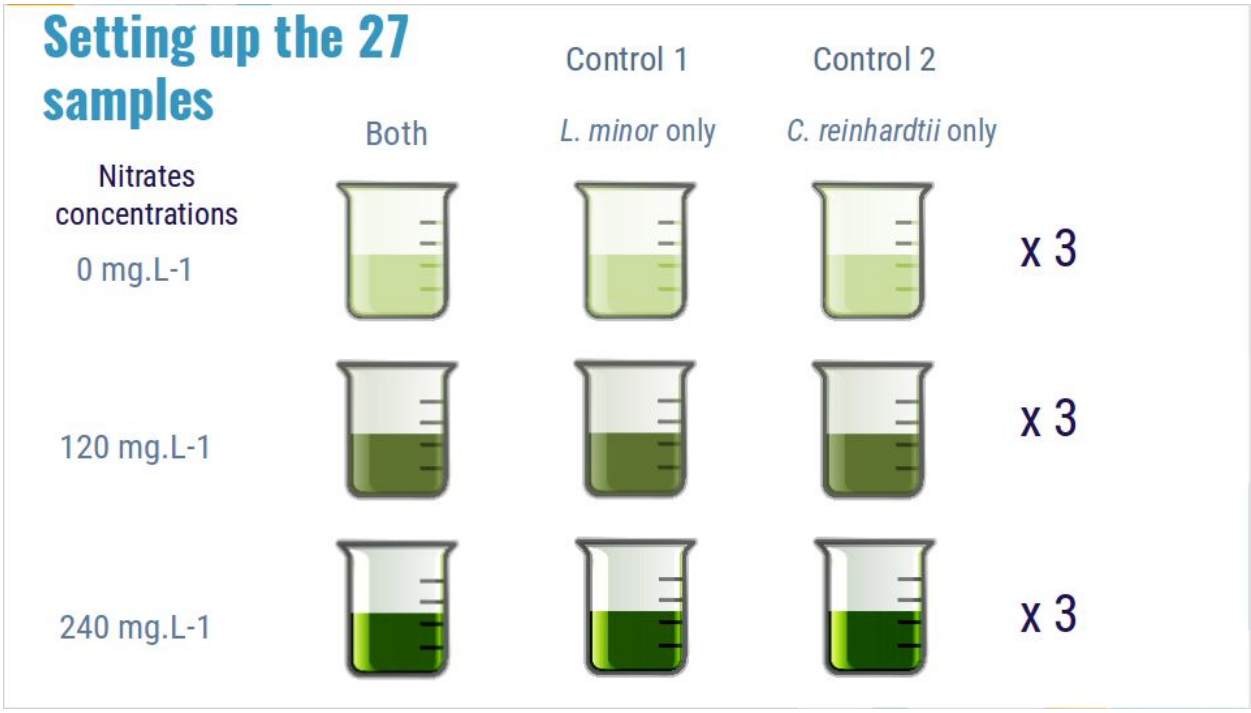
How did we make to answer this question ~

To study this characteristic, we followed a simple protocol, showed below. We chose to test 3 different concentrations of nitrate in water: 0, 120 and 240 milligram per liter. This means that the 0 corresponds in fact to the natural nitrate concentration of tap water, which was at 15 milligram per liter.

For each concentration, there were three different types of beakers: beakers containing only *Lemna minor*, or only *Chlamydomonas reinhardtii*, or both species. Each organism was introduced in the same initial quantity in each beaker and we placed the beakers at the same

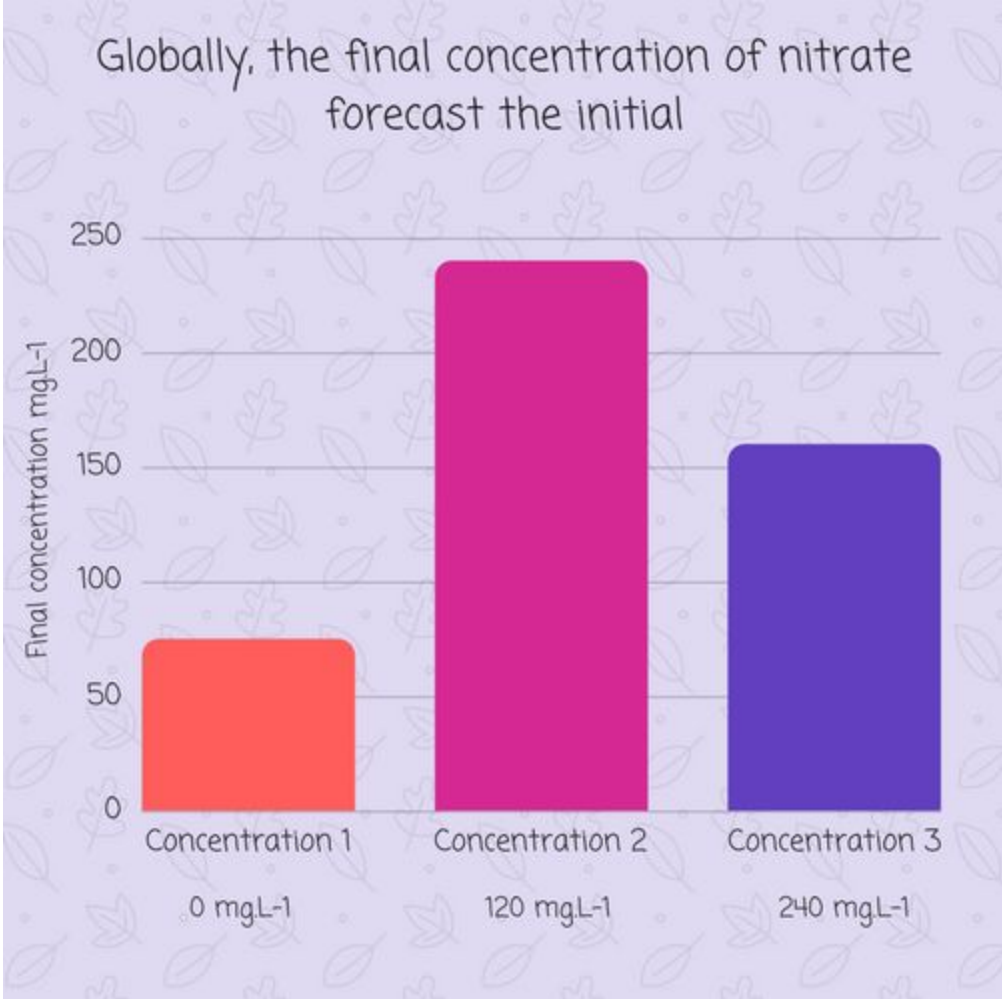
place, in a greenhouse in order to have similar experimental conditions. This allowed us to limit variability between our samples due to external factors. From this, we were able to distinguish the nitrate influence and the species interaction if there is, by comparing beakers results between them. We took in account several parameters: the light, pH, temperature, *C. reinhardtii* concentration, and *L. minor* growth, all overtime. The first three ones were to control the environment of our organisms and the last one, to follow how the experiment changes.

In total, we had 27 beakers to follow: we chose to have 3 beakers per type of beakers and per concentration. This is called “replicates” and it is particularly important in research to have significant results.



All of our days could be summarized as taking measurements of pH, light, L. minor surface and biomass, concentration of *C. reinhardtii*. Respectively, we took data with pH paper, luxmeter, pictures & the software imageJ, a scale and finally, a microscope with slides made to count. For the last day, we measured the final nitrate concentration of each beaker in order to compare it with the concentration that was originally in the water! We used a nitrate test which gave us a colour corresponding to a concentration. We chose to use a spectrophotometer to determine the colour absorbance and made a scale with knew concentrations. From this and the absorbances of our samples, we were able to determine their final nitrate concentration. :)

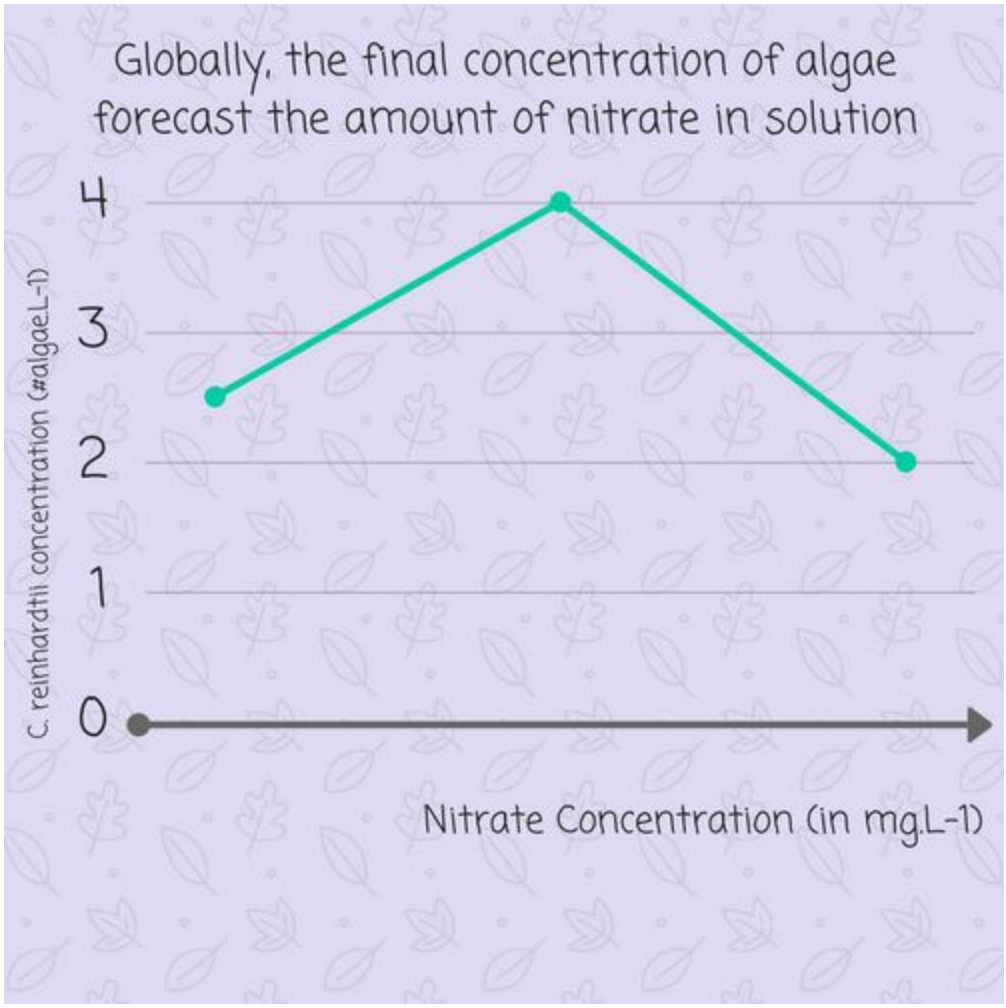
What did we find after the experiment?

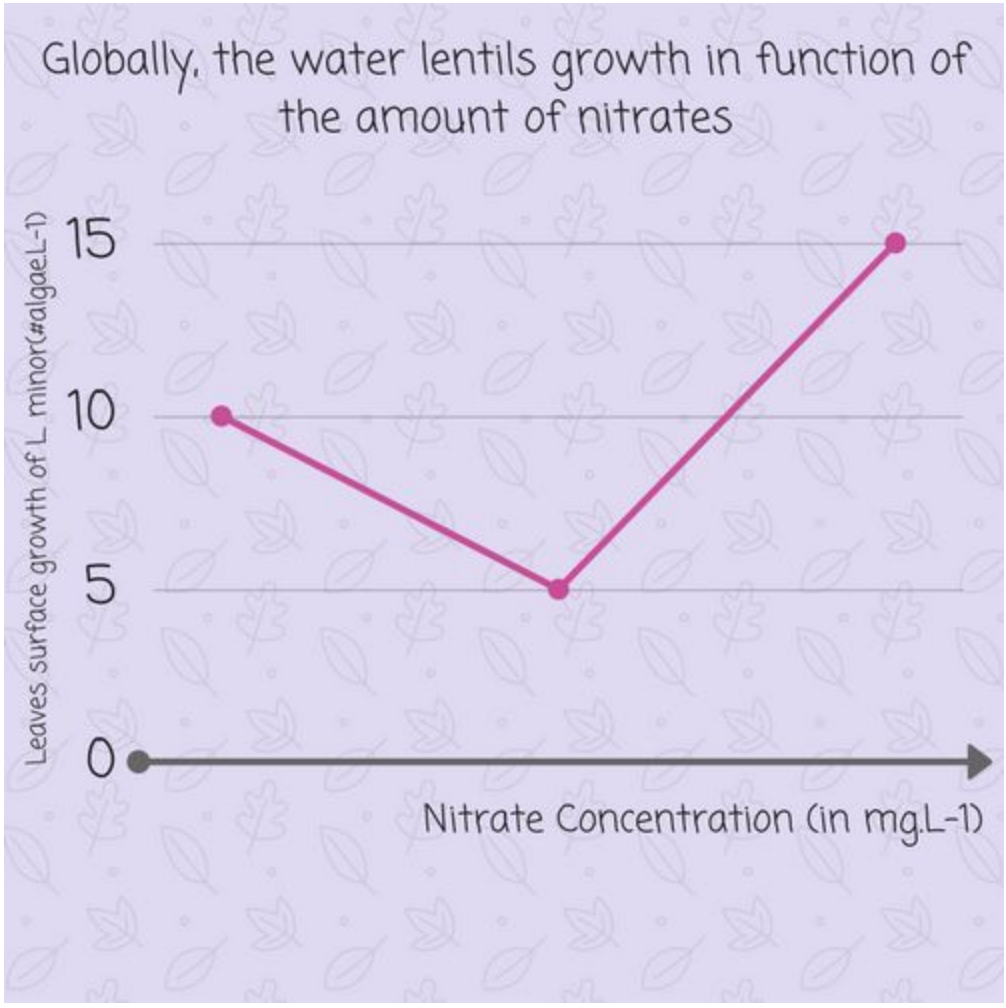


Following graphs don't correspond to the final graphs with all replicates, maybe too hard to read and so little much interesting, but it gives us the trend obtained. The graph above is showing the concentration of nitrate that we found in beakers at the end of the experiment. We can notice that there is an aberration: globally, final concentration is higher than the initial concentration. Moreover, it seems that more nitrate there is in solution initially, faster the nitrate is consumed.
We suggest that it is due to the fact that the nitrate test was not accurate enough and maybe the fact that the spectrophotometer was saturated,without taking the real absorbance of the solution and so given a 'false' value of the final concentration in nitrate.

Both graphs showed after represent the amount of both organisms for different concentrations of nitrates. We can see a small difference between concentrations, but unfortunately it is insignificant to conclude on the nitrate influence on *Lemna minor* and *Chlamydomonas reinhardtii*.

To go further, we have now a better idea of how this type of project is going and the next point could be to do it again with a nitrate probe. :)


Globally, the final concentration of algae forecast the amount of nitrate in solution
C. reinhardtii concentration (#algae.L-1)
4
3
2
1
0
Nitrate Concentration (in mg.L-1)



Thank you for your reading, if you want to know more:

- You can read our report and all our documentation on our GitHub
- You should look at our Twitter and of course, our superb storify
- You can contact us by mail
- You should check these really interesting articles: 1, 2
- You can visualize our manipulation by watching this video

Lots of love,

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