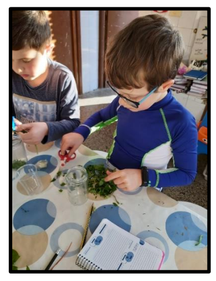



SCIENCE FOR THE YOUNGEST

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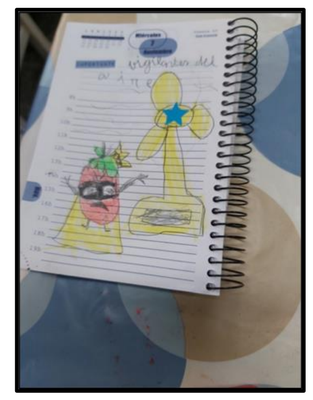
"WATCHERS OF THE AIR: STRAWBERRIES WITH SUPERPOWERS"

Citizen Science, Chemistry and Sustainability in Early Childhood Education



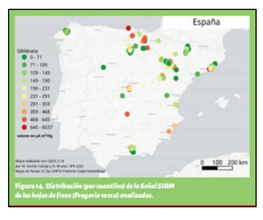
1.- **Participation citizen science project "Vigilantes del Aire"**, the Foundation Ibercivis in which the capacity of strawberry plants as heavy metals and natural antioxidant scavenging is studied.
We collected strawberry stolons, planted, labeled and distribute them among our students. To each one of the pots was attached a location card and initial data.

2.- Study and observation of the characteristics of strawberry plants, taking samples
of the stems, leaves, roots and observe them with magnifying glass and with digital microscope, to notice the presence of the villi responsible for the uptake of heavy metals.
We found another plants with similar vili: borage (garden) and saxifrage (house).
We also looked, if there were more plants that were capable of capturing heavy metals such as strawberries: milk thistle, fennel, esparto grass or oleander were being used in phytoremediation experiments on contaminated soils. These plants do it from their roots, they absorb them, not with their vili.

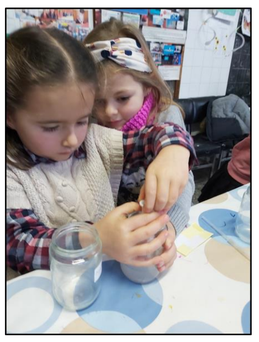
3.- Uptake of metals and vitamin C. Inquiry. We have been told that strawberries have a lot of vitamin C, it was up to us to check it out.
Our **starting question**: Does the uptake of heavy metals have something to do with their vitamin C content?
Some did not agree very much because they said that the metals were captured by the hairs of the leaves and stems and that vitamin C was in the fruits.
To try to solve the problem, we developed several simple inquiries:
3.1.- The first question to answer **was if the strawberry (fruit) had vitamin C and to compare its content with other foods.**
We used a chemical reaction that **vitamin C has with iodine** (povidone iodine) and various foods that we believe have vit C in their composition (fruits, juices, soft drinks, vitamin C pills, vitamin complex pill).
We analyzed the results together and reached the following **conclusions**:

1. Strawberries do have vitamin C.
2. The fruit that has the most vitamin C of the ones we have analyzed is the Kiwi, followed by the lemon.
3. Strawberries have more vitamin C than oranges, tangerines or pineapple.
4. Ripe strawberries have more vitamin C than green ones.
5. Most commercial orange juices have more vitamin C than natural juice because it is added artificially as a supplement and preservative.
6. Vitamin complexes have more vitamin C than natural juices.
7. Orange-flavored soft drinks that have some juice in their composition, have less vitamin C than natural and commercial juices.

3.2.- We studied too **if there is vitamin C in the leaves, stems and roots** of the strawberries. We obtained some extracts, and we performed the previous test with povidone iodine, concluding that the leaves, stems and roots of the strawberries also had vitamin C, in less quantity than the fruits, but appreciable.
3.3.- Finally, we wanted to **link the presence of vitamin C with the ability to retain heavy metals.**
We found that vitamin C breaks down in the presence of some metals such as iron, copper and other transition metals.
We have not been able to verify it yet due to the pandemic, but we are looking for simple experiments to help us visualize it better (take effervescent vitamin C tablets and put them in acid solutions of steel wool or copper ...)
3.4.- **We drew on filter paper with the iodine-starch solution**, using our fruits as stamps.







4.- We designed a pet, an **image that reflected what we had understood** about the project. Most portrayed him as a super hero strawberry that was capable of taking down evil heavy metals from the air.

5.- **We take care of our plants at home and in our science school, collected them again, wand toke the leaf samples as indicated in the project protocol, let them dry, filled in the final forms and sent them to Zaragoza for its magnetic analysis.**

6.- **Diffusion on social networks and radio podcast.**

7.- We have sent our samples (14 were valid). We are very happy, the **air in our region is healthy, practically free of contamination by heavy metals**. Our scientific strawberries told us.

CONCLUSION

Participation in citizen science projects from the childhood stage helps to visualize and give social importance to the work of scientists and is a very interesting opportunity to introduce them to IBL and foster their critical thinking and creativity.