GLOBE INTERNATIONAL VIRTUAL SCIENCE SYMPOSIUM 2022

MAKING BIODEGRADABLE SANITARY PADS USING COCONUT

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Teach Through Expounding of Themes

TABLE OF CONTENT

ABSTRACT

Sanitary pads are essential to the survival of all females, they are extremely useful, convenient and safe for use, unfortunately they are also a great threat to our environment.

In the US alone, there are 12 billion pads that get thrown away every year and this is greatly contributing to climate change. Sanitary pads are made from super-absorbent polymers which are not biodegradable, they do not decompose, instead they will eventually break down into micro-plastics. The micro-plastic contaminate soil, water and the air, posing a threat to living organisms. Sanitary pads also have a massive carbon footprint.

It has also been discovered that over 500 million women and girls worldwide (25% of the female population) cannot afford to buy sanitary pads therefore they resort to using cloth or tissue while on their period. This is extremely unhygienic and unsafe as it can cause a number of health complications from infections to infertility.

My objectives for this project were to find solutions to sanitary pad waste and non-biodegradable sanitary pads in order to improve the conditions of our environment and help mitigate climate change.

I did this by making sanitary pads out of coconuts, a readily available fruit (material) that is biodegradable, organic, cheap and easy to source. To make them, I wrapped coconut husks with a cut out piece of coconut sheath, lined the bottom with a bioplastic

that I made and finally covered it with a white cloth.

The results were great, the pads turned out to be absorbent and didn't leak through the other side because of the bioplastic which is water resistant. Therefore, my experiment worked as they were fit for purpose.

I think that biodegradable pads are the way forward because they are not only sustainable but also cheap to produce and convenient unlike washable pads that are basically a de-evolution of pads as they take us back to the old practices of having to wash "pads" every time you use them. Washable pads might be neglected by users because of the inconvenience of constantly having to wash your pads, this is made harder by the lack of running water in rural areas.

RESEARCH QUESTIONS

1. What can we do to reduce global warming and climate change?

   How do we reduce carbon dioxide in the atmosphere?

2. What effect do sanitary pads have on the environment?

   Do they contribute to climate change?

   By how much?

3. Can we make sanitary pads out of organic materials?

   Will they work?

4. Will the biodegradable sanitary pads help solve climate change?

WHY ARE BIODEGRADABLE PADS IMPORTANT?

The biodegradable pads are meant to tackle and help reduce climate change. They will reduce pollution because they will decompose a few weeks after being disposed off unlike ordinary (non-biodegradable) pads that are said to take 500 to 800 years.

Ordinary pads break down into micro-plastics which contaminate water, soil and air and are harmful to living organisms. They also release chemicals that will cause groundwater pollution and loss of soil fertility. The biodegradable pads will solve both these problems as they do not contain micro-plastics or harmful chemicals.

THE RESEARCH PROCESSES.

In order to do research on my project I first asked myself questions like; in which ways do I contribute to climate change? What do I do or use that affects the environment negatively? What are the most common but overlooked contributors to climate change? Can I find sustainable alternatives or solutions to the problems?

These questions enlarged my interest in the project and made me more curious. I scoured the internet day and night for ideas and project but all projects were overused. After days of struggling to come up with an idea, I finally thought of doing biodegradable pads.

I mainly consulted my teacher Mrs Neema and Ms Biasha for guidance, help or information that I needed for the project. They helped me decide on which materials and methods will work best for my project and provided their supervision and assistance required when I was making the pads.

We researched to find the best materials (coconuts) to use, how to use them, how absorbent the materials were, how comfortable they will be (by rubbing them against our skin) and if they are functional or not.

I did some research by asking some (20) women how many pads they use a month and found out that each woman uses an average of about 35 pads every month which is 420 pads per person annually. There are about 600,000 women in Mombasa, where I live, therefore approximately ***252 million*** pads being used and disposed of every year.

Through the internet I discovered that 433million pads will dispose of about 150kg of carbon dioxide every month which is 5,196,000,000 pads and 1800kg carbon dioxide each year. Therefore, in Mombasa 87.3kg of carbon dioxide is released by pads each year.

Using the biodegradable pads will reduce this to 0kg helping us solve our climate goals much faster.

CALCULATIONS

I obtained these numbers by first adding up the women's replies and divided it by 20 to obtain the average amount of pads used;

(35+32+30+29+35+38+37+30+37+32+33+33+36+39+40+35+35+34+35+36) /40

=694/40

=34.7

=35

Then I multiplied 35 by 12 to get total amount of Pads per woman per year. 35*12= 420

Then I multiplied 420 by 600,000 to get total amount of pads used by entire female population in Mombasa. 420*600000= 252,000,000

To find out the amount of CO_2 released used the equation:

$$\frac{253{,}000.000*1800}{5{,}196{,}000{,}000} = 87.3kg$$

HOW I MADE THE PADS

Materials and equipment used:

- Coconut husk
- Coconut sheath
- Cloth (linen)
- Water
- Bleach
- Natural enzymes
- Vinegar
- Corn starch
- Glycerol

Step 1: collecting materials and bleaching

I started off by collecting the coconut sheath and husks and soaked them in water and bleach to remove the brown colour.

Step 2: softening with natural enzymes

Rinse them with warm water to wash away the bleach.
I re-soaked them in water and added a natural enzyme and left it for a few hours. After a few hours I rinsed them and let them dry.

The natural enzyme is used to soften the husks and sheath.

Step 3: making bio plastic

I then made the bio plastic.
I mixed water, vinegar, cornstarch and glycerol in a pot on medium heat. Once the mixture thickens, remove it from the heat and spread a thin layer on to parchment paper or foil. Let it dry.

Step 4: assembly

I then wrapped the husks with a piece of the coconut sheath and sewed it shut. I placed the bio plastic onto the bottom of the semi-finished pad and wrapped the whole pad with a piece of cloth and sewed it in place.

RESULTS!

Results 1: absorbance

- The most important function of the pad is absorbance and retention of substance hence this was the most important and nerve wrecking part of the experiment.
- In order to test this, I slowly poured water onto the pad and checked to see if it was getting absorbed.
- Fortunately, the pads did absorb all the water used for the test confirming its absorbance and verifying that they work.

Results 2: retention

- Our next step was to check if the pad could retain the water or if it would just flow through to the other side.
- We used the test in **“Results 1”** and flipped the pad upside-down to check if it was dry.
- The pad indeed was dry. This was because of the bioplastic, we had decided to place the bioplastic at the bottom of the pad because it is water resistant therefore liquid substance cannot pass through it.

Results 3: comfort

- We knew that the pads had to be comfortable to wear otherwise no one would wear them and this would defeat the purpose of the pads.

- In order to test their comfort, we placed and rubbed them on our hands. They were soft and did not cause any irritation or rash which meant that they were a success.

DISCUSSION

The results show that the pads passed all the tests (absorbance, retention and comfort) which means that they are functional.

The positive results mean that women can start using them regularly instead of the unsustainable versions in order to help reduce the effects of climate change.

This could significantly change our environment.

Non-biodegradable pads contain micro plastic and harmful chemicals that they release when they are disposed of. These micro plastics and chemicals contaminate the soil, water and air and are very harmful to organisms.

In soil, they reduce soil fertility which can lead to soil erosion and desertification as they ripe the soil of its nutrients. This will cause it to lose its fertility hence crops will not grow.

In water, they can easy be eaten by marine life due to their small particle sizes. This can cause neurotoxicity and oxidation damage in fish.

In air, they are inhaled by human and can cause lung damage, swollen windpipe, emphysema and lung cancer.

These pads will provide solutions to many problems.
These include:

- Pollution

The pads do not contain any micro plastics or chemicals hence reduce pollution to the soil water and air and all its effects as mentioned above.

They will also reduce amount of litter because they will biodegrade after a few weeks.

- Reduced carbon dioxide and climate change

  These pads will help reduce the effects of climate change and make our planet more sustainable and habitable. The pads will reduce carbon dioxide emissions by 87.3kg every year, in Mombasa alone, imagine the impact they would have if every woman could use them.

- Cost

  I found out that 25% of the female population cannot afford to buy sanitary pads and therefore they resort to using cloth when they are on their period. This is devastating and can cause serious threat to their lives.

  This can cause infections, infertility and even cancer.

  These pads will also help woman prevent these health issues as they can switch from using cloth as pads to using the biodegradable pads that will be cheap to buy and easy to make.

Supplying these pads to woman all over Mombasa, Kenya and even the rest of the world will improve their lives in countless ways.

CONCLUSION

Coconuts can not only be used for consumption but production of sustainable substitutes to a lot of our necessities too. E.g., cloth materials, furniture and now, sanitary pads.

Our goal is to help mitigate global warming and climate change.

Switching from non-biodegradable sanitary pads to these biodegradable coconut ones that are both sustainable and cheap will reduce the concentration of carbon dioxide in the atmosphere. This will help solve/prevent/mitigate global warming and climate change.

Although the pads were a success practically, we still need to find out (by doing laboratory test) whether the pads with have allergic reactions on some people. We also need to test performance of the pad under real life circumstances in relation to body temperature (heat) and how our bodies (and body temperature) will react to the material and bioplastic. We will also need to find out the pads shelf life.

CITATIONS

https://medium.com/one-future/sustainable-menstruation-the-environmental-impact-of-menstrual-products-eba30e095cda

https://www.iqair.com/us/blog/air-quality/microplastics-effects-on-air-pollution

https://iopscience.iop.org/article/10.1088/1755-1315/631/1/012006/pdf

https://www.downtoearth.org.in/blog/waste/is-green-menstruation-possible--64796

https://stanfordmag.org/contents/planet-friendly-periods

https://www.youthkiawaaz.com/2020/12/carbon-footprint-of-sanitary-pads/