Culinary Protection from UV Devastation

Abstract

Sunscreen, a widely used protectant against UV rays, is crucial in the avoidance of diseases. It is usually made in factories but it's possible it could be made at home. Some mineral sunscreens are made using zinc. Some foods contain zinc. So this experiment strives to make a UV block out of zinc-based foods. Because of sunscreen's importance, the experiment could be used in significant ways.

It was discovered that, based off the test done below, the oyster mix blocked UV rays as efficiently as commercial sunscreen in the beginning of the experiment. This is important because this research could be used to create a natural sunscreen to keep more people from diseases.

The researcher made a carrot, flour and oyster mix and then spread each on an ultraviolet detector sticker which was then placed in the sun for several minutes. Pictures were taken at the beginning and the end of the experiment. Afterwards, the pictures were edited and compared. The oysters seemed to have worked better than the other mixes including the commercial sunscreen, but they didn't last as long.

The data was the pictures taken during the experiment. The commercial and oyster data was important. Though it is not a certain fact that the zinc in the oysters is what made oysters work best, it is a possibility and there is reason to believe so because the flour and carrots do not contain as much zinc as oysters do. This may be an important discovery in sunscreen production.

Purpose Statement

The purpose of this project is to create a simple, natural, mineral UV block using food-based substances. This protectant will block UV rays and be as efficient in blocking sun as commercial sunscreen but easier to produce.

Research Question

Which of the following mixes can block UV rays as effectively as commercial sunscreen to potentially create a natural sunscreen; oysters, carrots, or flour?

Background

The battle between skin and sun has gone on for a long time. People have tried many ways to protect their skin from the burning, relentless sun. The sun emits an ultraviolet light that, though invisible to the human eye, can damage or destroy skin. The most common protectant for UV rays is known as sunscreen.

Sunscreens fall into two main categories: chemical and mineral. Chemical sunscreens are made to change the chemical makeup of skin. Mineral sunscreens use a physical barrier to block the suns' UV rays and stay on the surface of the skin. Commercially produced mineral sunscreens use zinc and titanium dioxide to create a wall between skin and sun. As Nick Milazzo says in *Zinc Benefits, Dosage, and Side Effects* "Zinc is an essential mineral and has a multitude of biological roles because it is a functional component of over 300 enzymes that rely on zinc to be able to catalyze chemical reactions" (Milazzo). In mineral sunscreens, zinc oxide, (the element zinc combined with the element oxygen), is used. Some people say that zinc oxide blocks the sun by reflecting it but others say that zinc oxide absorbs the UV rays. Zinc can also be found in simple, natural foods like meat, fish, nuts and more.

Many zinc filled foods are recommended to be part of peoples' diets. Examples of such foods are "animal proteins like fish and meat [which] are among the best sources of zinc, but plant-based foods, like seeds and fortified cereals, also contain the essential mineral" (Levi). Some people are encouraging others to eat zinc-based foods to recover from the damages caused by the sun. If food can be eaten to fix the damage done after the sun's rays, it's possible it could be put on skin to protect them before the rays.

Hypothesis

I hypothesize that oysters will block UV rays and be a good substitute for commercial sunscreen to block UV rays because of their zinc content and because zinc is used to block the sun.

Control Group

A control group was used so that the mixes made in the experiment could be compared with it. This experiment's control group is zinc mineral commercial sunscreen.

Variables

The independent variable used in this experiment is the different foods used for each mix.

The dependent variable is the color of the UV stickers.

The controlled variables are the scale, the UV stickers, the timer, the food processor, and the fluid ounce measuring device.

The extraneous variables are the camera settings, the amount of mix and sunscreen applied to each card, the weather, and the time taken in between the timer going off and the picture taking.

Materials

- 1 Tablespoon of zinc mineral commercial sunscreen
- 50g all-purpose flour
- 50g unpeeled carrots
- 50g canned oysters
- 18floz of tap water
- 1 camera
- 5 index cards
- 1 red pen
- 2 coffee filters
- 1 glass bowl
- 3 plastic bowls
- 5 UV stickers—sticker which, when exposed to UV rays, turns purple
- 1 timer
- 1 scale
- 5 paper towels—use as many as needed
- 1 food processor fitted with a big sharp blade
- 1 fluid ounce measuring device
- 1 baking sheet
- 1 butter knife
- 1 apron
- 1 hair tie—if needed
- 3 glass bowls with tops
- 1 sharp knife
- 1 cutting board
- 1 can opener
- 3 spoons
- 1 ruler
- 1 photo editing software

Methods

1. Put on the apron and hair tie. Cover surface if needed.
2. Using the red pen, draw a 3cm-by-3cm box on each of the index cards.
3. Measure out 50g of all-purpose flour by placing a coffee filter on the scale, tearing it, and then placing flour in the coffee filter until the desired amount.
4. Using the fluid ounce measuring device, measure out 6floz of water and put the water and the flour into the food processor. Blend for 90 seconds and time using the timer. Put the mix into one of the plastic bowls and wash blender.
5. Measure out 50g of carrots by cutting them with the knife and cutting board and using the same method as the flour. This is done with the other coffee filter and the scale.
6. Using the fluid ounce measuring device, measure out 6floz of water and put the water and the carrots into the food processor. Blend for 90 seconds and time using the timer. Put the mix into one of the plastic bowls and wash the blender.
7. Measure out 50g of oysters using the glass bowl with no lid and the scale. Using the fluid ounce measuring device, measure out 6floz of water and put the water and oysters into the food processor. Blend for 90 seconds and time using the timer. Put mix into one of the plastic bowls.
8. Put each mix into a glass bowl with a top and refrigerate for about two days. Stir the mixes after they are removed from the fridge.
9. Write the start time, the date, and mix name on each of the five index cards. The mix names are No Sunscreen, Commercial, Flour, Carrot, and Oyster. Put one sticker on each.
10. Put all the cards on a baking sheet and spread each mix, using the butter knife, on a card inside the 3cm-by-3cm square. The paste should be even and every card should have the same thickness. One card should be blank, and the mixes should be about as thick as the amount of liberally applied sunscreen. Wipe the knife after each application.
11. Bring the timer (set for 1 minute) and the baking sheet with cards outside and place the sheet in a spot that has nothing overhanging it and no shadows. As soon as the card comes in contact with UV rays, start the timer.
12. When the timer goes off, reset it for seventy-five minutes and take a picture of each card.

13. When the timer goes off again, take picture of each card then bring the tray inside.
14. Clean up by throwing away cards, cleaning counters and washing dishes. Properly dispose of mixes.
15. Using photo editing software, create a mask and set the white point to a portion of the picture with the mix but without the sticker underneath. Do the same for the eighty-minute photos. Compare the photos of one-minute mixes to their relative eighty-minute mixes by making a color range from one to ten. Ten is the card with the most purple and one is the one with the least.
16. Remove the apron and hair tie as well as any other safety precautions.

Results

This research showed that some foods are better suited to withstand UV rays in comparison with others. The data was collected in the form of pictures with a total of twenty pictures. These pictures are qualitative data. The first experiment was not done properly and so the data collected on that test is not shown here. Also, due to rainy weather, a third experiment was not completed and extra pictures in the second experiment are not used. These tests may have changed the results but just looking at the results of just the one test, the following conclusion is below. So there are a total of seventy-five pictures taken but not included in this experiment.

It was noted that the no sunscreen card was always purple which meant that there was always UV rays hitting the cards. The commercial sunscreen didn't block UV as well as expected and after the eighty minutes its protective aspect failed some.

The carrot mix's sticker was very purple after one and eighty minutes. This means that it did not block the UV rays very well and was not as efficient as the commercial sunscreen. The flour mix's sticker was less purple than the carrot but it was more purple than the commercial sunscreen's sticker.

The oyster test blocked the UV rays better than the carrot, flour, and, for the first minute, it blocked the sun better than commercial sunscreen. After eighty minutes, however, it was slightly worse than the commercial. So the oyster works as well to block UV rays as the commercial but doesn't last as long. Figures 1 and 2 are the one-minute and eighty-minute marks respectively.

Because the carrot was continually purple, enough data was collected to prove that the carrot mix did not block UV rays. The no sunscreen was also continually purple so there were enough data points to prove that there was UV rays throughout the entire experiment. Since the no sunscreen was the card with the most purple, it was ten in the color range and, for at the one-minute mark, oyster was the one. At the eighty minute mark, the commercial sunscreen was the lowest in the color range.

Figure 1

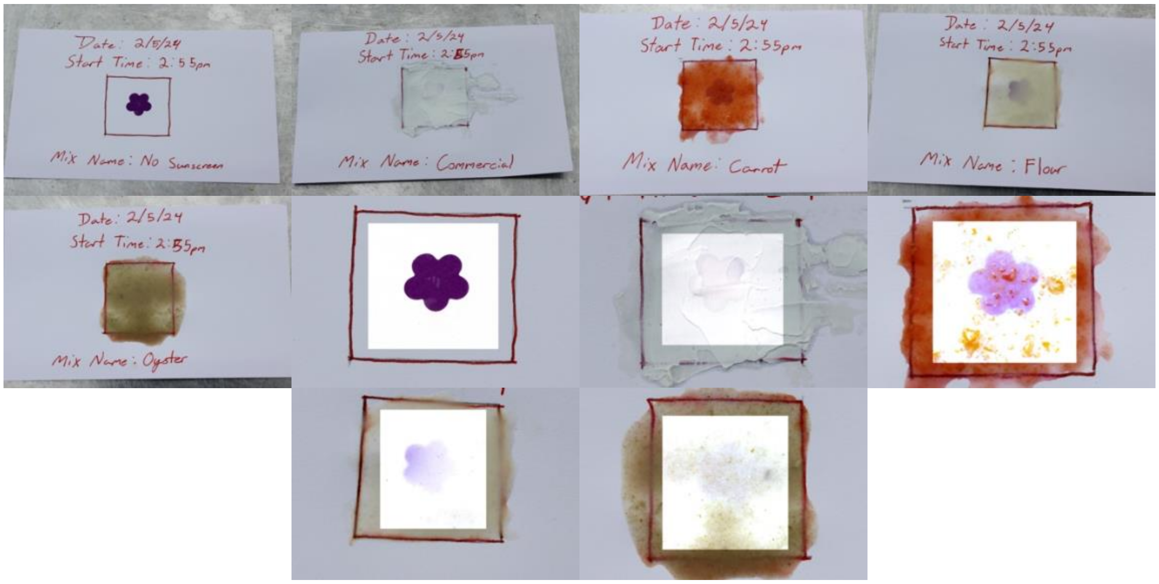


Figure 1 depicts the test after one minute of being exposed to UV rays. The date is 2/5/24 and start time is 2:55pm. Reading from left to right, top to bottom, the pictures read No Sunscreen, Commercial, Carrot, Flour, Oyster, No Sunscreen edited, Commercial edited, Carrot edited, Flour edited, and Oyster edited.

Figure 2

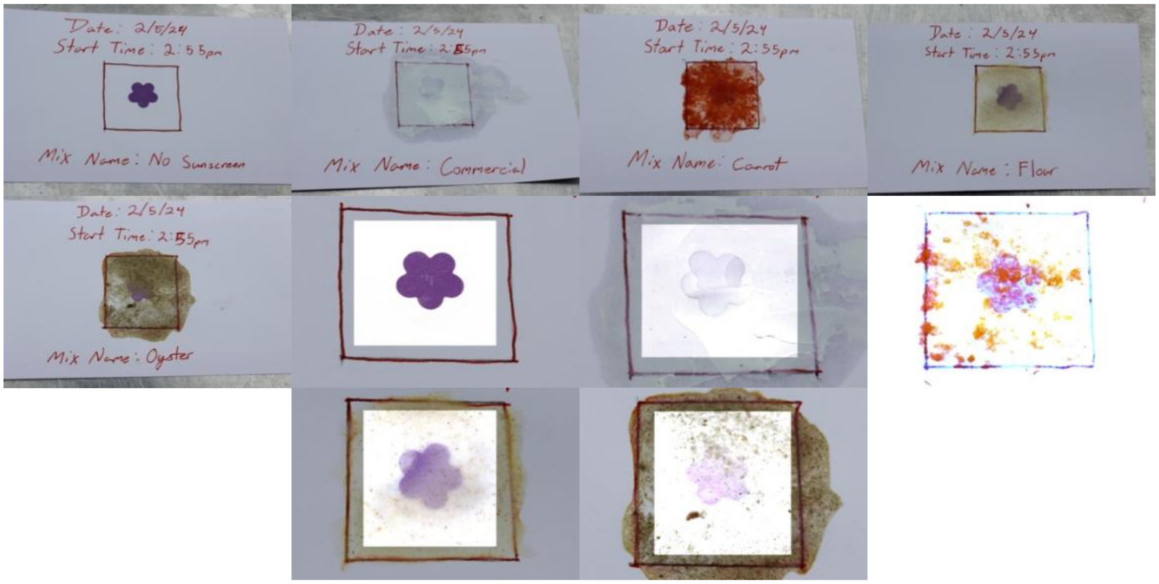
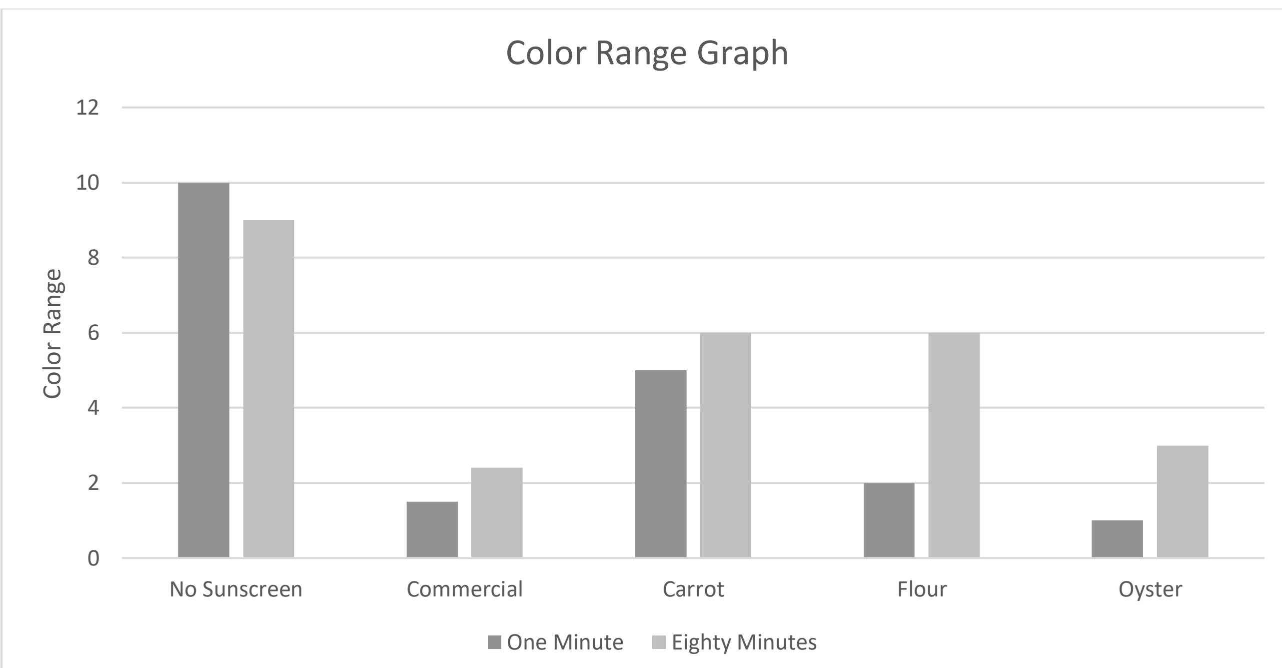


Figure 2 depicts the test after eighty minutes of being exposed to UV rays. The date is 2/5/24 and start time is 2:55pm. Reading from left to right, top to bottom, the pictures read No Sunscreen, Commercial, Carrot, Flour, Oyster, No Sunscreen edited, Commercial edited, Carrot edited, Flour edited, and Oyster edited.

Color Analysis Chart

	No Sunscreen	Commercial	Carrot	Flour	Oyster
One Minute	10	1.5	5	2	1
Eighty Minutes	9	2.4	6	6	3

This is a chart which gives the color range for the stickers based off of the edited pictures. The numbers from one to ten is a range with one being the lightest purple and ten, the darkest.



This graph shows the color range of each mix and it includes the one-minute and eighty-minute marks. Oyster blocks the most UV rays at the one-minute mark, but commercial blocks the most UV rays at the eighty-minute mark. The data is based off of the edited pictures.

Discussion

In this experiment the oyster worked better than all the other food mixes. It was found that it was more efficient in blocking ultraviolet rays than commercial sunscreen but it didn't last as long as the commercial and so at the eighty-minute mark its sticker was more purple than the commercial's.

These results supposedly happened because of the zinc content which was in the oysters but not present in the carrot and flour mixes. Zinc oxide was present in the commercial sunscreen, and zinc was in the oysters. So the possible reason for why the oyster worked so well in the experiment was because of the zinc content. People think zinc oxide works so well as a UV block because of either it's ability to reflect or absorb the sun's rays. "The inorganic metal oxide sunscreens titanium dioxide and zinc oxide have been considered to protect against sunburning ultraviolet radiation by physically reflecting/scattering the incident photons and thus protecting the skin. Earlier publications suggested, however, that the primary action of UV protection by these sunscreen agents is through absorption and not by reflection" (Cole). So this is supposedly why the test with zinc (oyster mix) worked well.

The method of doing this project could have been improved to better answer the question by doing more tests and using a device that measures UV rays by numbers. This would make the data easier to decipher and make the measurements more accurate. Also, the tap water could have been measured out better and the 3cm-by-3cm boxes could have been more precise. The measurements used were in fluid ounces, centimeters, and grams. These are all good and widely used measurements.

Some variables were controlled in the experiment to procure good results. However, there were some unexpected results. One of these was that the carrot mix was a little fizzy. Another was that the scale deleted the measurements for flour (this was fixed by simply redoing the weighing of flour). And, although flour did not work as well as some of the other mixes, it was unexpected how well it did work. The carrot mix was probably fizzy because a lot of air got trapped during the blending process and then escaped afterwards. The scale may have failed because a button got pressed accidentally or it was slightly broken and the flour may have worked so well because of its consistency.

Some of the ways to improve this project were said earlier but other ways could be better picture taking and standardizing the amount of mix spread on each card. Also it would be very important to do multiple tests instead of just one.

Conclusion

I accept my hypothesis that oysters are a good substitute for commercial sunscreen to block UV rays because of their zinc content. I accept this because of the data showed in the results and I think that the zinc content was what made oysters such good substitutes because the other foods are not rich in zinc.

Practical Application

Sunscreens are used all the time; in fact they are used every summer and sometimes in winter as well. So it would be very useful to have a type that could easily be concocted at home. This is what these discoveries could potentially do. Even in personal homes a simple mixture can be made to block out a huge fire ball. As said in an article; "**Who needs sunscreen?** Everyone." (*Sunscreen*).

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