Development of Food Bars

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INTRODUCTION

In the current world, there is a problem with the increasing numbers of displaced people. Some people are displaced by natural disasters that have occurred in recent months, such as the fires in Northern California, while others are from conflict, such as the Syrian refugees. The United Nations Refugee Agency estimates that there are around 65.6 million people displaced worldwide, with 28,300 more per day having to flee their homes. Due to the influx of the displaced, many camps face food shortages (UN News Centre, 2017). One way to help address the problem is to create a food bar that is commercially cheap, easy to ship, nutritious, and durable under extreme conditions. Although all of these factors contribute to a good food bar, I will be focusing on nutrition, calorie count, and flavor.

RESEARCH METHODOLOGIES

I mixed all of the dry ingredients together, then added the eggs, milk, and Better Than Bouillon. I then baked the bars in glass trays for 35 minutes at 375℉. In order to find the optimal balance of ingredients, I changed the amounts of specific ingredients in order to compensate for a shortfall of another one. After all of the bars were made and accounted for, a sample of each bar was burned in order to determine the amount of calories. The inquiry approach of the research question was quasi-experimental, as it needed both quantitative data and qualitative data. The research methodology used was observation, as different measuring instruments and bar look were observed to gather data. The measuring equipment used was a scale, a calorimeter, measuring cups and measuring spoons. The resource used to calculate the expected calories was the USDA database.

For each of the four bars, I tried a different ratio of potato, flour, rice, and beans. These ingredients were the basis for everything else, as they are the most filling and take the most space. The milk and eggs were to provide calcium and protein respectively, and to make sure the bar was not too dense or dry.
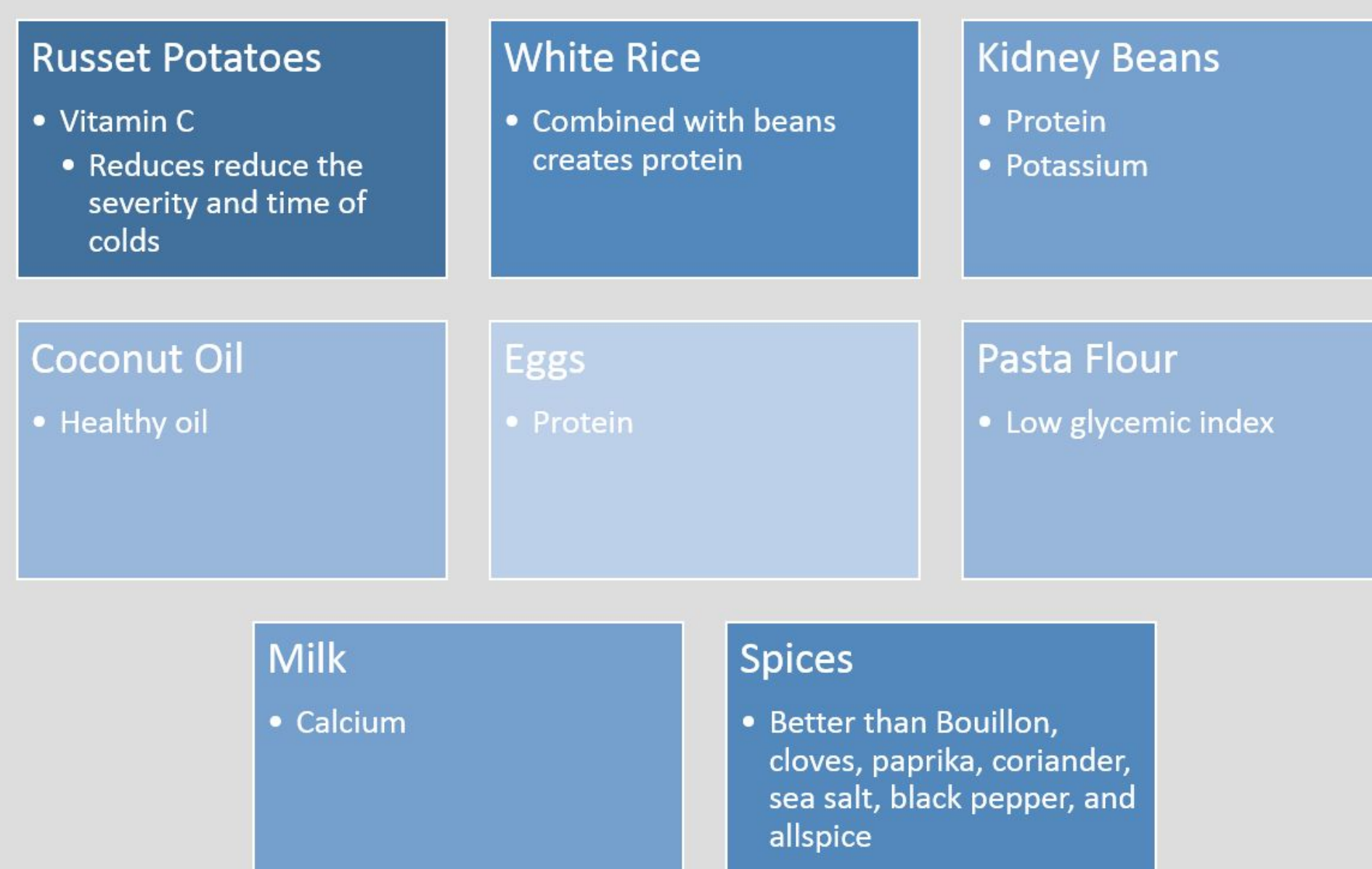
DATA AND FINDINGS

Most of the bars had dough similar to that of chocolate chip cookie dough. Most had some taste of Christmas wreaths, but that was easily remedied by not adding allspice and cloves. All the bars were dense, with some being slightly chunky, and all had a crumbly texture. All the bars were bigger than expected. The ingredients were relatively cheap and easy to find. All food bars did not meet their expected calorie count. The first bar had too much liquid, kind of like thick cake batter. The first bar was bland, as there was very little spice compared to the others. It was estimated to have around 1142 calories, but the amount of calories found was around one-fifth of the estimated calories. The second bar was a reduced version of the first bar, as the previous was too big, but also had more spices and a smaller potato to flour ratio. The estimated amount of calories was 642, but it was found to have about 172 calories. The third bar had more beans than the previous two, as well as more spices. The amount of allspice and cloves were cut down to keep it from tasting like Christmas decorations. It was estimated to have 777 calories, but it ended up with 234. The last one was the driest out of all the bars. It was spicy, and it was estimated to have 695 calories. However, the experiment showed only 72 calories.

Materials:

Ingredients: Russet Potatoes, Sea Salt, Pepper, Coriander, Cloves, Paprika, Allspice, Better than Bouillon, Brown Eggs, 3.25% Milk, Durum Flour, Coconut Oil, Rice and Red Kidney Beans

Measuring: Calorimeter, Bowls, Cooking Board, Oven, Measuring Spoons, Cups

Ingredients

Russet Potatoes
- Vitamin C
- Reduces reduce the severity and time of colds

White Rice
- Combined with beans creates protein

Kidney Beans
- Protein
- Potassium

Coconut Oil
- Healthy oil

Eggs
- Protein

Pasta Flour
- Low glycemic index

Milk
- Calcium

Spices
- Better than Bouillon, cloves, paprika, coriander, sea salt, black pepper, and allspice

Instructions:

1. Preheat oven to 375℉
2. Wash potatoes and scrub the outside with a toothbrush.
3. Boil potatoes in water for 15 minutes.
4. Wash Kidney beans in water and place in high pressure cooker with bean setting for 40 minutes.
5. Steam rice in the high pressure cooker for 30 minutes.
6. Mash potatoes, beans and white rice with a whisk.
7. Add beaten egg and Better than Bouillon to the potatoes.
8. Add all dry ingredients together and mix thoroughly.
9. Shape into glass plate and bake for 35 minutes.

How to Use a Calorimeter

1. Measure out around 2 grams of a bar.
2. Record temperature of 100 ml of water in the flask.
3. Place the bar under the flask, and light it. Occasionally stir the water.
4. Record the highest temperature of water and the mass the bar after burning.
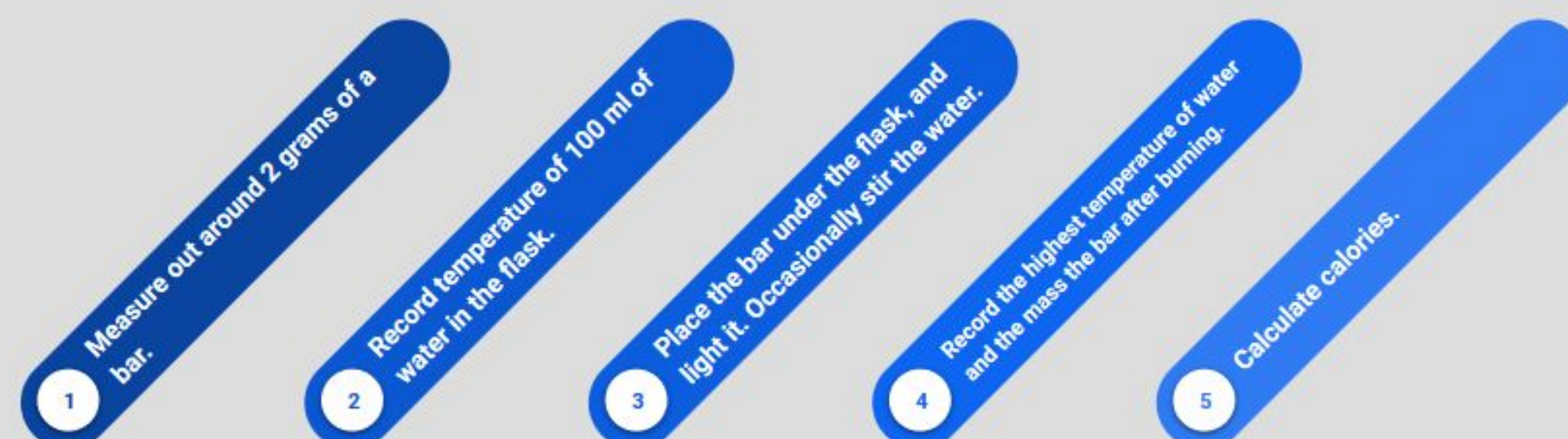5. Calculate calories.

FIGURE 1
Prepared Bars

FIGURE 2
Calorimeter Setup

FIGURE 3
Calorimeter in use

FIGURE 4
Bars after burning

DISCUSSION, ANALYSIS, AND EVALUATION

I accomplished making and testing the bars. The bars were edible and filling, although the taste could be improved. I was able to find the amount of calories in the samples by burning the bars, and I used this to calculate the number of calories in the bar as a whole.

Since none of the food bars met the predicted (nor desired) calorie count, there is much work to be done. There were flaws in some of the areas of experimentation. Firstly, my focus for the bars was not on the most important area. Instead of achieving the highest calorie count, I initially focused on the amount of nutrition each bar. The ingredients were chosen based on the types of nutrients each would contribute, not the amount of calories. Another aspect I focused on at first was the taste of bars. I spent some time trying to find the optimal blend of spices while neglecting the calorie count. Another way the experiment was flawed was in the use of the calorimeter. I measured the amount of calories by burning the samples and placing them in a flask filled with 100 mL of water. Once the sample was completely burnt, I measured the temperature and mass. However, burning food samples is not the most accurate way to measure calories, as there are too many environmental factors that can affect the burning.

CONCLUSIONS, IMPLICATIONS, AND NEXT STEPS

The bars met the correct amount of nutrition, as all the ingredients were considered healthy and had a large amount of nutrition. However, both the estimated amount and actual amount of calories were below the target amount, and the food bars were not particularly desirable in taste.

1. Experiment with more spices.
   - More spices means a more complex flavor, as well as a better tasting one that would leave a consumer satisfied.
2. Experiment with more nutrient materials.
   - There are other ways to add nutrients to the bar that would take less space.
3. Work on how to preserve the bar for longer time.
4. Work on improving the calorie count.

ACKNOWLEDGEMENTS / REFERENCES

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