Is there protein in those grains?

Introduction: Starch and Protein in Foodgrains

Question 1

Do you know any test for checking whether a food contains proteins? Please describe it here.

....

....

....

....

Question 2

Of the foodgrains listed below, circle those which are rich in protein.

Rice   Wheat   Toor dal   Chana dal   Black chana

Question 3

In the question above, how did you decide whether to classify a foodgrain as protein-rich or starch-rich?

....

....

Question 4

If you were given an unknown foodgrain, how would you decide whether it is rich in protein?

....

....

....

....

In this activity, we are given a <u>mystery grain</u>. We will try to decide whether it is rich in protein. However, we cannot use the tests for protein which you have learnt in your science textbooks.

Let us try to find out whether there is any other way of deciding whether a food grain is rich in protein!

In this activity, we will try to use two processes that are commonly used while cooking.

We will test the foods by heating them in water.

We will test the foods by shaking the water in which they are boiled.

We shall learn whether these methods can give us accurate predictions or not.

Task 1: Heating

Question 0

When cooking food, we frequently boil it in water. Have you ever seen any of the above foodgrains being boiled? What happens to them upon boiling?

....

....

....

....

> If we were to boil an unknown grain in water, do you think we could predict whether it was rich in protein? Let's find out.

1. Divide into groups. Each group is allotted a foodgrain for testing.
2. To prepare foodgrains for boiling, they will first be soaked overnight.
   a) Measure out 30 g of the grain in a beaker.
   b) Pour in some water and rinse out the grains 3 times. Drain out any spare water.
   c) Measure out 100 ml of water and add it to the grain.
   d) Soak these grains in the water overnight.
3. At the end of this period, strain out all the water from the grains into a separate beaker. Using a measuring cylinder, measure out 50 ml of this solution, and add it back to the grains.
4. Now add an additional 50 ml of fresh water to the grains.
5. Heat this beaker on a hotplate or using a burner, until the temperature reaches 75 °C. At this stage, remove the beaker and place it into a water bath, as mentioned in step 5.

6. Observe the beaker during the heating process and record any changes in table 4 below.
7. Prepare a water bath by filling a large tub with water. Place your beaker inside this bath for 10-15 minutes to cool it. NOTE: Be careful to not burn your hands while handling the beaker as it will be quite hot.
8. After cooling for 10-15 minutes, strain the water from the beaker into a measuring cylinder.
9. Be careful to not throw away the water you have strained into the measuring cylinder, as you will use it in task 3.

Food Grain	Changes Observed
Rice	
Wheat	
Toor Dal	
Black Chana	
Chana Dal	
Mystery Grain	

Question 1

Do you see any changes in the foodgrains during boiling that could be used to identify protein-rich foods? Please describe your observations here.

....

....

....

....

Question 2

Based on your answer to Question 1 above, can you predict whether the mystery grain is rich in protein?

....

....

....

....

Task 2: Shaking

Question 0

Sometimes, food is whipped or shaken during the process of cooking it. Have you ever seen this happen? What happens to foods when they are whipped or shaken?

....

....

....

....

Usually, we can only shake and whip liquids. For solid foods, if we shake water in which the food has been cooked, it can help us to see effects of shaking upon that food.

In this task, let us see if shaking and whipping can help us identify protein-rich foods.

1. Use the liquid strained out at the end of task 2 for this.
2. Measure out ___ ml of each extract. Pour this into a transparent plastic bottle and cap the bottle securely.
3. Shake the bottle containing the extract for 15 seconds.
4. Wait for another 60 seconds for any foam formed to stabilise.
5. Measure the height from the base to the top of the liquid (L) and the height from the base to the top of the foam (F) again. Record this data in table 6 below.
6. Repeat steps 4, 5, and 6 once more. Thus, you should have shaken the bottle and recorded observations twice.

7. Use table 6 to calculate the thickness of the foam formed (T) as the difference in height between foam and liquid.

Sample	Total Height, T1 (cm)	Shake 1 Liquid Height, L1 (cm)	Foam Height, F1 (cm)	Total Height, T2 (cm)	Shake 2 Liquid Height, L2 (cm)	Foam Height, F2 (cm)
Rice						
Wheat						
Toor Dal						
Black Chana						
Chana Dal						
Mystery Grain						

Look at the table above and answer the questions below.

Question 1

Which foodgrain gives the most foam upon shaking?

....

....

Question 2

Which foodgrain gives the least foam upon shaking?

....

....

Question 3

In task 1, we tried to find a pattern that allowed us to predict whether foodgrains were rich in protein or starch.

In the table above, can you see any pattern that lets you predict whether the mystery grain is rich in protein? Please describe the pattern here, and organise the foodgrains in ascending order of protein content.

....

....

....

....

Question 4

Does your prediction from Task 1 match that from Task 2?

....

Question 5

From the point of view of making predictions about proteins, are there any benefits to carrying out task 2?

....

....

....

....

Question 6

How can we confirm the predictions that were made about the mystery grain?

....

....

....

....

Question 7

Can we use foaming as a test for protein content in any other foodgrains? Why do you think so?

....

....

....

....