



Feeding a growing world: Planning potato investigations

Student activity sheet

Introduction

You have carried out an investigation into the reducing-sugar content of two varieties of potato. In the following activities you can use what you have learned to investigate similar questions of importance for food safety.

Imagine that you are a supervisor at a processed food plant that manufactures frozen chips. You are aware of the risks of acrylamide and the need to make your food products as safe as possible for public consumption. You and your team need to consider the effect of storage temperature, length of storage and type of potatoes used.

Activities

How does storage temperature affect the reducing-sugar content of potatoes?

Hypothesis: Potatoes stored at temperatures below 4°C will contain more reducing sugars and less starch, as storage at low temperatures causes starch to be converted to reducing sugars.

Design and plan an investigation to test this hypothesis.

- Explain the rationale behind your proposed investigation.
- Make a list of equipment you would need.
- Clearly state the independent variable and the dependent variable.
- List the control variables, and explain why and how they would need to be controlled.
- Write down the steps for the procedure/protocol.
- Describe how you would record, analyse and present the data.

Ask your teacher to check your plan. If you want and time allows, carry out your planned investigation. Share your findings with others in your class.

Safety

Carry out a risk assessment for your protocol. What hazards do you predict, and how will you control them?

Questions

1. Do you think chips cooked at home from frozen chipped raw potato would contain more or less acrylamide than chips made from fresh raw potatoes? Explain your answer.
2. Do you think it is advisable to store potatoes in a fridge? Explain your answer.

How does storage time affect the reducing-sugar content of potatoes?

Potato tubers are swollen parts of stems. They have leaves and axillary buds (between the leaf and petiole/leaf stem). These are called 'eyes' (see **Figure 1**).

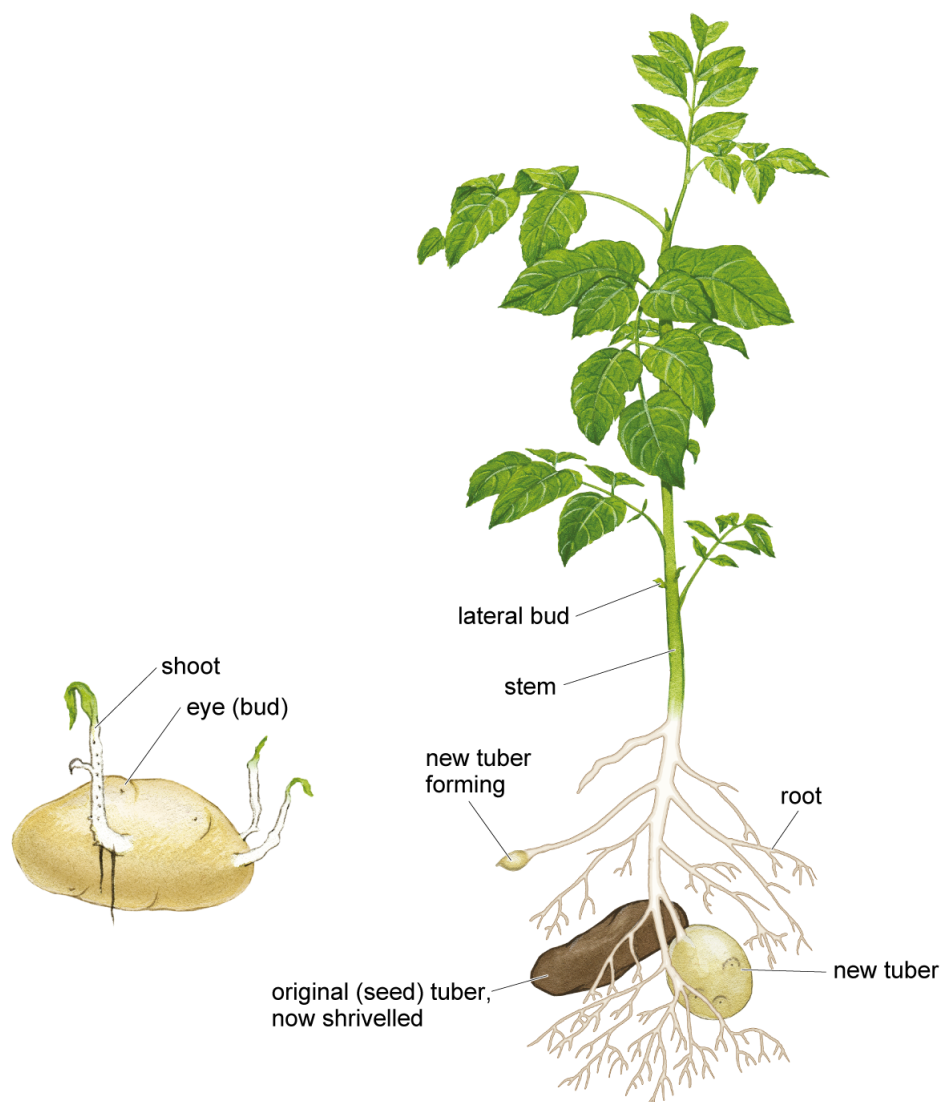


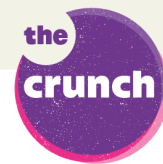
Figure 1 A sprouting potato tuber can grow into a potato plant that develops new tubers.

Each eye in a potato tuber can produce a new shoot in the following year. (Bear in mind that in the wild, potato tubers would remain in the soil and sprout the following year, producing new plants; this is an example of propagation and it is also vegetative and asexual reproduction.) Stored food in the sprouting tuber is used to produce the new shoots. Once the shoots are above ground and leaves have formed, the plants will make food by photosynthesis. Reducing sugars in the tuber and stored starch digested to reducing sugars are the respiratory substrates for the potato tuber, providing the energy, via ATP, for the new growth.

If potatoes are stored for too long they begin to 'sprout'. The sprouting tubers become flaccid (soft) as their stored food is used to provide energy for the new growth. Stored starch will be hydrolysed to reducing sugars.

Design and plan an investigation to investigate the effect of storage on the reducing-sugar content of potatoes.

- State a testable hypothesis.
- Explain the rationale behind your proposed investigation.



- Make a list of equipment you would need.
- Clearly state the independent variable and the dependent variable.
- List the control variables, and explain why and how they would need to be controlled.
- Write down the steps for the procedure/protocol.
- Describe how you would record, analyse and present the data

Safety

Carry out a risk assessment for your protocol. What hazards do you predict, and how will you control them?

Ask your teacher to check your plan. If you want and time allows, carry out your planned investigation. Share your findings with others in your class.

Questions continued

3. Why is it recommended that potatoes that have begun to sprout are not used for making chips?

Do new potatoes contain more sugar than main-crop potatoes?

Some varieties of potato are harvested in spring while the tubers are small – these are new potatoes. Main-crop potatoes are harvested later in the year when the tubers are large. While the potato tubers are still enlarging, they are receiving sugars from the plant leaves. Much of these sugars will be converted to starch as the tubers enlarge.

State a testable hypothesis in answer to the question above, and design and plan a suitable investigation to test your hypothesis.

- State the null hypothesis to be used when applying a statistics test.
- Explain the rationale behind your proposed investigation.
- Make a list of equipment you would need.
- Clearly state the independent variable and the dependent variable.
- List the control variables and explain why and how they would need to be controlled.
- Write down the steps for the procedure/protocol.
- Describe how you would record, analyse and present the data.

Safety

Carry out a risk assessment for your protocol. What hazards do you predict, and how will you control them?

Questions continued

4. Explain whether or not you think it is advisable to make chips from new potatoes.
5. Explain why, if new potatoes have a higher sugar content, it is safe to boil them.