

THE EFFECT OF CONCENTRATION OF BLACKCURRANT SQUASH ON OSMOSIS IN CHIPPED POTATOES

Research Question

What is the effect of concentration of blackcurrant squash on osmosis in chipped potatoes? A plant cell membrane is partially permeable which allows water to move across called osmosis. Six different concentrations of blackcurrant squash (0%, 20%, 40%, 60%, 80% and 100%) will be used to see the effect on osmosis in chipped potatoes. The effect on osmosis will be investigated through the change in mass of the chipped potatoes as an indication of the net movement of water. It is expected that increasing the blackcurrant squash concentration will decrease the change in mass of the chipped potatoes which will represent osmosis in chipped potatoes has increased.

Hypothesis

Osmosis is net movement of water from low solute concentration to high solute concentration. In other words, it is movement of water from high to low area of concentration. If the blackcurrant concentration is increased, then the mass of the chipped potatoes will decrease. This is because there is a higher concentration of water in the chipped potatoes. In other words, the water moves outside the potato chip through the permeable membrane since there is a higher solute concentration outside the potato chips.

Variables

Independent	Dependent	Control
Blackcurrant Squash Concentration (%)	Change in mass of chipped potatoes (g)	Total amount of solution Size of chipped potatoes Type of blackcurrant Squash Distilled water

Control of Variables

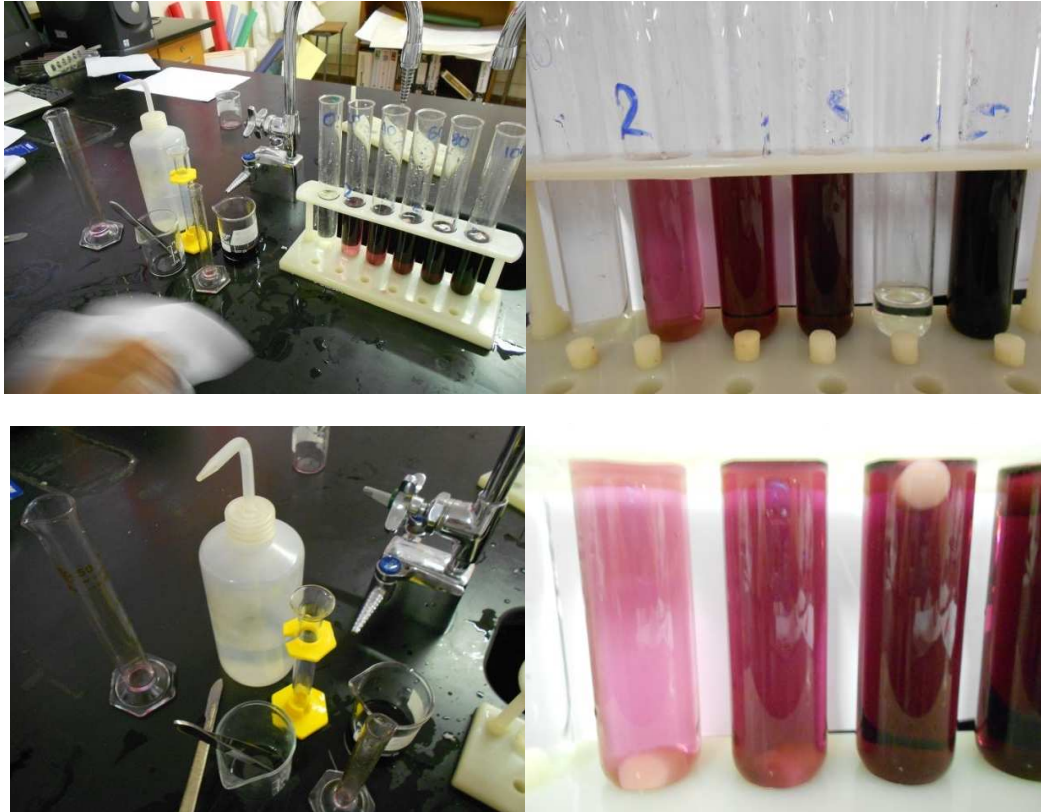
We controlled the variables by keeping the same amount of solution using a measuring cylinder, same size of chipped potatoes using the ruler and same size of borer, the same type of blackcurrant squash and distilled water throughout the experiment for consistency and accuracy of data.

Apparatus

Materials

- 6 test tubes
- 1 test tube stand
- 1 cylinder (50 \pm 1 ml)
- 1 cylinder (10 ml \pm 0.2 ml)
- Distilled water
- Borer
- Cutting knife
- Black currant Squash
- Tweezers
- Paper towel
- 1 potato
- Electronic balance (\pm 0.01 g)

Protocol Setup



Procedure

- 1) Label test tubes with the concentrations of blackcurrant squash.
- 2) Measure out the blackcurrant squash using the measuring cylinder for the dilutions to create a 30.00 cm^3 solution using the table below.

Concentration of blackcurrant squash solution (%)	Volume of blackcurrant squash (cm^3)	Volume of water (cm^3)
0	0.00	30.00
20	6.00	24.00
40	12.00	18.00
60	18.00	12.00
80	24.00	6.00
100	30.00	0.00

- 3) Collect a potato to cut up and make the chipped potatoes using the borer and cut the chipped potatoes into about 1.00 cm long each.
- 4) Dry the chips on a paper towel
- 5) Weigh the chips using the electronic balance and record the masses.
- 6) Place the chips in the test tubes and leave for at least 15 minutes.
- 7) Collect the chips using the tweezers from the test tubes.
- 8) Dry the chips on paper towel.

- 9) Reweigh the chips using the electronic balance and record the results.
- 10) Calculate the change in mass and the percentage change in mass of each set of potatoes.
- 11) Repeat the experiment for 3-5 times.

Data

Raw Data

Initial and Final Mass of Chipped Potatoes in Different Concentrations of Blackcurrant Squash

Concentration of Black Current Squash (%)	Initial Mass of Potato (± 0.01 g)		Final Mass of Potato (± 0.01 g)	
	Trial 1	Trial 2	Trial 1	Trial 2
0	0.68	0.77	0.68	0.77
20	0.71	0.65	0.68	0.64
40	0.69	0.67	0.65	0.63
60	0.71	0.76	0.66	0.72
80	0.67	0.70	0.59	0.66
100	0.68	0.80	0.61	0.76

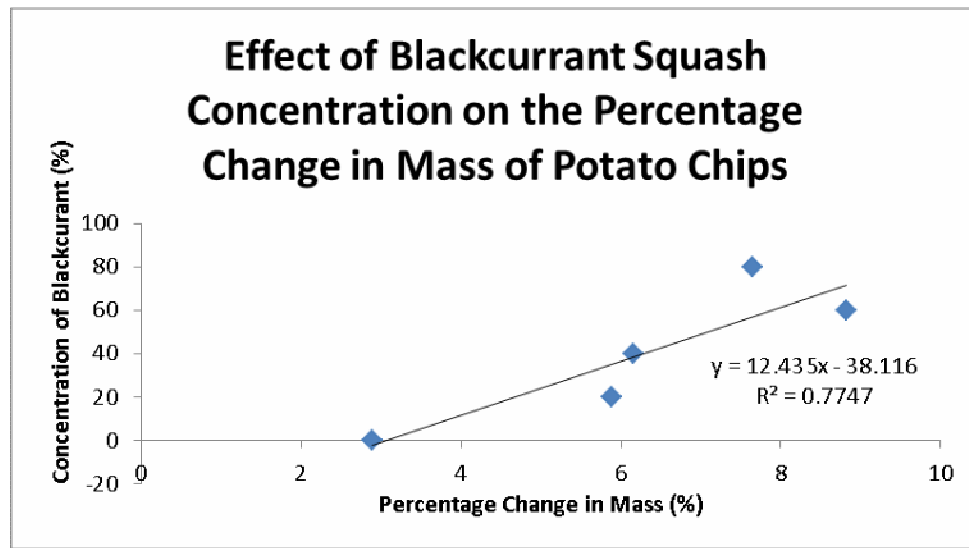
Processing Data

Change in Mass and the Percentage Change in Mass of Chipped Potatoes in Different Concentrations of Blackcurrant Squash

Concentration of Black Current Squash (%)	Change in Mass (± 0.01 g)		Percentage Change in Mass (%)	
	Trial 1	Trial 2	Trial 1	Trial 2
0	- 0.00	- 0.00	0.00	0.00
20	- 0.03	- 0.01	4.23	1.54
40	- 0.04	- 0.04	5.80	5.97
60	- 0.05	- 0.04	7.04	5.26
80	- 0.08	- 0.04	11.94	5.71
100	- 0.07	- 0.04	10.29	5.00

Average Change in Mass and the Percentage Change in Mass of Chipped Potatoes in Different Concentrations of Blackcurrant Squash

Concentration of Black Current Squash (%)	Change in Mass (± 0.01 g)	Percentage Change in Mass (%)
0	- 0.00	0.00
20	- 0.20	2.89
40	- 0.40	5.89
60	- 0.45	6.15
80	- 0.60	8.83
100	- 0.35	7.65



Conclusion

From this experiment, increasing the blackcurrant concentration decreases the mass of the chipped potatoes. This is shown with the decrease in the change in mass of the chipped potatoes in different concentration of the blackcurrant squash successively. We could also observe this by looking at the graph. As concentration of the blackcurrant increases, the percentage change in mass also increases. This is because the water has moved out in all the blackcurrant solutions which are from high concentration (inside the potato chips) to low concentration (the blackcurrant solution in the beaker). In conclusion, as the concentration of blackcurrant increases, the mass of potato chips decreases. Our results support our hypothesis.

Compare data with professionals

Evaluation

From our experiment, we noticed that one of the chipped potatoes fell apart in this increase the surface area of the chipped potatoes. Therefore, in one of the trials become an unfair experiment since the size of the chipped potatoes is inconsistent and not controlled. Another error made was using a different measuring cylinder. Instead of using the same using measuring cylinder, we used two different scale of measuring cylinders with different uncertainties. Therefore, systematic errors are increased. The data may be inaccurate due to human error. The degree of concentration and organization whilst conducting the experiment may result in chips getting mixed up before and after weighing.

For improvement, we could do one potato chips at a time to increase accuracy and reliability of data and to avoid mixing up the potato chips. By doing the experiment one at a time, we could also measure the time of the potato chips in the solution. In addition, we could do more repetitions to compare our data and take average value; therefore there are less random and systematic errors. Another improvement is to use the same scale of measuring cylinder at all times during the experiment. This would reduce the systematic errors. In addition, we could increase the size of the chipped potatoes because in this experiment, the ratio between the size of the chipped potatoes and

the amount of the solution is too big in difference. By increasing the size of the chipped potatoes, the difference of the ratio would be decreased and the experiment would be more accurate.