

Enzymatic Juice Extraction

Research question: Does the addition of pectinase, to chopped up apple result in a greater yield of apple juice, than if only water is added?

Hypothesis: I believe that the addition of the pectinase enzyme will lead to a greater yield of apple juice than if only water is added. This will be because enzymes speed up reactions. The pectinase will degrade the soluble pectin in the pulp which will in turn make the juices flow more freely resulting in a greater yield of apple juice in a set time period. Water does not act so fast on the pectin and so a small yield will be expected in the same time period.

<u>Variables:</u>	Time	Controlled
	Amount of apple	Controlled
	Addition of water/pectinase	Independent
	Temperature	Controlled

Apparatus:

- Apple
- Pectinase
- Coffee filter papers
- Knife
- Glass stirring rods
- 1cm³ syringes
- Filter funnels
- 100cm³ measuring cylinders
- Beakers
- Water bath
- Stopwatch
- 50ml beaker

Method: The apple was crushed into small pieces and these were divided between two 50ml beakers, 2 cm³ of diluted pectinase enzyme was added to one of the beakers, and 2 cm³ of water to the other. The beakers were stirred with a clear glass rod and then incubated in a water bath at 40°C for 15 -20 minutes. The juice from the apple pieces were then filtered using coffee filter papers in funnels placed in measuring cylinders. The volume of juice obtained was recorded from both lots of apple pulp at 5 minute intervals.

Results:

Time Taken (mins)	Amount yielded	
	Water/Pectinase (ml)	
4.5	0	10
5.3	0	11

Conclusion: From the results it is possible to see what a difference the pectinase enzyme makes. In 5.3 mins the beaker that had had pectinase added produced 11ml of juice whereas the beaker with only water produced none. This experiment therefore shows that the enzyme pectinase does speed up the breaking down of soluble pectin allowing the juices to flow more freely, which in turn results in a greater yield of apple juice.

Evaluation: This experiment had various weaknesses, first of all, the chopped up apple was not of equal sizes and so the total surface area will have been different in each beaker, also the apple was not measured out exactly into each beaker, yet again leading to differences in surface area as well as volume. This could have caused results to favour one beaker compared to the other, as a larger surface area would result in a faster reaction, and a larger volume would have resulted in more juice being available. Another problem was that the measuring cylinders used started at 10ml, with no grading before that. This meant that an adequate amount of results could not be obtained due to time pressure. However, these problems do not completely invalidate the results. Because although there will have been differences in volume and surface area they will have been very small, and therefore could not

Tim Dowdeswell
Mr Shawcross

Biology

have explained why the beaker with apple and water in it did not produce any juice in 5.3 mins and the one with pectinase in it produced 11ml.

Therefore ways to have improved the accuracy of this experiment would have been to cut up the apple into measured cubes and then place exactly the same amount of cubes into each beaker. This would give the same surface area and volume in each beaker. Using a measuring cylinder with smaller grading would have also given more results and so a greater accuracy.