










EXPERIMENT 1. Looking At The Browning and Shelf Life Of Apples & Potatoes- Millie-Jayne Hynard

<b>AFTER 2 HOURS</b>			
Experiment Name:	Texture/Feel	Colour	Additional Comments
1.Salt Solution Potato	- Soft, mushy -Wrinkly around the edges -Spongey	-Dark dirty brown around the edges, an uneven colour distributed around the potato	 2 hours Salt solution potato
2.Salt Solution Apple	-Moist -Holds Shape -Fresh looking and feel	-Yellow, off white creamy looking flesh -Looks the same as colour as when experiment started	 2 hours Salt solution apple  - Fresh apple smell
3.Lemon Solution Potato	-Dry, no moisture -Starchy powdered texture on the flesh of the potato -Same shape held	-Same Colour as when experiment started, speckled white in some areas due to starch powder	 2 hours lemon Juice potato
4.Lemon Solution Apple	-Slightly dry texture on the apple flesh -Holds its shape	-Slightly brown, dark yellow in some areas	 2 hours lemon Juice apple  -Overall sweet smell- hints going off




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5.Normal Potato	-Bendy -Normal moisture -Starchy smell	-Slightly light brown in some places, not a lot though	
6.Normal Apple	-Still moist -Skin has shrivel a tiny amount	-Orangey Brown colour, faint patterns of lines through the applies flesh/tissue fibrous patterns	




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<b>AFTER 24 HOURS</b>			
Experiment Name:	Texture/Feel	Colour	Additional Comments
1.Salt Solution Potato	<ul style="list-style-type: none"> <li>-Very Soggy and floppy, does not hold its shape at all</li> <li>-Skin is very wrinkly</li> <li>-Rubbery</li> <li>-Mouldy texture and look</li> </ul>	-Dark brown and hints of black, blotched all over the skin	
2.Salt Solution Apple	<ul style="list-style-type: none"> <li>-Moist</li> <li>-Holds its shape, little bit bendy</li> <li>-Still has its sweet apple aroma</li> <li>-Tiny bit rubbery</li> </ul>	-Very slight discolouration of yellow, overall still looks the same, at the start of the experiment	
3.Lemon Solution Potato	<ul style="list-style-type: none"> <li>-Starchy Feel- Powdery texture to the flesh of the potato</li> <li>-Dry texture</li> <li>-Potato Is very dense</li> </ul>	-Same colour as started, however there are like white spots, crystallises forming on the potato flesh	




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<p>4.Lemon Solution Apple</p>	<ul style="list-style-type: none"> <li>-Apple is very dehydrated, and dry, holds no moisture to the apple</li> <li>-Holds its shape</li> <li>-Faint smell of apple</li> <li>-Cracked areas of the apples flesh</li> </ul>	<p>-Yellowy , brown discolouration forming on the skin of the apple</p>	
<p>5.Normal Potato</p>	<ul style="list-style-type: none"> <li>-Wrinkled skin</li> <li>- Potato has become shrivelled decreased in size</li> <li>-No moisture to the potato</li> <li>-Flexible</li> <li>-Starchy feel of the overall potato</li> </ul>	<p>-Around the edges, silvery grey, shiny colouring has formed, which fades into uneven white and brown discolouration over the potatoes flesh</p>	
<p>6.Normal Apple</p>	<ul style="list-style-type: none"> <li>-Shrivelled and decreased in size</li> <li>-Apples skin is coming away from the apples flesh</li> <li>-Apples skin is all chapped, and frilly and wrinkled</li> <li>-Still holds a fraction of moisture, bit a little dry</li> </ul>	<p>-Yellowy overall colour, with brown discoloration, there are faint pattern lines on the apples flesh, with darker brown pigmentation</p>	

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<b>AFTER 48 HOURS</b>			
Experiment Name:	Texture/Feel	Colour	Additional Comments
1.Salt Solution Potato	<ul style="list-style-type: none"> <li>-Sticky</li> <li>-Gooeey</li> <li>-Mega bendy and flexible</li> <li>-Wrinkly</li> <li>-Does not hold its shape at all</li> </ul>	<ul style="list-style-type: none"> <li>-Dark black on the outer flesh of the potatoe, fades into a dark dirty brown</li> <li>-Barely any normal potato flesh showing</li> <li>-White salty/starchy powder blobs on the flesh of the potato</li> </ul>	 <p>48 hours salt solution potato</p> <p>-Mouldy, rotten off smell</p>
2.Salt Solution Apple	<ul style="list-style-type: none"> <li>-Very flexible</li> <li>-Tight</li> <li>-Still withholds moisture to the apple</li> <li>-Still holds its shape</li> <li>-Bit rubbery</li> <li>-Peel is slightly coming away from the flesh of the apple</li> </ul>	<ul style="list-style-type: none"> <li>-Light Yellow, with slight uneven discoloration of dark yellow, brown</li> </ul>	 <p>48 hours salt solution apple</p> <p>-Still has fresh apple smell</p>
3.Lemon Solution Potato	<ul style="list-style-type: none"> <li>-Very Dry – dehydrated</li> <li>-Holds it shape well</li> <li>-Starchy texture- dusty</li> <li>-Bendy</li> </ul>	<ul style="list-style-type: none"> <li>-Yellow pigment in the inner flesh of the potato, however the outer flesh near the skin is brown uneven discoloration</li> <li>- All over potatoes flesh there is silvery/white powder</li> </ul>	 <p>48 hours lemon juice potato</p> <p>-Neutral Smell</p>

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<p>4.Lemon Solution Apple</p>	<ul style="list-style-type: none"> <li>-Waxy Texture of the apples flesh</li> <li>-Holds a good shape</li> <li>-Slightly bendy/ flexible</li> <li>-Dry</li> </ul>	<p>-Yellowy pigmentation on the flesh, has many uneven discolorations of brown as well in many areas of the apple</p>	 <p>-Hinted smell of apple</p>
<p>5.Normal Potato</p>	<ul style="list-style-type: none"> <li>-Very dry and dehydrated</li> <li>-Dry texture</li> <li>-Skin is upper wrinkly</li> <li>-Starchy, and rubbery</li> <li>-No moisture at all!</li> </ul>	<p>-Grey, dark brown pigmentation around the edges of the potato</p> <p>-Uneven yellowy and brown pigmentation on the flesh of the potato</p>	 <p>-Neutral smell</p>
<p>6.Normal Apple</p>	<ul style="list-style-type: none"> <li>-Slimy, slippery</li> <li>-But also dry, not a lot of moisture</li> <li>-Skin is wrinkly and coming away from the flesh of the apple a lot</li> <li>-Decreased in size, shrivelled</li> </ul>	<p>-Dark yellow pigmentation, brownly uneven lines within the flesh of the apple</p>	 <p>-Neutral Smell</p>

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### CONCLUSION + NOTES

Most vegetables and fruits contains the compounds called polyphenols, which are the antioxidants, are beneficial for treatment of digestion and many more health benefits. Enzymes break down the polyphenols in the fruit and vegetables which then can result in them turning brown, when they are cut and the exposed to oxygen – the air. Which applies also to potatoes and apples, which is the copper- containing the enzyme polyphenol oxidase.

With my experiment I had used a salt solution and lemon solution on the potatoes and apples as well a normal control set. The salt and the lemon juice should stop the enzymes then from working correctly, salt is a non- competitive inhibitor, which reacts with the active site and then displaces the copper ion from the enzyme which is polyphenol oxidase. The lemon juice is the chelating agent which means the copper ion of the polyphenol oxidase to form a more stable compound. Lemon juice has pH level around 2 which is also the same as stomach acids, which has an inhibitory effect.

Overall there were many physical changes that had occurred on the apple and the potato, in order me investigating the shelf life of the food products. The salt solution through the results shown a lot of physical changes of the product. Soaking potatoes in water, releases their moisture before cooking, so they can crisp up nicely as chips, however In which the shelf life can be decreased due to then resulting of it drying out. When the potatoes is been put in salt solution, can bring the scientific investigation. If the salt concentration of the water is higher than the potato then there will then be net movement from the potato and the salt water. Which causes the potato cells to plasmolysis which means the call plasma membrane shrinks away from the cell wall, which than causes the potato to shrink, which In this case it did. Also the water will move from an area of less salt to more salt, and so when the potato is placed in the salt water, all the water inside the potato moves through osmosis.

The 2<sup>nd</sup> experiment- apple in salt solution, was not as bad as I predicted, however the skin did start turning brown or yellow, which this could be an option for improving shelf life of the apple. Oxidation occurs as it is the main cause of browning of the apple, dipping it into salt solution then interferes with the oxygen reaching the apples surface which then actually over time will turn it brown. But salt also is an electrolyte, which allows the apple to get its nutrients and allows the apple to stay moist.

The 3<sup>rd</sup> and 4<sup>th</sup> experiment being lemon solution for the potato and the apple, allowed the produce to be fresher for longer. Lemon juice has a low pH which is often used to prevent browning. The potatoes brown when ana enzyme In their cells react with oxygen from the outside air. The acidity of the lemon juice then inhibits the browning of the enzymes ability to then reacts with the oxygen, which then the water limits on how much oxygen can reach on the potato and the apple. Lemon juice is high in ascorbic acid (vitamin C) and natural anti- oxidant in which is actually used to preserve fresh fruit for longer.

Potatoes have a brown and black pigmentation on their flesh due to the actual mechanist, which causes the browning in apples and potatoes involves an enzyme called polyphenol oxidase, also known as tyrosinase. The browning reaction results from the oxidation of the enzyme PPO which is common in plant tissues.

When we buy out apples pre cut form shops or super markets there are different reactants that have been applied to improve the shelf life of the apple , many dipping them in solutions or a wide range of anti browning chemical agents. Calcium Ascorbate (CaAsc) has been found to be the most effective anti-browning agent and be marketed in minimal chemical input.

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