Why do some fruits and vegetables turn brown?

This is due to a process called enzymic browning.

What is enzymic browning?

Enzymic browning is a chemical process which occurs in fruits and vegetables. It causes the flesh to discolour, most commonly to a brown colour. This effect is caused by a naturally occurring enzyme found in fruits and vegetables. The **enzyme** in fruits and vegetables which causes brown pigments to develop in the food is called **polyphenol oxidase**.

Enzymic browning can be observed in fruits such as apricots, pears, bananas, grapes and avocados, and vegetables such as aubergines, potatoes, lettuce. Once the fruit or vegetable is cut, some of the cells are opened up to the air. The enzyme **polyphenol oxidase** then has access to oxygen in the air and a reaction occurs, which results in the fruit or vegetable turning brown. This is the same reaction that causes brown spots in apples and pears when they are bruised.

Enzymic browning in fruits and vegetables is not desirable, and chefs can control it with a range of methods. These are listed below.

How can enzymic browning be controlled?

Method 1– Stop the enzyme by using acid or heat

These two methods **denature** the enzyme **(polyphenol oxidase)** and prevent it from producing brown pigments.

a. **Acidity:** Add some vinegar, cream of tartar (tartaric acid), lemon or lime juice to water to lower the pH on the surface of the fruit or vegetable. Choose an acid based on the flavours which complement the food.
b. **Heat:** Blanch, boil, steam, bake, fry, poach, microwave, or use whatever cooking method you think works best to cook the fruit or vegetable. *(Note: This is fine if you need to cook the fruit or vegetable, for example an apple pie filling or roast potato, but not so great if you want to serve the fruit or vegetable uncooked, for example fruit salad or banana split. The heat will destroy the enzymes, but it will also cook the food, which is not always desirable.)*

Method 2 – Stop the oxygen by using water or antioxidants

Oxygen is required for the browning reaction to take place. The oxygen coming into contact with fruits and vegetables can be reduced by:

a. **Water:** Immerse the prepared fruit or vegetables in plain water. This slows down enzymic browning, but does not stop it altogether. This can be improved by adding acid, such as lemon juice, to the water. This is often referred to as acidulated water. The layer of acidic water helps limit the access of oxygen to the cell surfaces. Salt water and a sugar syrup also slow down enzymic browning.
b. **Antioxidants:** This is the method most commonly used in the food industry to prevent browning on pre-cut fruits and vegetables, for example apple slices. The antioxidant commonly used is vitamin C (also known as ascorbic acid). Vitamin C is not acidic enough to denature the enzyme, but it does slow down the browning considerably.

Finally, …

- Make sure the fruits and vegetables are only prepared when needed – not too far in advance.
- Keep sliced fruit and vegetables away from copper and iron, as these metals speed up enzymic browning. Metallic bowls and knives should therefore be avoided.
- Refrigerate sliced fruit and vegetables. Enzymic browning still occurs in refrigerated conditions, but at a slower rate.