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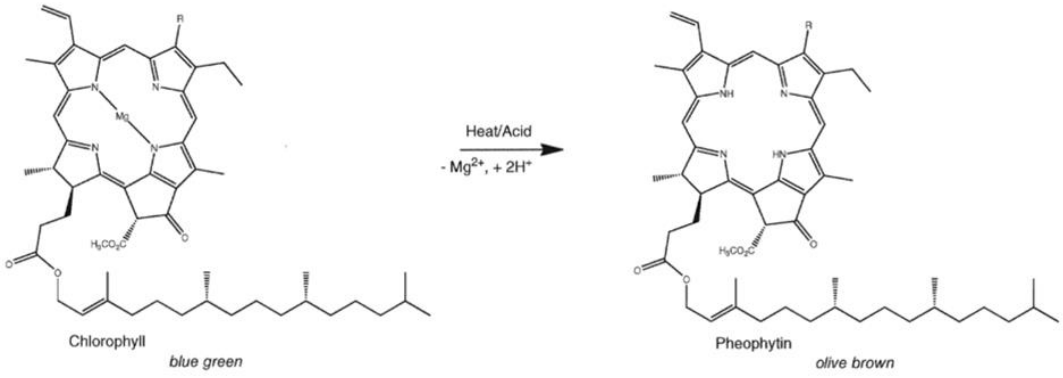
Why Do Greens Become Duller When Cooked?

Chlorophyll is the pigment responsible for the green colour of vegetables. There are two types of chlorophyll, namely chlorophylls a and b, each produces a specific colour in green plants. Chlorophyll a has an intense blue-green colour, whereas chlorophyll b is characterized by a yellow-green colour (Paciulli et al., 2017).

That intense, bright green that develops within a few seconds of throwing vegetables into boiling water is a result of the sudden expansion and escape of gases trapped in the spaces between cells (McGee, 2007). When these microscopic air pockets no longer cloud the colour of the chloroplasts, we can see the pigments much more directly (Brown, 2010).

During cooking, chlorophyll is highly susceptible to degradation:-

- Presence of chlorophyllase, an enzyme that affects the green colour of green vegetables by causing the degradation of chlorophyll (Wijerathne et al., 2018), leaves the pigment water-soluble and leaks out into the cooking liquid (McGee, 2007).
- Once the pigment becomes water-soluble, further dulling down of its vibrant natural colour is generally observed (Gibson, 2018).
- When the cooking temperature rises above 60°C, the membranes around the chloroplast will start to damage, causing chlorophyll to be exposed to the plant's own natural acids (Gibson, 2018).
- The heat will leave the chlorophyll free and unstable in vegetables which then becomes pheophytin, at which chlorophyll a turns into grey-green pheophytin a and chlorophyll b turns into yellowish pheophytin b (Gibson, 2018).
- The intense green chlorophyll is now no longer being masked which leads the yellow and orange pigments in green vegetable tissues to appear.
- Stir-frying, grilling and barbecuing will cause changes of colour in the greens (Gibson, 2018).



(Yahia, 2017).

There are certain chemical tricks that can aid to keep green vegetables bright and vivid by adding baking soda (sodium bicarbonate) to the cooking liquid, as alkaline solution is capable of displacing the magnesium ions in chlorophyll. However, do take note that excessive alkaline condition can turn your vegetable mushy (Gibson, 2018).

There are also other non-chemical option by keep the cooking times as short as possible – as short as 5-7 minutes (Gibson, 2018). Cook the vegetables in plenty amount of boiling water/cooking liquid to dilute the acid leaked from vegetable cells (Gibson, 2018). If the vegetable is not served immediately, simply remove the vegetables at their greenest peak and immersed them into an ice bath to stop the cooking process (Gibson, 2018).

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