

POLYPHENOL OXIDASE

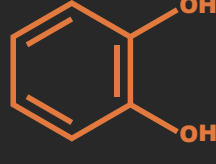
PPO for short; an enzyme that is responsible for the browning of fruits and vegetables

The culprit of brown guacamole

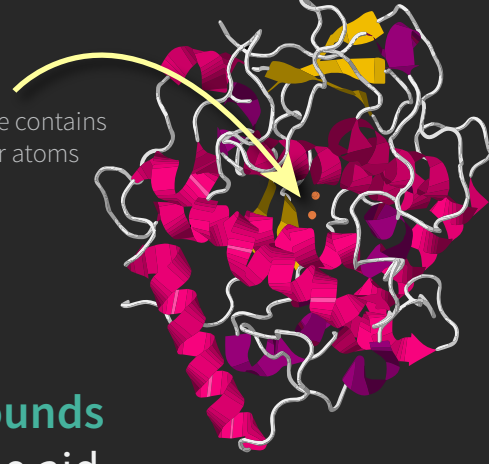
Polyphenol oxidase enzymes encompass both **tyrosinases (monophenols)** and **catechol oxidases (o-diphenols)**



General structures of typical PPO substrates

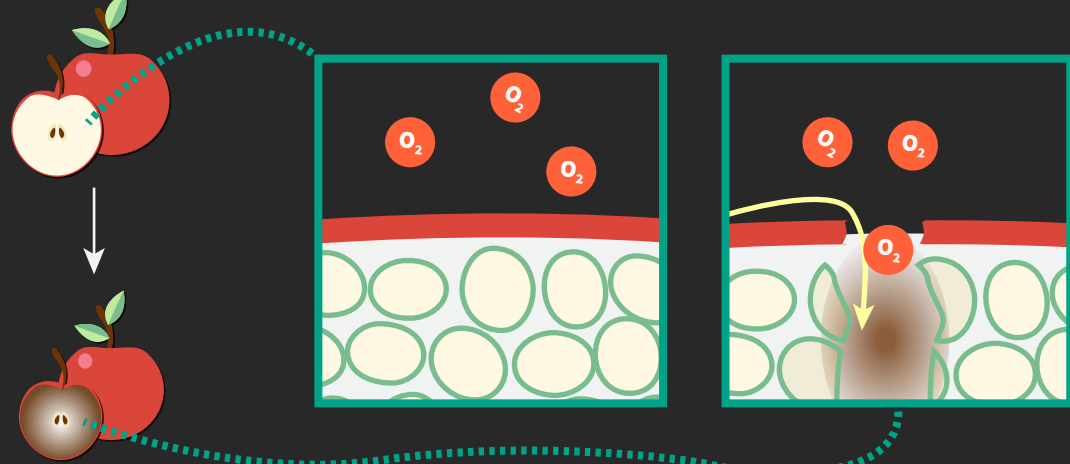


active site contains copper atoms



Structure of PPO

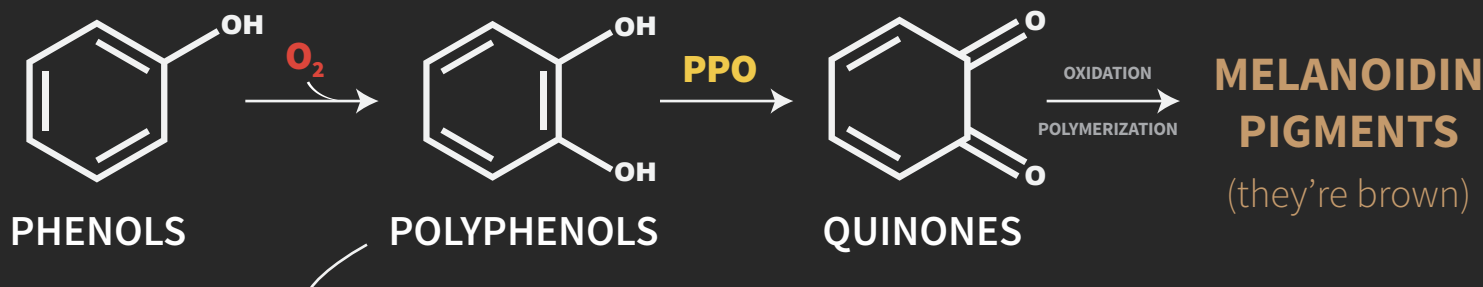
As the name implies, PPO uses **phenolic compounds** as substrates. These compounds react, with the aid of **PPO**, with **oxygen**



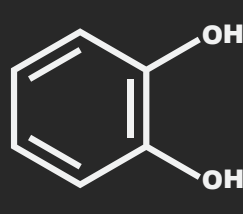
When cells are ruptured, their contents can now react in the presence of oxygen... *browning occurs*

REACTION

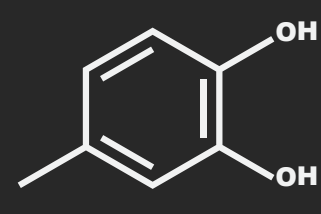
The overall reaction is outlined below



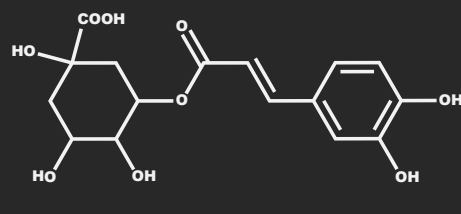
Some examples include:



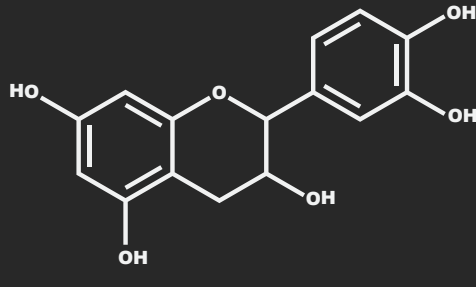
catechol



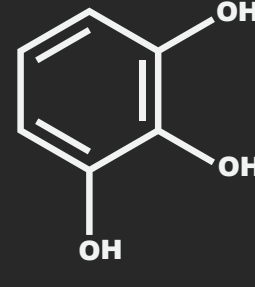
4-methylcatechol



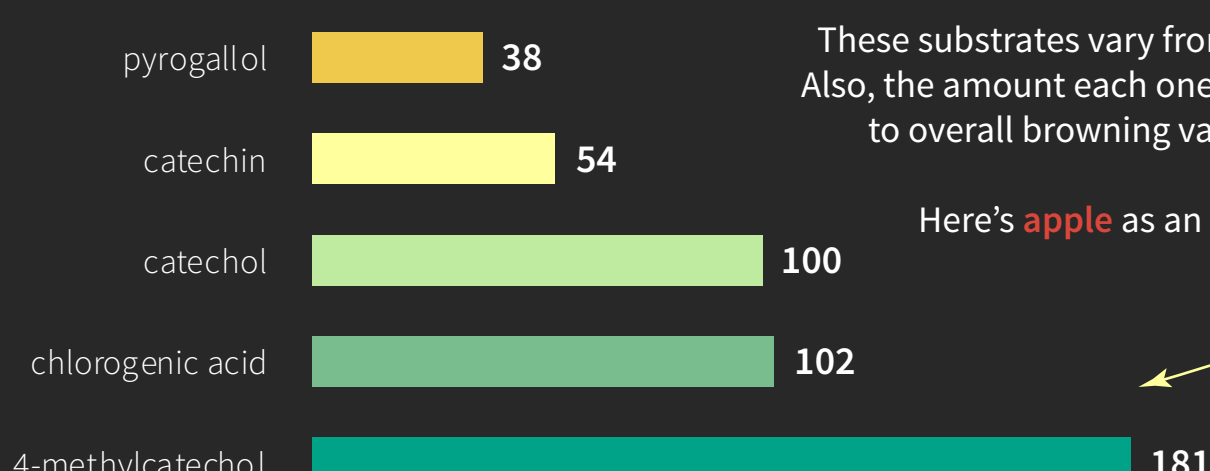
chlorogenic acid



catechin



pyrogallol



Relative Substrate Specificity of PPO in Apples

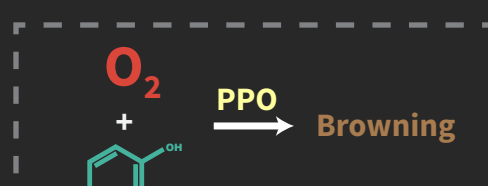
These substrates vary from food to food. Also, the amount each one may contribute to overall browning varies as well.

Here's **apple** as an example

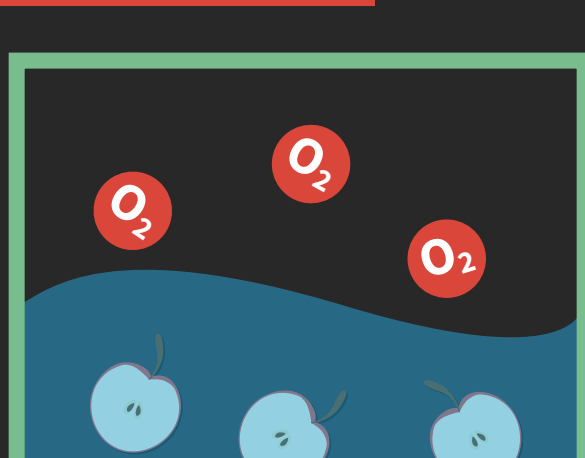
INHIBITION

Several methods can be used to help prevent **browning**

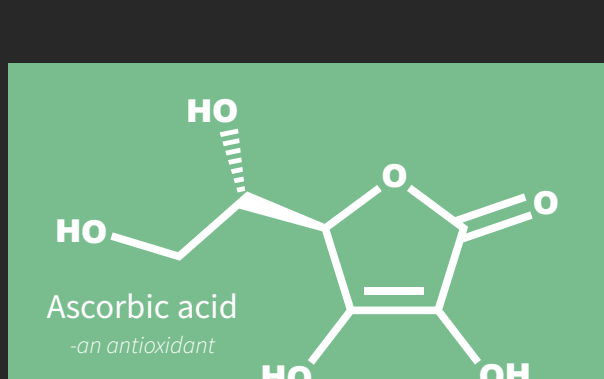
1. Limit **oxygen**
2. Alter **enzyme** functionality
3. Tie up **reactants**



OXYGEN



Limit oxygen exposure



Give oxygen something else to react with

ENZYME

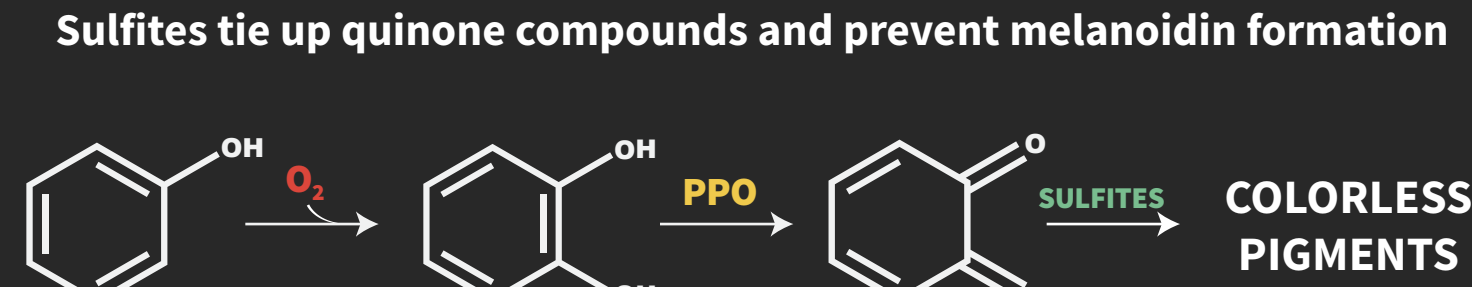


Conformational changes of the enzyme prevent the browning reaction from taking place

Submerging fruit in acidulated or salted water can slow browning

REACTANTS

Sulfites tie up quinone compounds and prevent melanoidin formation



Sources:

Yoruk, Ruhiye and Marshall, Maurice R. PHYSICO-CHEMICAL PROPERTIES AND FUNCTION OF PLANT POLYPHENOL OXIDASE: A REVIEW. Journal of Food Biochemistry 27 (2003) 361-422.

Queiroz, Chrisiane et al. Polyphenol Oxidase: Characteristics and Mechanisms of Browning Control. Food Reviews International, 24:361-375, 2008

Mayer, Alfred M. Polyphenol oxidases in plants and fungi: Going places? A review. Phytochemistry. doi:10.1016/j.phytochem.2006.08.006