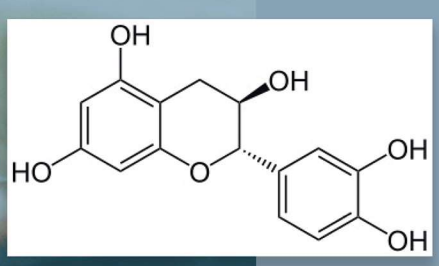
3- IONISATION - THE COLOUR OF TEA BY ADDING LEMON

Even though I had never spent any time on board a boat before this trip, I quickly feel welcomed by that life, with its small but sweet habits. Among them is breakfast at the start of the day, the first moment of the day we all spend together. Little by little we get to know each other and understand each other's habits: I know that Barbara prefers coffee in the morning, Yves likes to eat yoghurt and Thierry doesn't like slices of bread cut too thin. We begin to get to know each other, to anticipate each other's gestures, it's very nice, it gives me a feeling of familiarity. Among these habits, I realise that every morning Thierry drinks black tea, to which he adds lemon. Observing this process, however, I realise something curious: just a few drops of lemon juice, a colourless substance, are enough to change the colour of the entire contents of the cup, which becomes clearly lighter. This process strikes me as interesting, and so I begin to wonder: how is it possible that the addition

Scientific explanation

In everyday experience, it is easy to see that the moment we add lemon to black tea, the colour changes and becomes lighter. As lemon juice is colourless, this colour difference is not intuitive at first glance. The typical colour of black tea, which gives it its name, is mainly conferred by tearubigins, a type of molecule belonging to the polyphenol family. These molecules are present in black tea as a result of the oxidation and subsequent polymerisation of the tea catechins by enzymes of the polyphenidase group.

The catechin molecule is responsible for the astringent taste and strength of tea infusions and has the following structure:



The property of tearubigin molecules is that they are ionised in solution, which is a characteristic shared by many other classes of organic molecules, and which gives them their characteristic very dark colour. When we add lemon to tea, the nitric acid it contains causes the pH, the parameter that characterises the acidity of a solution, to become lower.

This lowering of pH corresponds to an increase in the acidity of the solution, preventing most of the tearubigin molecules from ionising. Due to the low percentage of ionised molecules the tea no longer possesses its characteristic brown colour, becoming light in colour despite the addition of a colourless liquid.