Exploring Rancidity Assessment and Prediction

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Background and aims

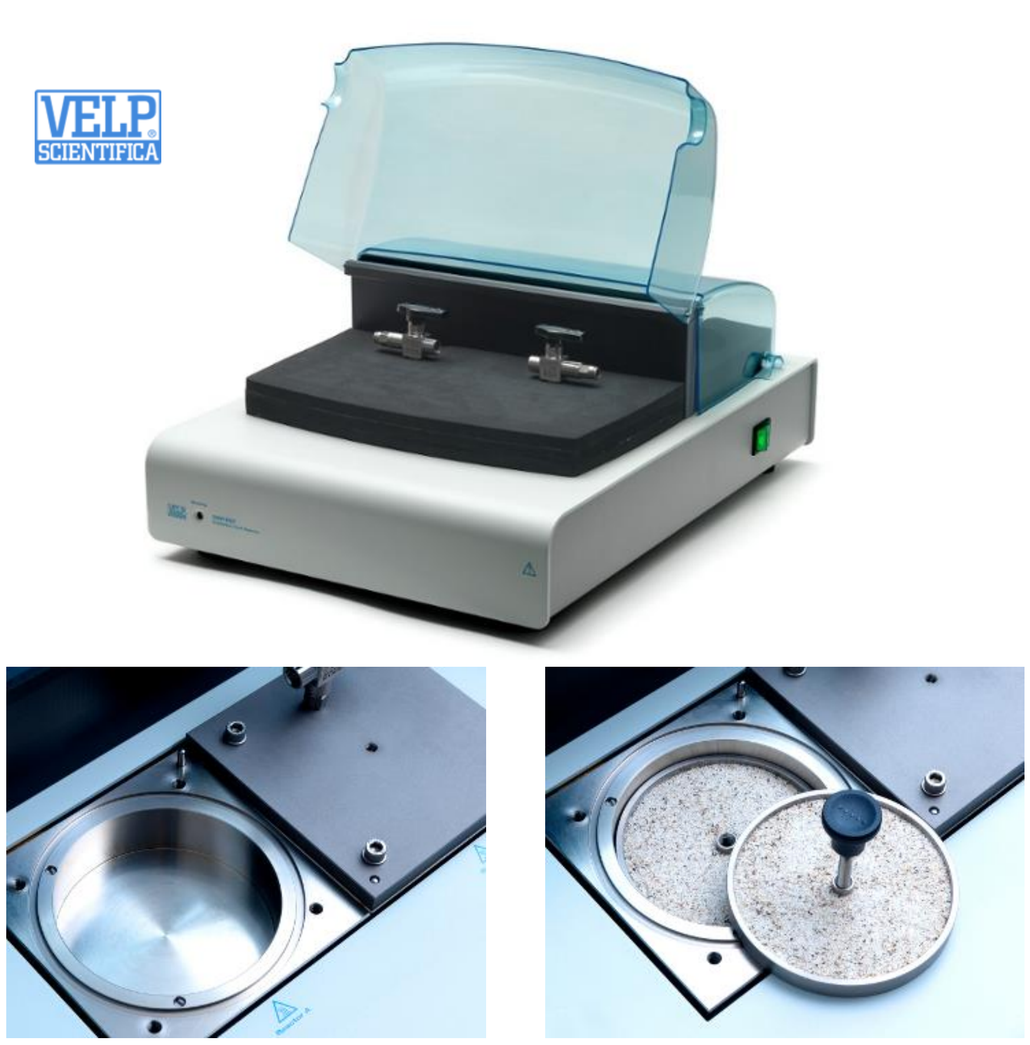
Lipid oxidation causes a number of chemical changes to occur within foods, which can negatively affect taste, smell, texture and nutritional quality, leading to foods becoming rancid. Rancidity has a major impact on the product's shelf-life, so being able to assess rancidity is an important part of a product's development and control. There are a number of different analytical tests available to assess rancidity or a food's potential for oxidation. Measurement of peroxide value, anisidine value and free fatty acids are used to determine the extent of lipid oxidation which has occurred in the product, and can be used to compare samples taken at different times over the shelf life. These measurements can also be used in conjunction with accelerated shelf life trials, where samples are stored at higher temperatures in order to accelerate ageing of the product. A potential problem with these methods is that fat must be extracted from the product before analysis, which could itself alter the degree of oxidation of the sample.

The measurements described above are made on aged products, but there are circumstances where an indication of the oxidative potential may provide the required information, for example in the comparison of different oils or for an initial assessment of the effect of an antioxidant. Measurement of the oxidative potential of an oil or fat can be carried out using an instrument such as the Rancimat, which is well known and has been used for many years. However, as for the analytical measures described above, for most products the oil or fat must be extracted first which may not only have an impact on the degree of oxidation of the sample but removes the fat from any other components within the product that may affect lipid oxidation. To overcome this issue, assessment of the oxidation of the whole product is offered by a relatively new instrument - the OXITEST. This instrument has been designed to analyse lipid oxidative stability on whole products without the need for fat extraction, which could offer a major advantage when assessing particular products.

This project was designed to use the OXITEST alongside established techniques to assess lipid oxidation in fried potato crisps.

Study design and methodology

Potato crisps were fried using two different oils, with one oil containing an antioxidant and the other without.
Freshly prepared crisps will be assessed using the Oxitest, Rancimat and by traditional analytical measures.
The crisps are now being stored under two different temperature conditions, 20 and 30 ºC. At selected time-points samples will be removed from storage and analysed using a variety of rancidity assessment methods.



The basic principle of the Oxitest is that a weighed representative sample of product is placed in the sample chambers which are then closed. The sample chamber is pressurised with oxygen and heated to the selected temperature. Pressure drop is monitored as the sample consumes oxygen, and the induction period calculated.

Initial Results

Results obtained using the Oxitest on the oils before and after frying and on the crisps fried in different oils are shown in Figure 1. It can be seen for all samples that oil A shows greater oxidative stability in the Oxitest than oil B, with a greater difference between the oils after frying and in the crisps than in the oil before frying.

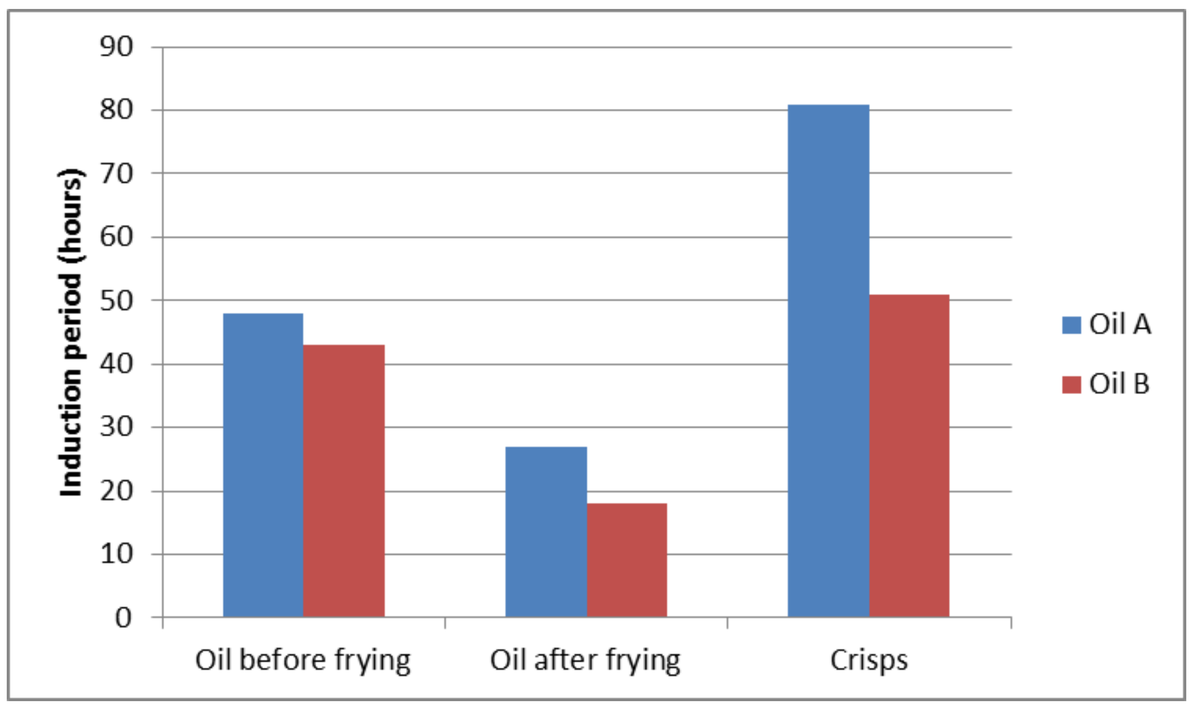


Figure 1: Oxitest induction period (hours) of oils before and after frying, and crisps cooked in those oils

Further Work

Rancidity measures will be taken over the shelf life of the product stored under ambient and accelerated conditions. The final set of data will be used to compare the predictive abilities of Rancimat and Oxitest data with respect to oils and finished product.

Acknowledgement

Leatherhead would like to thank Velp Scientifica for the loan of the Oxitest instrument and for their help and assistance in setting up this project.