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Fried snacks: the knowledge of the oxidation state to improve the Shelf life

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Abstract

Snack foods are currently consumed by millions of people of diverse cultural backgrounds in many countries because they are tempting snacks if characterized by crispness, brilliant colour and flavours. However, these products can undergo degradation processes, first of all, the lipid oxidation which causes rancidity and off- flavours. There are several methods to test the shelf life of snacks and bakery foods, but CDR FoodLab® is the only one, not only to be a green method, but also, it is able to give an actual measurement of oxidative stability of finished products, in a simple and fast way.

Introduction

Snack foods contain oil and they can become rancid, for this reason it is necessary to control the oxidation status of finished products to know the shelf life of them.

Lipid oxidation is one of factors that limits the shelf life of many food products through organoleptic changes, due to chain reactions that generate, at first, free fatty acids, and subsequently, reactive compounds, as peroxides, able to spread the oxidative process, giving the

food products the so-called "smell of rancid". Those reactions are accelerated by high temperature and by light and oxygen exposure. (Fontanella, 2015)

Thanks to periodic analyses, oxidation status test of bakery products and snack foods checks the nature and the degradation process's speed.

The most important indexes that allow to estimate oxidative stability of finished products are: Free Fatty Acids (FFA) to determine the process of acidification of fatty component, Peroxide value to indicate the degree of primary oxidation and p-Anisidine value (AnV) to evaluate the formation of molecules (aldehydes and ketones) responsible for the organoleptic alterations. Furthermore, AnV analysis on oil is an indicator of excessive oil deterioration in deep frying process.

Overview of oxidative stability methods

Several methods are used to predict the resistance of oil to oxidation, in order to be able to estimate the shelf life of snacks and bakery foods.

One of many, the accelerated aging method is based on the acceleration of natural aging process of sample by exposing high temperature, with a continuous flow of air. Airflow delivers volatile oxidation products from the reaction cell into a vessel where they are adsorbed by the measuring solution (deionized water). The continuously recorded electrical conductivity of the measuring solution increases due to the absorption of the reaction products.

This application based on accelerated oxidative stability testing belongs to others analytical devices, as oxidation stability reaction, able to provide data concerning oxidation status of foods, oils and fats.

However, a technique founded on a forced oxidation reaction, as described above, does not provide an actual knowledge of the original oxidative status of the sample, because it only causes an oxidative degradation. For this reason, it can be defined an indirect method, even if analyses are carried out on finished snack products.

At the same time, solvent extraction techniques are commonly used for the determination of lipidic content, using a Soxhlet extractor. Meshing the sample using a mortar until it becomes as homogeneous as possible and choosing an appropriate solvent, it is possible to extract the target analytes and to quantify them by gas-chromatography-mass spectrometry.

Solvent extraction with a Soxhlet continues to be used as a reference method by the AOAC (Association of Official Analytical Chemists) for quality control, although it is cumbersome and at the same time toxic, because hazardous solvents for health are used. In fact, extraction and post-extraction steps must be performed in a vented hood and it requires skilled personnel, competent in chemical matters.

Furthermore, Soxhlet method needs a long time, also about the extraction based on focused microwave-assisted Soxhlet extraction (FMASE). A study has demonstrated that for 6 samples, which were classified in two groups, snacks and cookies, no significant differences in the extraction efficiency of the fat content in bakery samples using FMASE versus the official method were found. Moreover, a drastic reduction in both the extraction time (60 and 35 min versus 16 and 8 h, respectively, for the two above commented groups). (F.Priego-Capote & Castro, 2005)

Nevertheless, a time too long compared to the analysis time obtained using CDR FoodLab®.

CDR FoodLab® is the analysis system that allows testing the shelf life of bakery products, snacks and spreads in a simple and fast way.

Why CDR FoodLab®?

Unlike the Soxhlet method, which is restricted to performing one analysis at a time, CDR FoodLab® carries out several analyses at the same time on the same sample, using a smaller amount of it.

Thanks to its multitasking mode, it is possible to process one analysis and to start another one at the same time, with the possibility to go back to the first one at any moment.

CDR FoodLab® performs an analysis quickly and easily without relying on dedicated external laboratories, and to analyze 16 samples at the same time and constantly monitor the production process, obtaining exact and accurate answers in just a few minutes.

Contrary to what was described using Soxhlet extraction, CDR FoodLab® method does not require the use of hazardous solvents, in fact, risks for the operator are eliminated and the environmental impact is minimized thanks to no complicated extraction processes. The system is designed to be used by anyone, without any support of skilled staff.

The aim of CDR FoodLab®

CDR FoodLab® is an analysis system designed to perform a quality control about the oxidative stability of finished snacks products.

In the CDR laboratories, a new method was developed to quantify the acidity (FFA), peroxides (PV) and p-Anisidine for testing the shelf life of bakery products, snacks and spreads in faster and easier way than traditional procedures.

CDR FoodLab® for frying industry

CDR FoodLab® system has been intensively using for the quality control in frying industry for many years. Free Fatty acids, Peroxides values and p-Anisidine are among the most important analyses for this sector. Thanks to its easiness, CDR FoodLab® is used from the quality control of the oil to the entire frying process in order to manage it at best avoiding dangerous off-flavours. With the possibility of Shelf life determination CDR FoodLab® becomes an important system that allows the frying industries to realise a complete quality control from the oil to the packaged final product.

How to use CDR FoodLab®?

CDR FoodLab® determines the shelf life of finished snack products monitoring the oxidation status and the rancidity of the oil contained in different products.

CDR FoodLab® is composed of an analyser based on photometric technology and a kit with disposable pre-vialed reagents with low toxicity, in package of 10 tests, 1 year shelf life, developed and produced by the research laboratories of CDR.

The analyses are easier than the traditional ones and can be performed in few steps. Using a Press is possible to extract the oil from the snack or the fried product. Thus, the extraction process is done mechanically and without any solvents. After the extraction step, the solid oil suspension is centrifuged (5 minutes) and the oil extracted is collected to perform the analysis (5 minutes).

Each test is performed dispensing in the cuvette containing the buffer a determined amount of the sample. Thanks to the reagents created on purpose, a colorimetric reaction is generated.

The result of the test is printed immediately after the elaboration of the photometric reading, in its unit of measure.

Conclusions

CDR FoodLab® is the analysis system specifically developed by CDR to respond to the needs of snacks producers of any size.

CDR FoodLab® allows testing the shelf life of finished products (fried snacks and nuts) more rapidly and easily than traditional methods.

References

F.Priego-Capote, & Castro, M. d. (2005). Focused microwave-assisted Soxhlet extraction: a convincing alternative for total fat isolation from bakery products. *Talanta*, 81-86.

Fontanella, E. (2015). Shelf life: Informazioni pratiche per arrivare a definire la durabilità di un prodotto e a prolungare la sua vita commerciale. *Camera di Commercio di Torino*, (p. 50). Torino.