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LUMINESCENT ANALYSIS OF THE RYE AND MAIZE FLOUR

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Abstract

The luminescent analysis is applied in the different fields of science and technique. In agriculture and public food the luminescent usage is based on different colors of illumination of the low and high quality food products or of the personal luminescence of some vitamins.

Key words: analysis, luminescence, food products.

INTRODUCTION

The visual analysis is express but not so objective. Fluorometrical methods are quite long and do not allow analyzing the product without dividing them. The luminescent spectral analysis methods of the food products have a high priority to the visual analysis methods and fluorometric methods. These luminescent spectral analysis methods are more accurate and convenient than the visual analysis methods and other methods. The luminescent analysis is used to sort the food products, seeds, rooty products. Because of the color of the food products luminescence, it may be observed the beginning of their alteration much earlier than it can be observed in an ordinary light, so, a prior analysis gives the possibility of a long storage of the products and it is useful for the preparation of the tinned food. In this way, the analysis methods are simple and accessible to all. They are reduced to the illumination of the analyzed product with UV rays or with those of short wave.

MATERIAL AND METHODS

The luminescence spectra and rye flour luminescence excitation spectra has been calculated at the temperature of the liquid nitrogen for the fresh grinded flour, kept at room temperature for a year. It was found that the luminescence spectra of the fresh grinded rye flour removed at 313 nm consisted of two radiation strips at 405 and 420 nm (fig.1, curve 1).

This kind of radiation strips, the maximums of which at 77 K are found in the same way in the limits of the wavelength 405-420 nm, are also on the luminescence spectra of the unsaturated fatty acids on their first stage of fermentation, according to the other ones' fermentation, the luminescence excitation spectrum of the fresh grinded product, for example: rye whole flour, removed at 405 nm, on which appear the maximums near 210, 325 and 55 nm and in the same way they correspond, respectively, to the initial spectra of the fermented products of the unsaturated fatty acids.

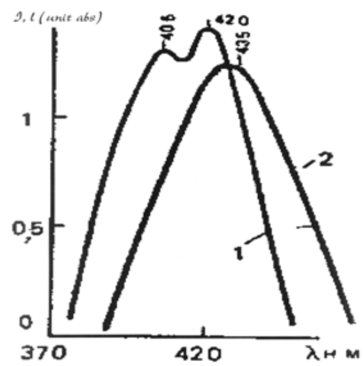

Fig. 1. Luminescence rye flour spectrum
1 – fresh flour
2 – after storage

Respectively, it may be considered a great contribution in the luminescence of both radiation strips, which appeared on the luminescence spectrum of the examined examples, fresh grinded products, and rye flour showed above, excitation of the wheat acids, examined in the process of its storage and which, practically, totally moves to the grinded rye flour.

The spectral – luminescent features of the musty maize flour were established within the temperature of 77-300K after the immediate excitation of the luminescence. The luminescence spectrum of the musty maize flour, measured at room temperature consists of a single radiation strip at 470 nm (fig.2, curve 5) at decreasing temperature up to 77K, the maximum of this spectrum is shifting with 30 nm in the side of the spectrum's short waves (fig. 2, curve 6). On the excitation spectrum of the musty maize flour luminescence, raised for 470 nm, it is accentuated a maximum at 380 nm (fig.2, curve 2). A similar maximum appears in the luminescence spectrum.

In the first case, the size of the shift represents 25 nm, in the second case 10 nm (fig.2, the corresponding curve 3 and 4). It is shifted with 29 nm in the side of the short wavelengths the maximum of the excitation spectrum of the normal and sound maize flour luminescence, in contrast with the maximum corresponding to the musty wheat.

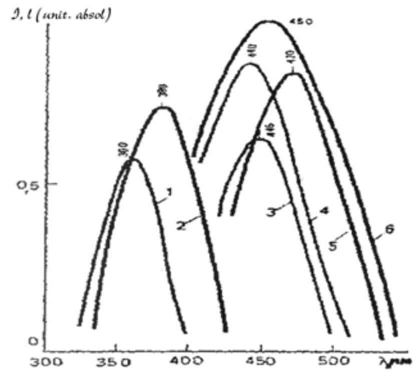

Fig. 2. The spectral luminescent features of the maize flour

I – II – luminescence excitation spectra
1 – normal and sound grain
2 – musty grain
3 – 6 – luminescence spectra
3 – normal and sound grain (300K)
4 – normal and sound grain (77K)
5 – musty grain (300K)
6 – musty grain (77K)

RESULT AND DISCUSSION

If the fluorescent object is illuminated with monochromatic light, then the intensity of its fluorescence will be different from different wavelengths.

This is related to the fact that the intensity of the fluorescence depends on the intensity of the excitation light that falls at every wavelength and on the absorption degree of this excitation light.

The low temperature spectra analysis allows the obtaining of new information on the substance's properties and on its state in the composition of the medicinal material.

The raising of the medicine's temperature leads to the decreasing of the luminescence's intensity.

The decreasing of the temperature leads to the amplification of the fluorescence for the compounds with a weak luminescence at room temperature. At law temperatures it is better accentuated the fine structure of the luminescence spectra and, besides fluorescence, there also appears phosphorescence.

The maximums of short wavelengths belong to the fluorescence and the maximums of long wavelengths to the phosphorescence.

Being measured after storage, during the year, in the same luminescence excitation conditions, the luminescence spectrum of the examined examples of the rye flour consists of a single unstructured strip, located at 435 nm. On the excitation spectrum of the luminescence of the examined examples, removed for 435 nm, it appears in the same way a single excitation strip, located close to 365 nm.

CONCLUSIONS

The analysis of the obtained experimental data shows that, with the help of luminescent spectral features calculations of the cereal products in the process of their storage it may be estimated the degradation of the lipid fractions and, thus, we can estimate the quality and period of storage of these products in the given conditions.

The position of the radiation strips, accordingly appeared at 300 and 700K in the luminescence spectra of musty maize flour, are characteristic to this product.

Meanwhile, the luminescence spectra and the normal and sound maize flour luminescence excitation are distinct from the accordingly musty maize flour spectra, in the same way also to the analogical spectra.

The luminescence spectra of the normal and unaffected by different fungi maize flour is shifted to the part of short wavelengths in comparison with the spectrum of accordingly musty wheat flour at temperature of 300K, and in the same way of 77K.

When measuring the luminescence at law temperatures close to that of the liquid nitrogen it takes place the stopping of the biochemical processes and so the compound is guarded from the photochemical action of the intensity of the excitation light.

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