Rapid and Cost-Efficient Method for Lactic Acid Determination in Dairy Products

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Abstract. Lactic acid content from dairy products (20 samples from local market) was determined by Boehringer Mannheim/ R-Biopharm kits and reflectometric method in order to compare the results obtained from both methods.

Keywords: reflectometry, lactic acid determination

Introduction. The appearance of a large number of new food products and the current possibilities in the instrumental analysis field lead to the development of new and rapid analytical methods in order to identify and evaluate specific chemical compounds. The reflectometry is one of these methods and several advantages are: rapidity, easy to use, obtaining reliable results. According to the principle of the reflectometry (remission photometry), reflected light from the strip is measured (fig.1). Just as in classical photometry, the difference in intensity of emitted and reflected light allows a quantitative determination of the concentration of specific chemical compounds that are analysed. Lactic acid (lactate) is oxidized by nicotinamide adenine dinucleotide (NAD) under the catalytic effect of lactate dehydrogenase to form pyruvate. In the presence of diaphorase, the NADH formed in the process reduces a tetrazolium salt to form a blue formazan, the concentration of which is determined reflectometrically.

Fig. 1 Principle of emission spectroscopy (www.emdchemicals.com)

Aims and objectives. Lactic acid content from dairy products was determined by Boehringer Mannheim/ R-Biopharm kits and reflectometric method in order to compare the results obtained from both methods.

Materials and methods. Dairy products were purchased from the local market. Lactic acid was determined through reflectometric method and by using enzymatic kits (Boehringer Mannheim/R-Biopharm-Enzymatic BioAnalysis/Food Analysis).
The reflectometric method measures the total level of lactic acid as a sum of L-lactic and D-lactic acids. The measuring scope is 1.0-60.0 mg/l lactic acid. RQflex device, part of the REFLECTOQUANT (Merck) system was used.

For the enzymatic kits we used UV methods based on the measurement of the increased or decreased absorption of co-enzyme NADH/ NADPH at 340 nm. Reading was performed with a Multi-Detection Microplate Reader Synergy™ HT spectrophotometer manufactured by BioTek Instruments, Inc. USA. The data supervision, control and acquisition were performed through the Gen 5 software. All measurements were made in triplicate.

We used the one-way ANOVA t paired test to compare the values obtained through reflectometric method to the values obtained through the enzymatic method. Thus, the average values of the two pair groups were compared to find out if there is a Gaussian distribution of differences between the two.

Results and Discussion. The values of lactic acid determined through the reflectometric method are generally higher than the same values determined through the enzyme method, although the differences are not significant (ns). The main difference between the two methods is that the reflectometric method determines the total content of lactic acid (D, L lactic acid), while the enzyme method only determines the L lactic acid content. There is a direct correlation between the two values and the climb and fall of lactic acid content was found through both methods (fig.2). Therefore, the results obtained through the reflectometric method correlate with the results obtained through the enzymatic method.

Fig. 2 Correlation between enzymatic and reflectometric methods for lactic acid determination.

Data represent the means of three independent measurements.

Conclusion. The lactic acid content from dairy products could be determined correctly and rapidly through reflectometric method. It is possible to use this method for quality control of the manufacturing process and also for the quality control of the end products.

REFERENCES

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