Development of a Derivative Spectrophotometric Method for the Analysis of Colorants and Sweeteners in Chewing Gum

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Derivative spectrophotometry is an analytical technique of great utility for extracting both qualitative and quantitative information from spectra composed of unresolved bands and for eliminating the effect of baseline tilts. It consists of plotting one of the mathematical derivatives of spectral curve. Sweeteners mainly artificial are added to foods as a sugar substitute particularly to low-joule foods. Synthetic colors are added to food replace natural color which could be lost in processing and to reduce batch to batch variation in manufactured products. Those permitted and the amounts vary from country to country. Toxicological investigation of food colors is in progress in many countries. The main obstacle in the spectrophotometric determination of mixtures of these colorants is the overlapping of their spectra. Since the colorants and sweeteners studies here present spectral overlapping their simultaneous determination is hard when conventional methods are used. In this study a derivative spectrophotometric method for the determination of the colors and sweeteners in chewing gum was developed. The investigated colorants and sweeteners were: Tartrazine (T;E102), Alura Red (AR,E 129), Indigotin (I;E 132), Aspartame (Asp.;E 951) and Aceufame-K (Ace-K;E 950). The first derivative spectrophotometric method was developed for quantitative determination of T in single form and in the presence of AR or I in chewing-gum samples. The first derivative method eliminated interferences of AR and I and also turbid background of the samples. The first derivative signal measured at 353 nm was used for elimination of the interferences of the other additives for the T estimation, while for determination of AR, the first derivative signal was measured at 551 nm. The applicable concentration range were the following for T, from 1 to 6µg mL⁻¹, for A between 10.0-22.2 µgmL⁻¹. The other sample, the amplitudes of the first derivative at 460 and 638 nm were used for determination of T and I in the range of 5.0-10.0µgmL⁻¹ and 0.5-4.5µgmL⁻¹, respectively. Asp. and Ace-K were also determined without a separation step in the chewing-gum samples. Before the spectrophotometric measurements of sweeteners, the dyes were sorbed onto active carbon and the sample solution was centrifuged. Then, the amplitude of the first derivative at 242 nm was used for determination of Ace-K in the range of 3.0-8.0µgmL⁻¹ and the amplitude of the third derivative at 227 nm was used for the determination of Asp in the range of 5.0-11.0µg.mL⁻¹. The proposed method was applied satisfactorily to the determination of small amounts both compounds in synthetic binary mixtures and chewing gum samples.