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## Determination of dyes in cosmetic products by micro-matrix solid phase dispersion and liquid chromatography coupled to tandem mass spectrometry

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- Micro-MSPD-LC-MS/MS method developed to analyze regulated dyes in cosmetics
- Micro-MSPD is rapid, low cost, and easy to implement for routine control
- Validated method successfully performs in a broad range of personal care products
- Seven dyes were found in 24 real analyzed samples, some at high concentration
- Detected dyes appeared in the product label, complying with legal requirements

### ABSTRACT

A simple method based on micro-matrix solid phase dispersion (MSPD) followed by liquid chromatography-mass spectrometry (LC-MS/MS) has been developed for the rapid and simultaneous determination of nine regulated water-soluble dyes in personal care and decorative products. The proposed miniaturized extraction procedure was optimized by means of experimental designs in order to obtain the highest extraction efficiency. Under the optimal selected conditions, the method was validated showing satisfactory performance in terms of linearity, sensitivity, and intra-day and inter-day precision. Recoveries were evaluated in different cosmetic matrices and they can be considered quantitative with average values between 70-120% with relative standard deviations (RSD) lower than 15%. Finally, the validated method was applied to 24 samples of cosmetic and personal care products, including decorative makeup, lipsticks, lip gloss, toothpastes, regenerating creams, shampoos, and eye shadows, among others, to cover a broad range of commercial real samples. Seven of the analyzed dyes were detected, being declared all of them in the label list of ingredients. More than 50% of the samples contained at least two dyes. Tartrazine was the most frequently found (50% of the samples) at concentration levels of 0.243-79.9  $\mu\text{g g}^{-1}$ . Other targets were found in 1-9 samples, highlighting the presence of Quinoline at high concentration ( $> 500 \mu\text{g g}^{-1}$ ) in a toothpaste sample.

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