

UV-VIS SPECTROSCOPIC DETECTION OF ILLICIT METANIL YELLOW DYE IN CANDY PRODUCTS SOLD IN MALAYSIA

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Structured Abstract: The toxic food adulterant Metanil Yellow remains a major safety concern. This study evaluated its presence in nine local yellow-orange candies using chemical color testing, TLC, and UV-Vis spectrophotometry. The chemical test showed low sensitivity, while TLC and UV-Vis successfully detected the dye in spiked samples. Though highly sensitive, UV-Vis lacked the specificity to distinguish Metanil Yellow from permitted dyes. Ultimately, combining preliminary and instrumental techniques is crucial for effective detection, providing a foundation to strengthen Malaysia's food safety regulations.

Background: Food adulterants are toxic substances that can cause severe illnesses and negatively impact public health. Metanil Yellow, an unpermitted azo dye intended strictly for industrial use, is frequently used as an illegal adulterant to enhance the appearance of foods, particularly candies. To date, limited scientific research exists regarding the presence of this dye in candy products sold in Malaysia. Therefore, this study aims to develop an effective sample preparation method to detect and estimate Metanil Yellow levels in yellow-orange candies collected from various local shops. Additionally, this research will evaluate the overall sensitivity and accuracy of the analytical methods used for detection.

Methods: Food colors were extracted by drying the candy samples at 60°-70°C for 3 hours, crushing them, and soaking them in an ammonia-99% alcohol solution before centrifuging and filtering. A Metanil Yellow standard was prepared to create a calibration curve for calculating concentrations. Chemical testing and thin-layer chromatography (TLC) served as qualitative detection methods, while UV-Vis spectroscopy was utilized for quantitative measurement. To evaluate the sensitivity and accuracy of these analytical methods, three samples were spiked with 3 ppm of standard Metanil Yellow.

Results: This study reveals the preliminary HCl test lacked sensitivity for trace analysis, yielding negative results for all samples. Similarly, TLC detected no Metanil Yellow in unspiked candies, though it successfully identified the dye in spiked samples (R_f 0.7). Conversely, UV-Vis spectroscopy detected apparent concentrations (0.69–2.32 ppm) in seven of nine unspiked samples. However, these are not true positives due to spectral overlap with Tartrazine, a permitted yellow dye. Despite this specificity limitation, UV-Vis demonstrated high accuracy, achieving a 93.78% recovery rate in spiked samples.

Conclusion: In conclusion, the sample preparation used in this study has successfully produced a clear sample extract, making them suitable for both qualitative and quantitative analysis. The overall findings of this study highlight both the practical challenges and the effectiveness of each method. UV-Vis is the most sensitive, but the results cannot confirm the true presence of Metanil Yellow. TLC on the other hand complemented it by offering qualitative confirmation, whereas the preliminary chemical test is unreliable for low-level or visually complex samples.

Keywords: Metanil Yellow, food adulterations, UV-Vis spectroscopy, thin-layer chromatography (TLC), chemical test

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