

UV-Vis Spectroscopic Detection of Illicit Rhodamine B Dye in Local Shrimp Paste

Puteri Nurul Aisyah Amiruddin^a, Hamizah Md Rasid^{ab*}

Structured Abstract

Background: Rhodamine B is a synthetic xanthene dye prohibited for use in food due to its genotoxic and carcinogenic effects. Despite regulations, it is still illegally used to enhance the appearance of products like shrimp paste, posing serious health risks. There is limited research on the prevalence of Rhodamine B in Malaysian shrimp paste. Current analytical methods offer excellent sensitivity and accuracy; however, they are expensive and are not suitable for routine or on-site testing. The purpose of this study is to investigate the presence of Rhodamine B in locally available shrimp paste and to propose a more accessible and cost-effective analytical method by combining chemical test, ultraviolet-visible (UV-Vis) spectrophotometry and thin-layer chromatography (TLC).

Methods: Ten shrimp paste samples were collected from local markets. For chemical screening, 2 g of each sample was extracted using sodium hydroxide and petroleum ether, followed by acidification with 10% HCl to observe colour change. For UV-Vis analysis, both spiked and unspiked samples were treated with methanol and 0.1 N HCl, then analyzed at 557 nm using a Perkin Elmer Lambda 25 UV-Vis Spectrophotometer. Calibration standards ranging from 2 to 6 µg/mL were used to construct a calibration curve. TLC was conducted using silica gel plates and a mobile phase of n-butanol:ethyl acetate:ammonia (10:4:5), with visualization under both white and UV light, as well as by comparing R_f values to those of the Rhodamine B standard.

Results: This study shows that one out of ten samples tested positive for Rhodamine B with an absorbance of 0.637 and a concentration of 2.74 µg/mL. The calibration curve exhibited excellent linearity ($R^2 = 0.9999$), with LOD and LOQ values of 0.0623 µg/mL and 0.1888 µg/mL, respectively. Spiked recovery tests yielded average recoveries of 100.42%, validating the method's accuracy. TLC confirmed results visually by matching R_f values and fluorescence spots to the Rhodamine B standard.

In conclusion, the findings of this study demonstrate that integrating chemical testing, UV-Vis spectrophotometry, and TLC provides a practical, cost-effective, and reliable approach for detecting illicit Rhodamine B in food. This method contributes to both food safety monitoring and supports forensic and regulatory enforcement actions.

Keywords: Rhodamine B, Shrimp Paste, UV-Vis Spectrophotometry, Thin-Layer Chromatography

*Correspondence: hamizah7708@uitm.edu.my

^a School of Chemistry & Environment, Faculty of Applied Sciences, Universiti Teknologi MARA, Shah Alam, Malaysia

^b Multifunctional Nanoporous Material Research Group (MULNA), Universiti Teknologi MARA, Shah Alam, Malaysia