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Perspective

Development and Analysis in Food by Thin-Layer Chromatography

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ABOUT THE STUDY

Thin layer chromatography is a technique that is frequently used during food evaluation and quality control. TLC is an open chromatographic technology that works with chemical, biological, and microbial derivatization techniques. Since they are compatible, *in situ* bioassays may be performed right on the plate to produce activity-profile chromatograms, or the effect-directed examination of the material. Numerous characteristics that can currently be evaluated using this analyte format are connected either to desired or undesirable characteristics for products that are related to food. The TLC assays can identify pollutants (antibiotics, pesticides, estrogenic compounds, etc.), substances that affect nutrient and metabolite absorption, metabolism, or excretion, as well as substances that could improve consumer health. They can also identify substances related to food stability (antioxidants, antimicrobials, antibrowning, etc.).

For many years, general chemistry laboratories have employed Thin Layer Chromatography (TLC), a straightforward, affordable, and user-friendly planar chromatographic method, to regularly separate chemical and biological substances. The sample areas on the TLC plate are typically observed using chemical and optical techniques. There has been a long-standing interest in the creation of interfaces that enable TLC to be merged with Mass Spectrometry (MS), one of the most effective analytical tools for structure determination, even though direct identifying and structural elucidation of the solutes on the TLC plate through all these methodologies are not possible. The existing TLC-MS systems can be divided into two groups based on differences in their operational procedures: i) indirect mass spectrometric analyses, carried out by scraping, extracting, purification, and concentrating the analyte from the TLC plate before directing it into the mass spectrometer's ion source for additional analysis; and ii) direct mass spectrometric analyses, in which the analyte on the TLC plate is characterized directly through mass Direct TLC-MS analysis is typically carried out in vacuum, although the introduction of ambient spectrometry has made it possible to characterize analytes on TLC plates under atmospheric pressure.

As a result, there are two additional kinds of TLC-MS procedures dependent on the ion source's operating environment: ambient TLC-MS and vacuum-based TLC-MS. For many analysts, the astounding prevalence of this modest analytical technique—both in its standardized way and the high-performance one , whether hyphenated or not—might initially appear chaotic and random, playing a supporting rather than a leading role in research, and not being able to make conclusive statements that mean anything.

ased on these considerations, our goal is not to provide a comprehensive review of TLC's use in screening botanicals, but rather to provide a framework (illustrated with a variety of real-world examples) that emphasizes TLC's crucial role in the following analytical tasks: i) resolving puzzles relating to chemotaxonomy of plants; ii) screening a wide range of biological properties of plants; iii) providing high quality control of medicinal herbs for both manufacturers and consumers, quality assurance, nutritional content, and the monitoring of dangerous substances in honey bee products have emerged as hot button issues.

Bee-products with a high concentration of bioactive chemicals are becoming more and more popular because of their potential impact on human health. To provide an overview of thin-layer chromatography techniques used in bee product quality control, authenticity is testing and chemical profiling in order to assist scientists working in the field of bee product chemistry in making use of the benefits of this technique in the identification and eradication of dishonest manufacturing practices. Recently, the simultaneous measurement of analytes with various detection principles, identification of specific bioactive compounds, and chemical structure elucidation have been made possible by hyphenation of thin-layer chromatography, image analysis, and chemometric. Thin-layer chromatography has several advantages that have been highlighted. These advantages may spur more research and lead to advancements in the identification and abolition of marketing fraud techniques.

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