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Pesticides

Marija Kaštelan-Macan and Sandra Babić
University of Zagreb, Zagreb, Croatia

I. INTRODUCTION

Because of the growing awareness of the detrimental influence of pesticides and their residues on the environment and human health, there has been an increase in the number of papers that analyze their separation and isolation from water, soil, food, and biological material. Numerous analytical techniques have been developed with chromatography in the forefront. Although gas chromatography (GC) and high-performance liquid chromatography (HPLC) are still the leading chromatographic techniques, thin-layer chromatography (TLC) is being used more frequently in the analysis of pesticides, thanks to modified stationary phases, optimization of mobile phases, and modern apparatus for developing chromatograms and for quantification. The growing use of efficacious techniques for the separation and isolation of pesticides from complex sample matrices is contributing to the success of thin-layer chromatography.

Because the second edition of this Handbook gives a detailed and instructive review of sample preparation and pesticide identification (1), and because of the large number of references over the last 10 years or so, this chapter reviews the topic only for the period 1990–2001.

Numerous useful reviews, both general ones and those devoted to specific determinations, were published over this period. General reviews of pesticide analysis by TLC, including theory, chromatographic systems, methods of detection and quantification, and applications, have been published (2–13). Separation and determination of nonionic surfactants used as pesticide additives were reviewed (14). TLC methods for determining the octanol/water partition coefficient with data for 221 pesticides and metabolites were published (15).

Chromatographic methods, including solid-phase extraction (SPE), supercritical fluid extraction (SFE), and TLC determination of pyrethin and pyrethroid pesticide residue in crops, foods, and environmental samples were reviewed (16). A paper was published on the determination of herbicide residue in these sample matrices (17). A selective review was given of TLC methods of pesticide residue analysis (18). Papers were published on chromatographic pesticide residue analysis and advances in the techniques and application of TLC (19,20).

Pesticide residue analyses in environmental samples (21,22), food and agricultural samples (23–26), and water (27,28) were reported. Extraction methodology and chromatography for determination of pesticide residues in water were reviewed (29), as were the high-performance separation and determination of triazine herbicides and their residues (30,31).

Two interesting reviews discuss matrix solid-phase dispersion (MSPD), a patented process for conducting simultaneous disruption and extraction of solid and semisolid samples that can be successfully applied to pesticide analysis (24,32). The application of luminescence methods for determining pesticides in various sample matrices were reviewed (33). The color reactions of 178 pesticides with six detection reagents were tabulated to form a rapid screening system for forensic analysis (34). A review of modern HPTLC pesticide analysis using automated multiple development (AMD) was presented (35).