REFERENCES

Anastassiades M., Lehotay S. J., Stajnbaher D., Schenck F. J. 2003. Fast and Easy Multiresidue Method Employing Acetonitrile Extraction/Partitioning and "Dispersive Solid-Phase Extraction"for the Determination of Pesticide Residues in Produce, *J. Assoc. Offic. Anal. Chem.*, 86, 412-431.

Hu X; Juanxin Y, Znigang Y, Lansun N, Yanfei L, Peng W, Jung L, Xin H, XIagang C, Yibin Z. 2004. Determination of multiclass pesticide residues in apple juice by gas chromatography-mass selective detection after extraction by matrix solid-phase dispersion. *J. Assoc. Offic. Anal. Chem.,* 87:972-985

Gabaldon J.A., Maquieira A., Puchades R. 1999. Current trends in immunoassay-based kits for pesticide analysis. *Crit. Rev. Food Sci. Nutr.*, 39:519-538.

Newsome W.H. 1987. Determination of iprodione in foods by ELISA. In "Pesticide science and biotechnology", R. Greenhalgh and T. Roberts (Eds.). London, Blackwell Scientific Publication.

Newsome W.H. 1985. An enzyme-linked immunosorbent assay for metalaxyl in foods. *J. Agri. Food Chem.*, 33:528-530.

Newsome W.H., Shields J.B. 1981. A radioimmunoassay for benomyl and methyl-2-benzimidazolecarbamate on food crops., *J. Agric. Food Chem.*, 29:220-222.

Santanella, R.M. 1988. Monitoring human exposure to carcinogens by DNA adduct measurement. *Cellular biology and toxicology,* **4:** 511–516.

Santanella, R.M. 1990. Immunologic methods for the detection of carcinogen adducts in
humans. *Progress in clinical and biological research,* **340C:** 247–257.

Stajnbaher D., Zupancic-Kralj L., 2003. Multiresidue method for determination of 90 pesticides in fresh fruits and vegetables using solid-phase extraction and gas chromatography-mass spectrometry, *J. Chrom. A*, 1015:185-198.

Wright P.F.A., Apostolou E. 1999. Advances in immunochemical methods of analysis for food contaminants. In "Environmental contaminants in food" C.F. Moffat and Whittle (Eds.) CRC Press. Sheffield. UK. 81-103.

MULTICOMPONENT CHROMATOGRAPHIC METHODS FOR DETERMINATION OF PESTICIDE RESIDUES IN FOOD

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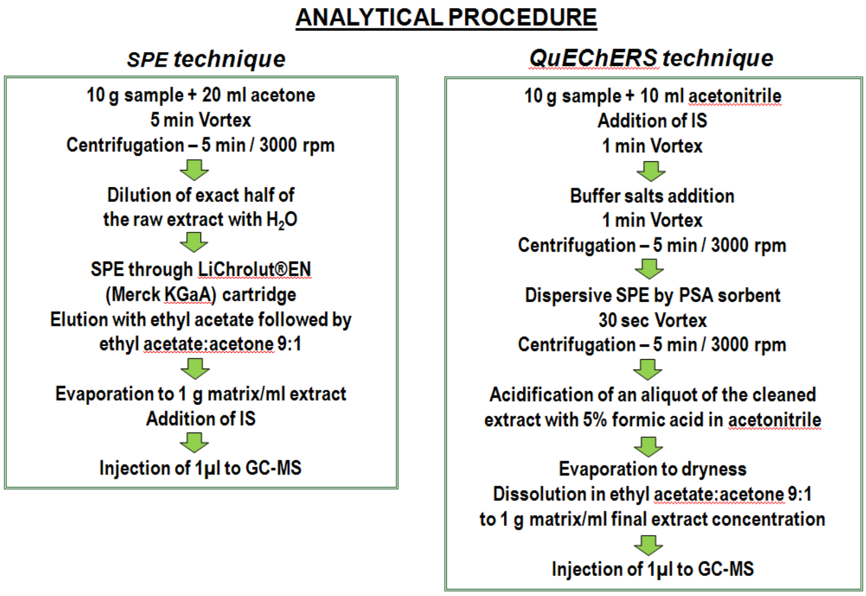

Figure 1.
Sample preparation procedure for the two techniques

Table 1. Average recoveries and LOQs for the analyzed compounds obtained by two methods

Pesticide group	Recovery range %		LOQ [mg/kg]	
	SPE	QuEChERS	SPE	QuEChERS
Organophosphates	88.3 ÷ 96.0	82.0 ÷ 109.8	0.9 ÷ 10.7	2.9 ÷ 35.7
Organochlorine	79.5 ÷ 94.3	75.2 ÷ 93.1	6.7 ÷ 9.1	9.9 ÷ 14.8
Pyretroids	84.1 ÷ 104.0	56.0 ÷ 103.9	2.8 ÷ 14.0	1.9 ÷ 34.3
Triazoles	90.3 ÷ 101.5	94.7 ÷ 107.5	2.4 ÷ 15.2	3.7 ÷ 15.1
Carbamates	89.1 ÷ 93.7	85.2 ÷ 103.3	3.4 ÷ 7.1	4.0 ÷ 9.6
Dicarboximides	89.4 ÷ 95.3	67.4 ÷ 104.6	4.9 ÷ 8.3	6.1 ÷ 30.5
Strobilurins	92.2 ÷ 97	84.9 ÷ 106.7	3.3 ÷ 5.8	4.2 ÷ 7.6

Different types of pesticides are widely applied to protect plants from disease, weeds and insect damages during plant growing and storage. Many of these compounds can remain as residues in foodstuffs after their application and therefore they can pose serious risk for the consumers. Hence adequate pesticide residue control intended to ensure the safety of foodstuffs is needed. A brief overview concerning the analysis of pesticide residues by chromatographic methods in samples of plant origin is presented. The basic principles and recent developments in the sample preparation (extraction and clean-up), detection and quantification are discussed. Comparison between traditional solid phase extraction techniques and so-called QuEChERS (quick, easy, cheap, effective, rugged, safe) approach is emphasized. Possibilities and limitations of single quadrupole mass spectrometer for quantitative determination are also discussed.

EXPERIMENTAL AND NUMERICAL STUDY OF THE HENS EGG BEHAVIOUR AT THE IMPACT

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ABSTRACT

Hens eggshell behavior at the impact by a circular rod is studied. The instrumentation of the rod enables to obtain time history of the force at the point of the bar impact. The velocity of the rod is gradually increased up to some critical value at which the eggshell failure starts. At the same time the surface displacement of the eggshell is also recorded. The numerical simulation of the egg behavior under this impact has also been performed. LS DYNA 3D finite element code has been used for the evaluation of the force and surface displacement at the points of their experimental detecting. The experimental results well agree with numerical ones. The elaborated computational procedure has been future used for the numerical simulation of the Hens eggshell behavior at the impact on a rigid plate. Qualitative features of the numerical simulation agree with results recorded using of the high speed camera.

INTRODUCTION

Eggs can be regarded as naturally packaged food. When examining the quality of the packaging, one primarily considers the strength of the eggshell. The eggs are exposed to many different kinds of loading occurring during their collection, within the sorting equipment, and during transport. There exist several techniques to determine the material strength of an eggshell see e.g. (Kemps et