

# MICROWAVE ASSISTED MICELLAR EXTRACTION AS ALTERNATIVE METHODOLOGY FOR THE EXTRACTION OF ORGANOCHLORINE AND ORGANOPHOSPHOROUS PESTICIDES IN SOLID SAMPLES

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## INTRODUCTION

Organochlorine and organophosphorous pesticides are lipophilic compounds which tend to associate to organic matter and organisms. Their low chemical and biological degradation rates have led to their accumulation in biological tissues and subsequent magnification of concentrations in organisms progressing up the food chain.



In addition are also toxic compounds which can affect to human health.

### Organophosphorous Pesticides Mix

- 1.- Dimethoate
- 2.- Methidation
- 3.- Parathion methyl
- 4.- Malathion
- 5.- Ethoprophos
- 6.- Parathion ethyl
- 7.- Diazinon
- 8.- Chlorpyrifos

### Organochlorine Pesticides Mix

- 1.- 4,4'-DDD
- 2.- dieldrin
- 3.- 4,4'-DDT
- 4.- 2,4'-DDT
- 5.- 4,4'-DDE
- 6.- aldrin

A large number of multiresidues methods have been developed for this kind of compounds in solid samples.

As alternative to conventional techniques we used Microwave Assisted Micellar Extraction (MAME) for the extraction of these compounds in different matrix using a non-ionic surfactant solutions as extractant.

One of the most important properties of surfactants is that they can dissolve lipophilic compounds in aqueous solutions.

In this work we present the implementation of MAME procedure using POLE as extractant in the extraction of organochlorine and organophosphorous pesticides in sediments, soils and vegetables prior to their determination by HPLC-UV.

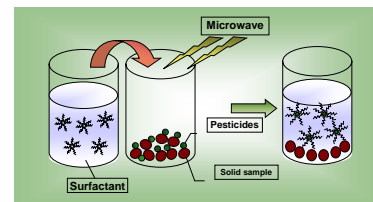
## EXPERIMENTAL

The samples were spiked with the mixture of organochlorine or organophosphorous pesticides.

### MAME procedure

Spiked samples were introduced in Teflon vessels with the optimum volume of POLE solution, introduced in the microwave oven and irradiated at the optimized conditions. The surfactant extracts were then removed, filtrated and directly analysed in the HPLC/UV system.

### Diagram of MAME process

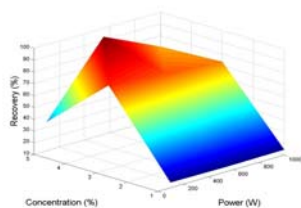


## RESULTS AND DISCUSSION

### Optimized Variables

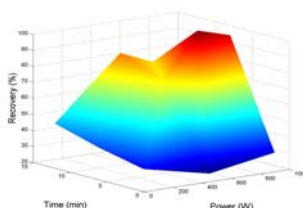
For the variables optimization was used a multiparametric analysis.

#### Surfactant Concentration

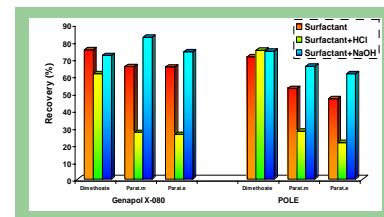


Response Surface Diagram where is represented the recovery of the compound 4,4'-DDT versus Power and Surfactant Concentration

#### Microwave's Power and Time

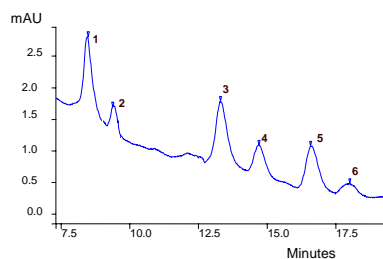


Response Surface Diagram where is represented the recovery of the compound 4,4'-DDT versus Power and Time



Effect of pH on the extraction

### Analytical Applications



Chromatogram of an extract of six organochlorine pesticides

### MAME Recoveries (%)

Surfactant	Compound	MAME Recoveries (%)		
		Tomato	Lettuce	Pepper
POLE	Dimethoate	--- <sup>a</sup>	94.5	85.8
	Methidathion	86.3	84.2	67.4
	Parathion-m	90.3	83.8	66.7
	Malathion	72.7	76.0	50.0
	Ethoprophos	74.3	100.9	--- <sup>a</sup>
	Parathion-e	87.5	83.5	60.8
	Diazinon	93.3	59.0	49.3
	Chlorpyrifos	35.0	60.0	32.4

<sup>a</sup> Matrix interference

## CONCLUSIONS

Microwave assisted extraction of pesticides using surfactant solutions is a procedure with several advantages: is an efficient method, less time consuming, green method, low cost and their compatibility with mobile phase used in HPLC.

The method has been applied in different types of soils and vegetables at different spiked times with satisfactory results for organochlorine and organophosphorous pesticides.

### References

1. E. Kusvuran, O. Erbatur, J. Hazardous Materials 106B (2004) 15-125
2. Z. Sosa Ferrera, C. Padrón Sanz, C. Mahugo Santana, J.J. Santana Rodríguez, Trends in Anal. Chem. 23 (7) (2004) 469-479.
3. D. Vega Moreno, Z. Sosa Ferrera, J.J. Santana Rodríguez, J. Chromatogr. A 1104 (2006) 11-17
4. C. Padrón Sanz, R. Halko, Z. Sosa Ferrera, J.J. Santana Rodríguez, J. Chromatogr. A 1078 (2005) 13-21

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### Recoveries of the organochlorine pesticides in a soil for a 24 hours, 2 weeks and 9 weeks spiked soil

