A Multi-Residue LC-MS/MS Method for the Trace Analysis of 300 Pesticides Using a Solid-Core Stationary Phase With Unique C18 Bonding Chemistry

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1. Introduction

- More than 1000 pesticides are used worldwide to protect crops from pests and pesticide residues can be found in small amounts in fruit, vegetables, cereals and water
- The presence of pesticides over certain thresholds (known as safe exposure limits) can result in adverse health effects in humans so determination at low levels is important
- This poster presents a rapid multi-residue LC-MS/MS method for the trace analysis of 300 pesticides commonly found in foodstuffs and animal feed using a solid-core stationary phase with unique C18 bonding

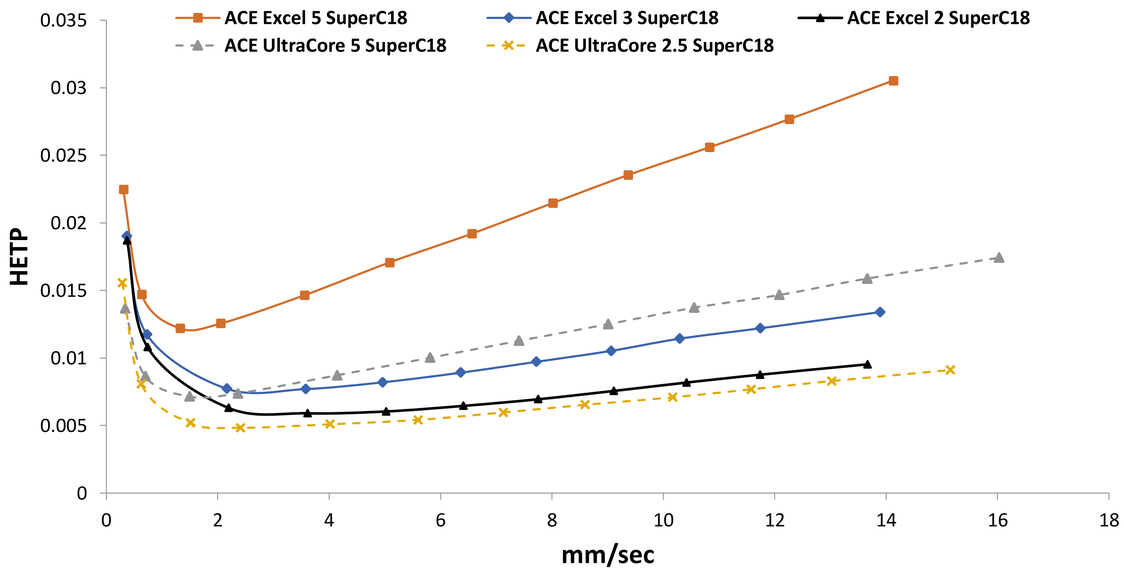
2. Solid-Core Particle Technology

- Superficially porous particles offer advantages such as analysis speed at lower back pressures compared to fully porous particles of the same size

$$HETP = A + \frac{B}{u} + C.u$$

- Solid-core particles are able to be packed into a more homogenous bed near the column wall, reducing eddy diffusion (A-term) contribution
- Axial diffusion (B-term) contribution is also reduced due to solid cores
- Smaller A and B van Deemter terms result in a smaller HETP (Height Equivalent to Theoretical Plate), therefore increasing efficiency (or number of plates)

3. Efficiency Comparison - Solid-Core vs Fully Porous



Column dimensions: 50 x 2.1 mm
Mobile phase: 0.1 % TFA in MeCN/H_2O
Composition: Varied so k(ketoprofen) ≈ 10

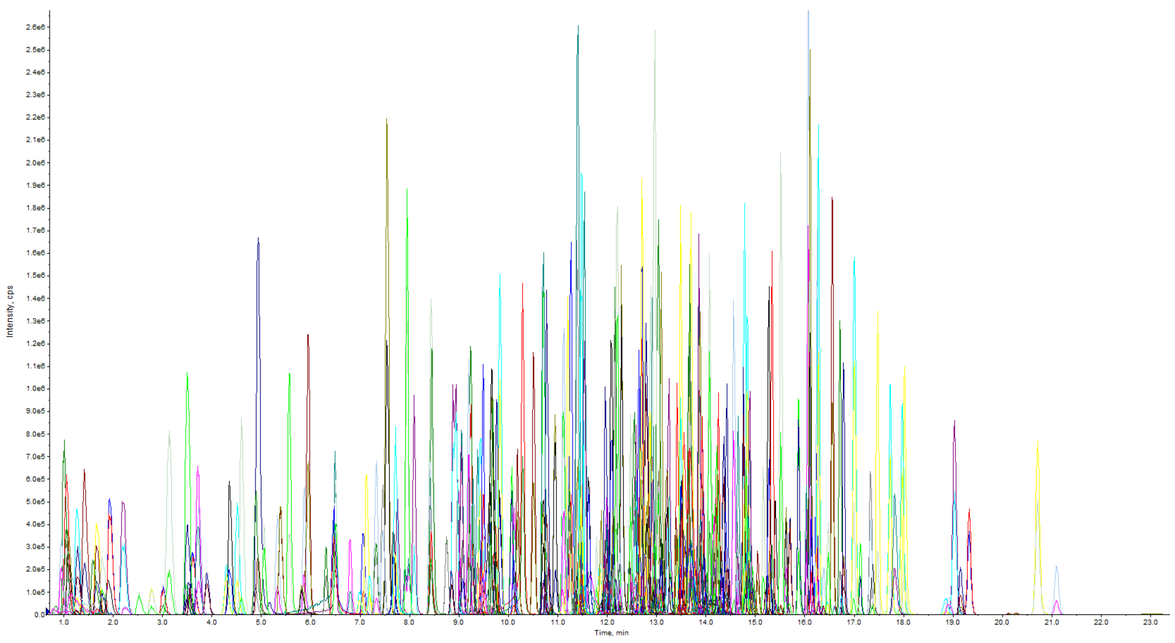
Temperature: 40 °C
Injection volume: 2 µL
Detection: UV, 256 nm

4. LC-MS/MS Method Conditions

- QuEChERS sample preparation technique used for food samples

Column:	ACE UltraCore 2.5 SuperC18, 100 x 2.1 mm
Part number:	CORE-25A-1002U
Mobile phases:	**A:** 5 mM ammonium formate in MeOH/H_2O (1:9 v/v) **B:** 5 mM ammonium formate in MeOH/H_2O (9:1 v/v)
Gradient:	30 – 100 % B in 14.5 mins including 0.5 min isocratic hold at start
Flow rate:	0.3 mL/min
Injection volume:	6 µL
Temperature:	24 °C
Detection:	ESI-MS/MS in positive ion mode Heater gas temp: 450 °C Capillary voltage: 5000 V

5. 300 Pesticides Panel using LC-MS/MS



Full analyte list available on request

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6. Summary and Conclusions

- Pesticides are used worldwide to protect crops but can be harmful to human health if over-exposed
- This work presents a multi-residue, multi class low level LC-MS/MS method for the analysis of 300 pesticides in common use
- The use of a solid-core stationary phase with a unique C18 bonding enabled the efficient separation and retention of 300 different pesticides