

Monitoring of pesticides in air

Implications of sampling techniques

Introduction

Pesticides applied on agricultural fields can enter the atmospheric compartment due to volatilization. Depending on e.g. compound intrinsic properties and climatic conditions pesticides can thus be subjected to short- or long-range atmospheric transportation following application. Monitoring studies frequently demonstrate occurrence of currently used pesticides in the atmosphere, including trans-boundary transport. However, less is known on the importance of the collection procedure of air-borne pesticides in order to enhance interpretation of the transport processes involved.

Results

Distribution between gas phase & particle bound pesticides

- 11% of the total pesticide concentration were found on the filter
- Most particle bound pesticides were currently used
- 25 substances identified on filter, 9 exclusively on the filter
- 34 substances identified in gas phase

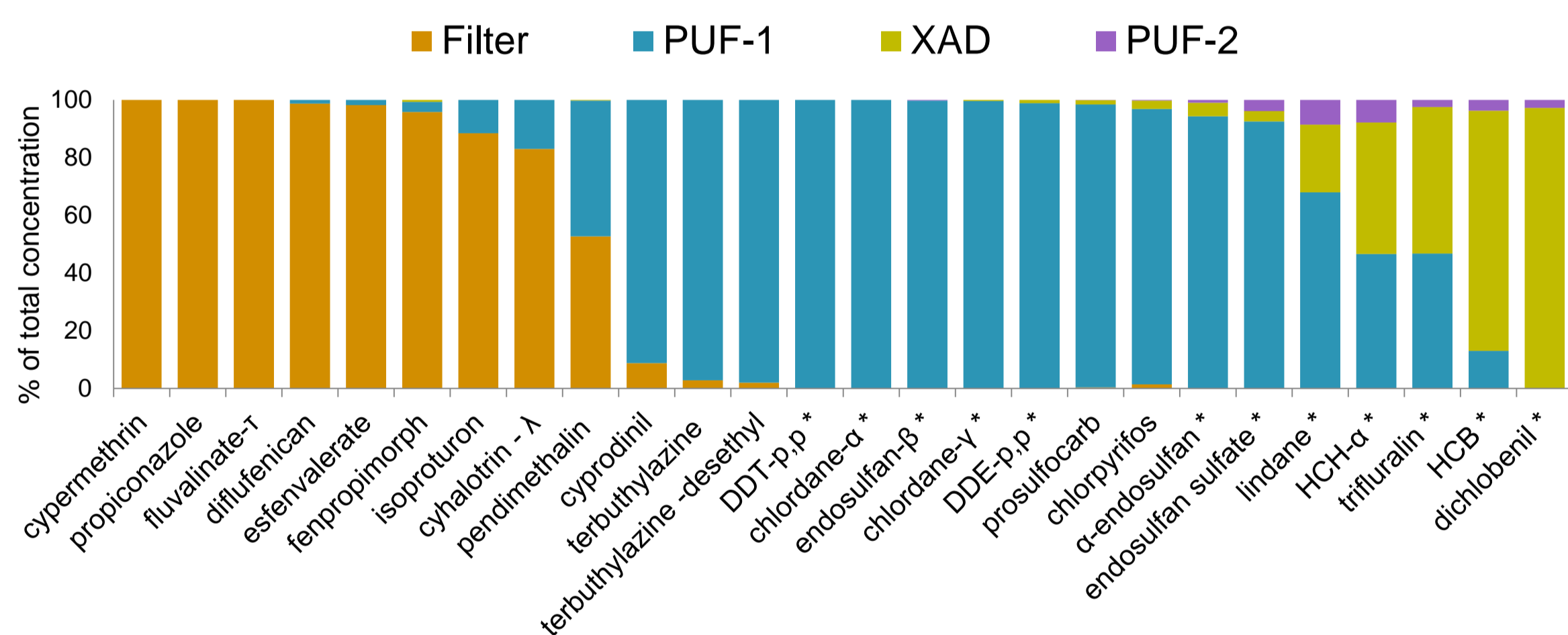


Figure 2: Distribution between filter, PUF and XAD for the 26 pesticides found in >20% of the 34 samples. Substances marked * were not approved for use within EU at the time of sampling.

Efficiency of adsorbent

- PUF showed breakthrough > 30% for dichlobenil, α-HCH, HCB and trifluralin
- 4 % of total pesticide concentration found in XAD and PUF-2

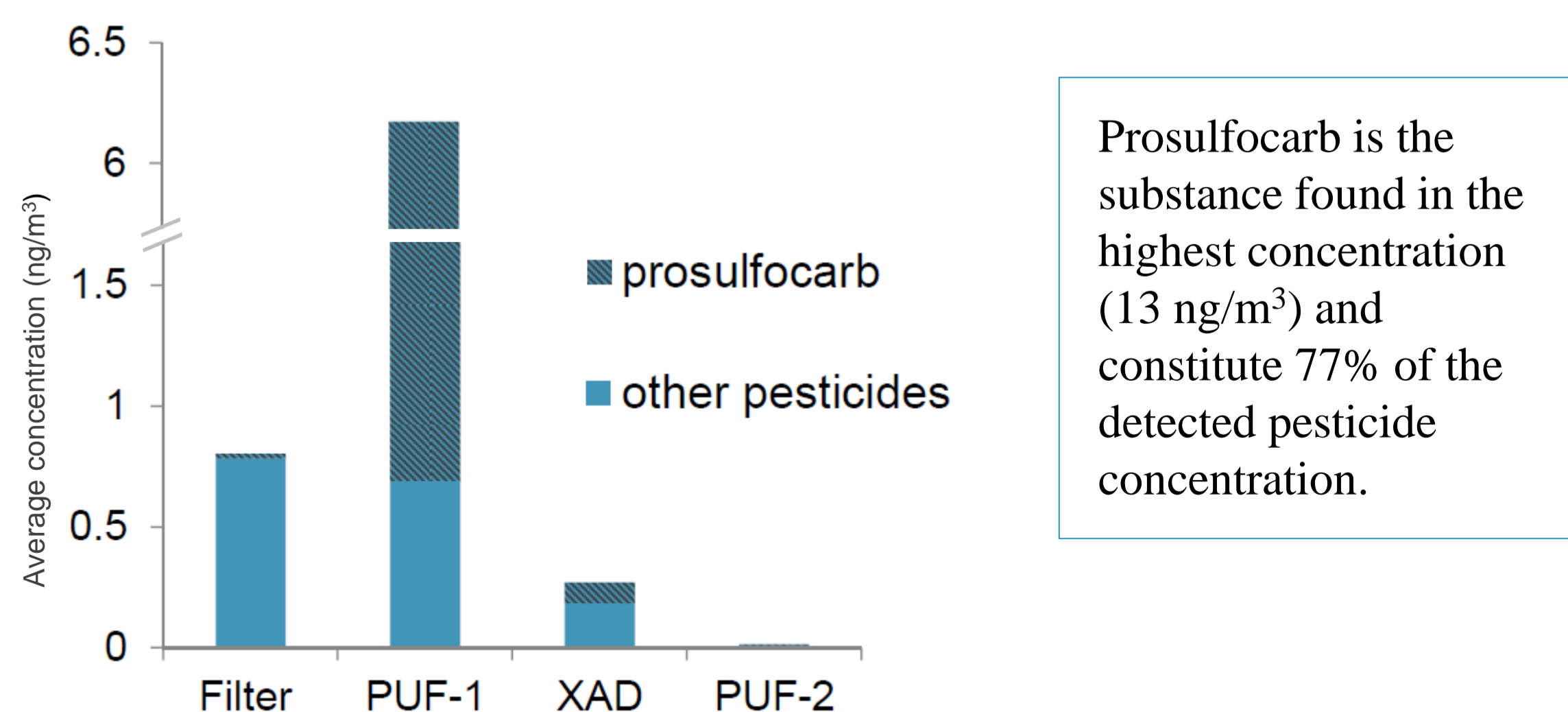


Figure 4: Average total pesticide concentration in the filter and adsorbents.

Method

- 34 air samples collected 2010 – 2012 in a rural area in the very south of Sweden
- High volume sampling (1000 – 4500m³) through (i) glass-fibre filter, (ii) polyurethane foam (PUF), (iii) a hydrophobic crosslinked polystyrene copolymer (XAD) and (iv) a second PUF
- Filter and adsorbents (PUF & XAD) were Soxtec extracted separately
- Analysed on GC-MS for 67 pesticides

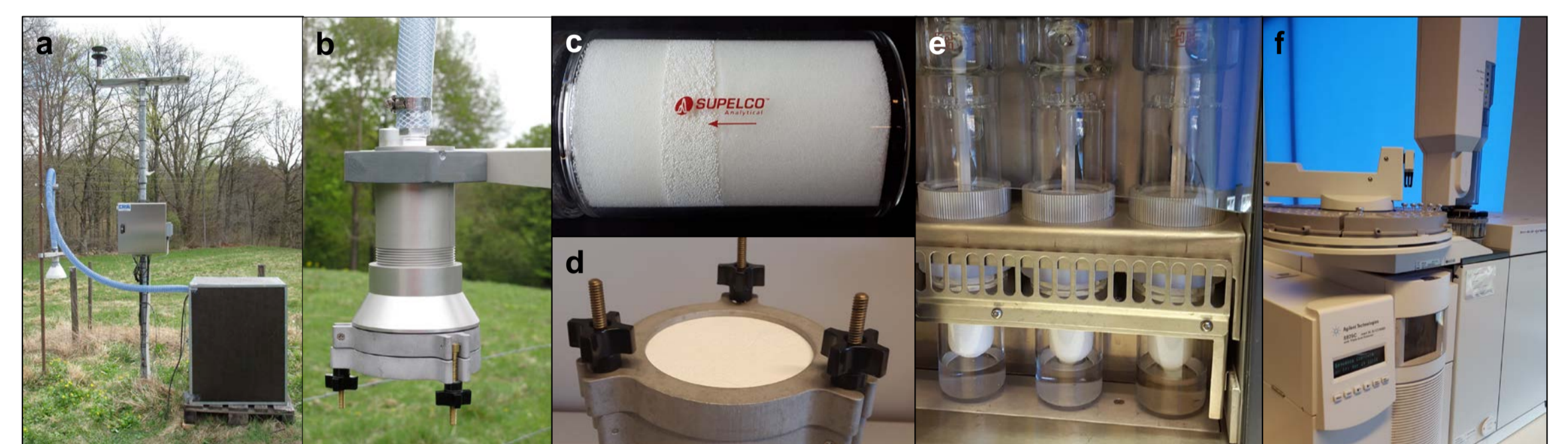


Figure 1: a) setup at sampling site b) holder for filter and adsorbents c) PUF-XAD-PUF sandwich d) filter in holder e) Soxtec extraction setup f) GC-MS.

Pesticide detections & concentrations

- A total of 43 pesticides were detected
- Most frequently found substances (100% of all samples): lindane, α-HCH, HCB, α-chlordane, γ-chlordane
- Substances found in highest concentrations: prosulfocarb (13 ng/m³), pendimethalin (2.9 ng/m³), fenpropimorph (2.9 ng/m³)

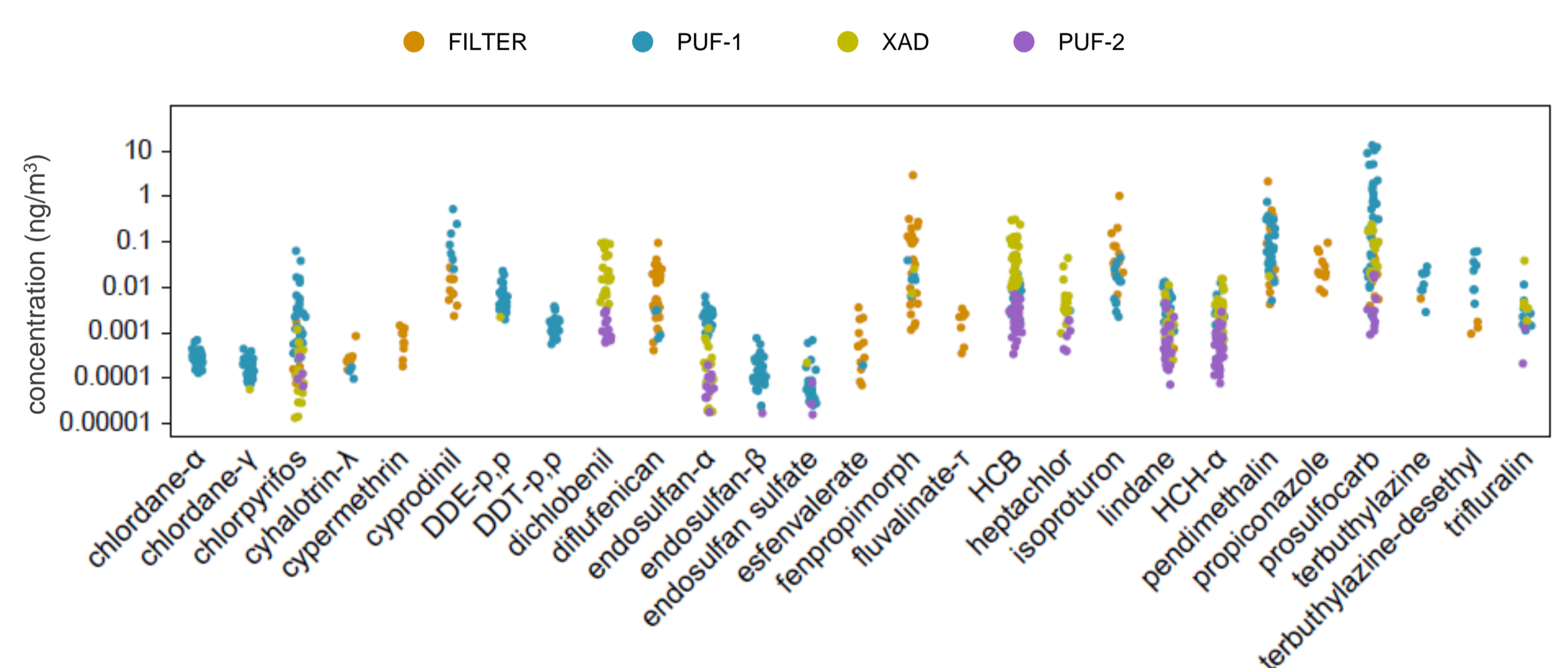


Figure 3: Concentration of pesticides found in > 20% of samples.

Conclusions

- Many currently used pesticides are bound to particles
- PUF is an efficient adsorbent for gas phase pesticides
- XAD was essential for capturing a few volatile, obsolete pesticides
- Analysis of both particle bound and gas phase pesticides needed