Tracking Pesticide Residues in European Air: A Harmonised, Low-Cost Approach

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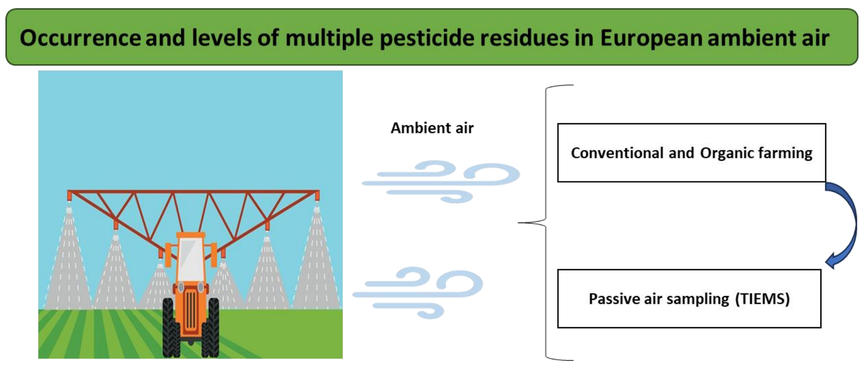
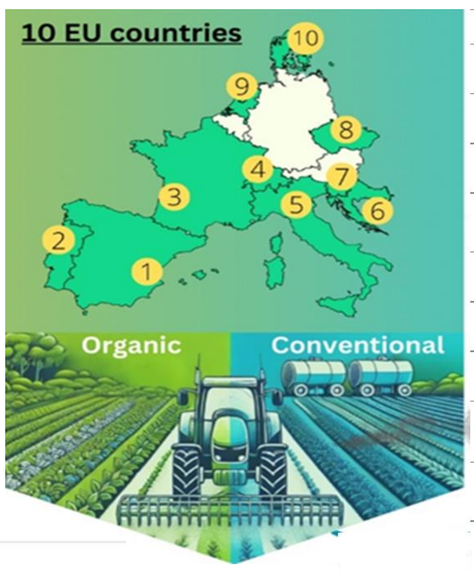
Background and Objective

Unravelling air contamination with pesticide residues is an emerging challenge. The lack of large-scale studies and unstandardised sampling methodologies has led to fragmented assessments. This study, part of the EU project SPRINT, presents the first harmonised, pan-European evaluation of pesticide residues in ambient air, addressing a critical gap in pesticide monitoring.

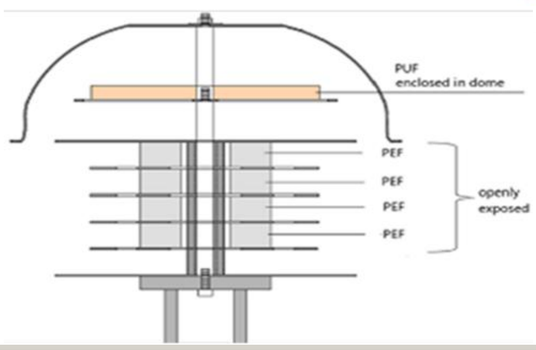


Methods

- 10 European case study sites (CSS), 10 fields under conventional (IPM) and 10 under organic (ECO) farming
- The CSS covers the main crop types seen in Europe and the three pesticide regulatory zones.

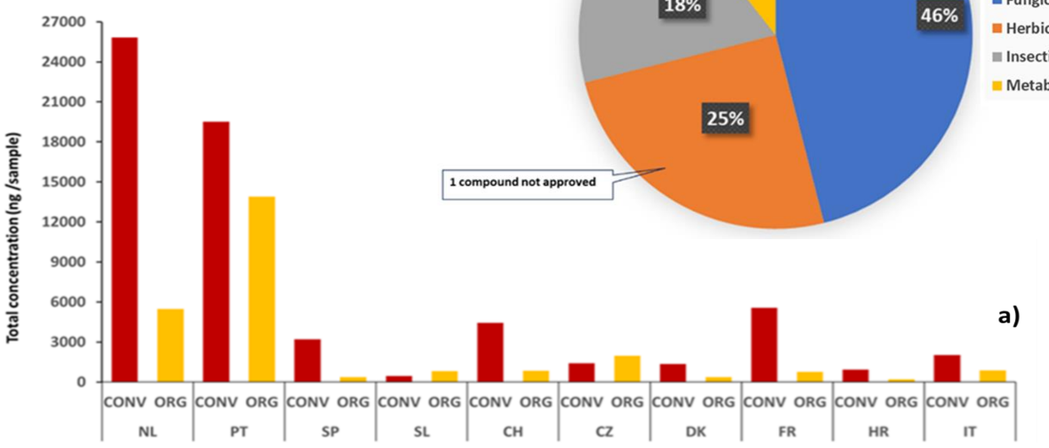


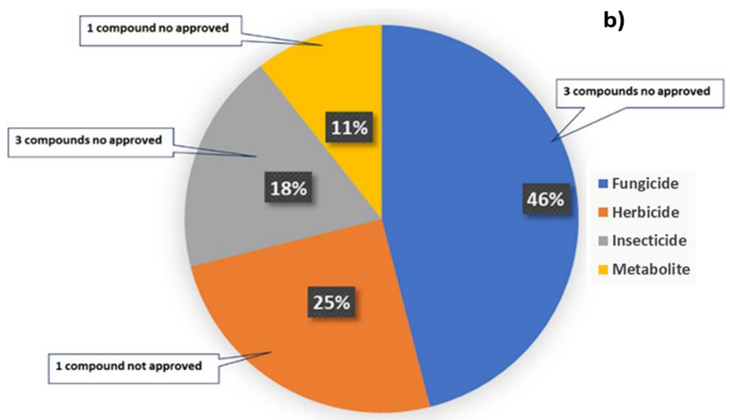
Country	Crop system	Farming system
1. Spain (SP)	Vegetables	Conventional
		Organic
2.Portugal (PT)	Grapes	Conventional
		Organic
3. France (FR)	Grapes	Conventional
		Organic
4.Switzerland (CH)	Fruit orchards	Conventional
		Organic
5.Italy (IT)	Vegetables	Conventional
		Organic
6.Croatia (HR)	Olives tree	Conventional
		Organic
7.Slovenia (SL)	Maize	Conventional
		Organic
8.Czech Republic (CZ)	Oil plants	Conventional
		Organic
9.Netherland (NL)	Potatoes	Conventional
		Organic
10.Denmark (DK)	Cereals	Conventional



- 161 pesticides were analysed
- Glyphosate and AMPA were collected in PEF filters.
- Seventy-three residues were collected in PUF filters.

Results

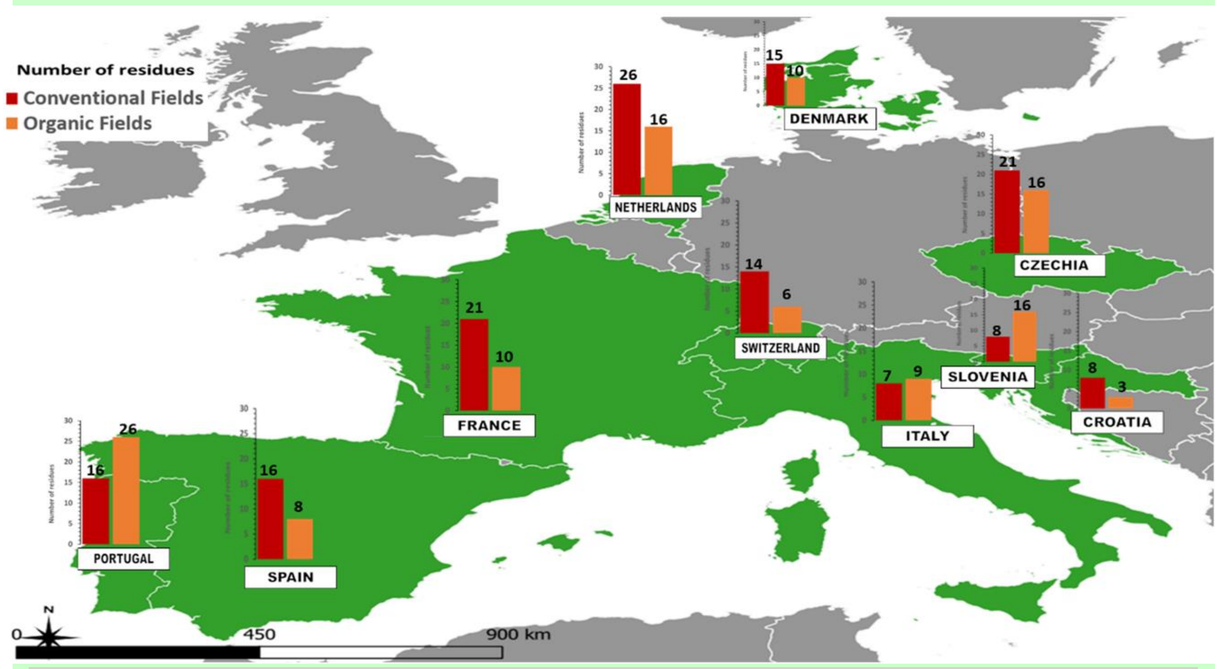




- 75 of 161 pesticide residues analysed were detected in ambient air at least once.
- The number of pesticides detected per CSS ranged from 3 to 26 residues.
- The highest number of pesticide residues was detected in Dutch samples (CONV (IPM): 26), followed by Portugal (ORG (ECO): 26), France (CONV (IPM): 21), and the Czech Republic (CONV (IPM): 21).
- 8 residues were not approved in the EU at the time of sampling, being DDE p,p', dieldrin, and hexachlorobenzene banned under the Stockholm Convention.

Results

- Glyphosate, AMPA, and pendimethalin were most frequently detected compounds.
- 19 residues were detected exclusively in conventional fields, while 10 were found only in organic fields.

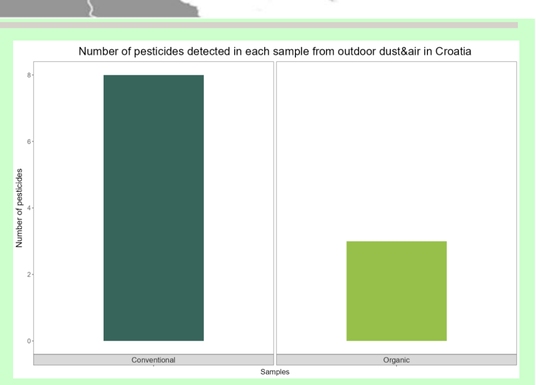


Results - Croatia

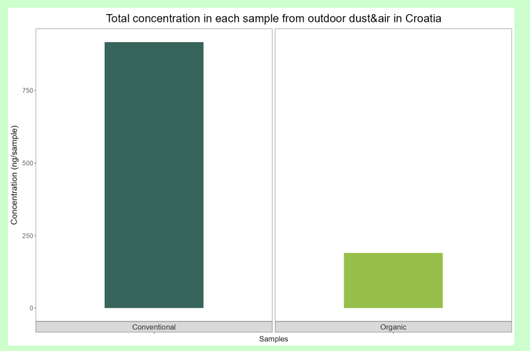
- A number of detected pesticides ranged between
- 3 (organic/ECO) and 8 (conventional (IPM)), with 100% detection frequency for glyphosate and folpet PHI.

Most frequently detected pesticides in outdoor dust&air (up to 20) with its median concentration

Pesticides	Frequency (%)	Concentration (ng/sample)
Glyphosate	100	88.2
Folpet PHI	100	138.4
AMPA	50	26.7
Carbendazim	50	28.4
Chlorpyrifos	50	87.8
Deltamethrin	50	32.8
Folpet	50	87.2
Phosmet	50	323.6
Phosmet oxon	50	67.9



- Phosmet had the highest levels (323,6 ng/sample), followed by folpet PHI (138.4 ng/sample)).



Conclusions

- Pesticide residue mixtures were omnipresent in ambient air in Europe.
- Results revealed distinct pesticide residue profiles between conventional (IPM) and organic farming systems.
- The overall results indicate that organic fields are not free from pesticide contamination.
- Our results show that TIEM diffusive samplers are a cost-effective approach to pesticide residue monitoring in air, particularly in regions with limited resources. This methodology can potentially assist regulatory procedures, providing an accessible tool for environmental and public health assessment.

Acknowledgements

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