SPRINT
SUSTAINABLE PLANT PROTECTION TRANSITION

RESEARCH PAPER SUMMARY

Occurrence of pesticide residues in harvested products of various crops from European conventional and organic farming systems

- A SPRINT study counted and measured **pesticide residues on 6 types of crop harvested across 10 European countries**.
- It compared crops from **organic farms** with crops from **conventional farms**.
- The crops contained **multiple pesticide residues** – especially those from conventional farms. These included long-banned substances.
- The study also suggested that pesticide residues can be influenced by agricultural practices, with **permanent crops tending to have higher levels**.

This factsheet summarises the following research paper:

Occurrence of pesticide residues in harvested products of various crops from European conventional and organic farming systems (2025). Tourinho *et al*. Journal of Hazardous Materials. https://doi.org/10.1016/j.jhazmat.2025.139113

The study was conducted under the EU Horizon 2020 **SPRINT project**.

https://sprint-h2020.eu

The research context: supporting pesticide regulation

Regulators need to know the levels of pesticides in food to ensure that there is **no unacceptable risk to consumer health**.

When deciding whether a pesticide is safe to be on the market, regulators typically focus on risk-assessing **single substances as applied to specific crops.**

However, a growing body of evidence finds that pesticides can have unpredictable and stronger effects when they are **combined in mixtures.**

Cross-contamination of crops can also occur, through spray drift, for example. This means **crops may contain pesticides which were originally applied to other crops.** It can also mean organic crops can become contaminated.

Research methods

During harvest season of 2021, the researchers collected **193 individual samples of crops from farms in 10 European countries:**

- **Croatia**
- **Czechia**
- **Denmark**
- **France**
- **Italy**
- **Portugal**
- **Slovenia**
- **Spain**
- **Switzerland**
- **The Netherlands**

95 of the samples were from **organic** farms.

98 of the samples were from **conventional** farms (most of which practiced integrated pest management (**IPM**)).

The samples represented **6 different crop types:**

- **vines**
- **vegetables**
- **orchard fruits**
- **olives**
- **oil plants**
- **cereals**

The researchers analysed the crops for the presence of **197 different pesticides**.

Results

Key results

- **78 substances** were detected altogether, including those have the potential to cause health problems, such as neurological and developmental issues.
- **Most (85.7%)** of the samples from **conventional** farms contained pesticide residues.
- **40%** of **organic** samples contained pesticide residues.
- Most conventionally farmed crops contained **multiple pesticides**.

Which types of crops had the most pesticides?

Permanent crops (e.g. orchard fruits, grapes and olives) had a higher concentration and number of substances than **annual crops** (i.e. crops that are replanted every year, such as vegetables and grains).

Annual crops rely less on pesticides because they benefit from farming practices, such as crop rotation, that reduce pest pressures.

Average pesticide concentrations per sample

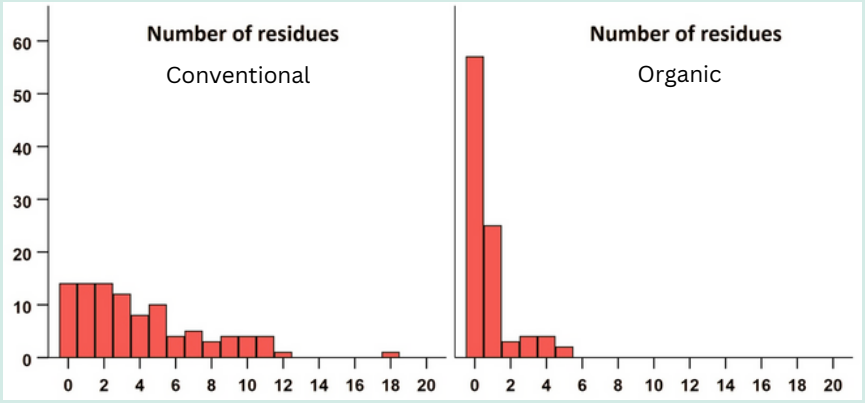
Coventional	Organic
46.4 µg/kg	2.7 µg/kg

As may be expected, **conventional** crops had much higher average **concentrations** of pesticides.

Which pesticide mixtures were found?

Conventionally grown crops contained **3 different pesticides**, on average. Organically grown crops contained **less than 1**, on average.

However, there was variation. **Up to 18 pesticides** were found on conventional crops and **up to 5** on organic crops.



Why did organic crops contain pesticides?

40% of the organic crop samples contained pesticides, albeit at much lower concentrations than those found in conventional crops. These included both banned pesticides and approved pesticides that are not authorised for organic farming.

The **banned substances**, such as dieldrin, lindane, and DDTs and its metabolites, can persist in soil for decades. The crops, therefore, probably **absorbed these from the soil.**

Other routes for **cross-contamination** of the organic crops are likely to include:

- **Irrigation water** drawn from groundwater that is contaminated by pesticides from surrounding conventional farms.
- **Spray drift** from neighbouring conventional farms.
- **Long-distance transport** in the air.

Were MRLs exceeded?

The maximum residue level (MRL) refers to the highest concentration of pesticide substances that regulators allow in or on food. The concentrations of pesticide substances in **11 of the conventional samples and 5 organic samples exceeded their MRL.**

However, it should be noted that the samples were collected during harvest. Exposure assessments for MRLs consider post-harvest commodities. Therefore, a direct comparison of these results to MRL values should be made with caution.

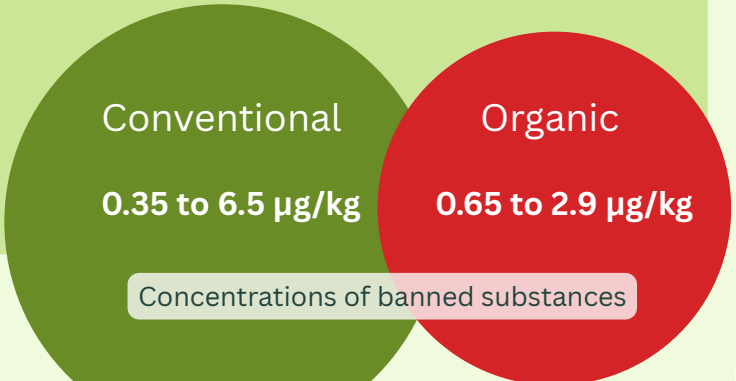
How many pesticides were banned substances?

Out of the 78 pesticides detected:

- **22%** of substances on **conventional** crops were non-approved.
- **36%** of substances on **organic** crops were non-approved.

These included dieldrin, lindane, and DDTs and its metabolites.

Concentrations of obsolete substances were similar for both crop types:



Conclusions and recommendations

This study provides **a snapshot of the occurrence and concentrations of pesticide residues** in harvested crops. It shows that these are strongly affected by agricultural practices.

It highlights the presence of pesticide mixtures on crops, particularly on conventionally farmed products. It, therefore, supports the case that regulators should **consider mixtures when assessing pesticides' risks.**

It further shows that cross-contamination can occur between farms and crops. **Continuous monitoring of pesticides in the environment can help identify possible risks to consumers.**

Want to know more?

Read the full research paper:
Occurrence of pesticide residues in harvested products of various crops from European conventional and organic farming systems (2025). Tourinho *et al.* **Journal of Hazardous Materials**, https://doi.org/10.1016/j.jhazmat.2025.139113

Any questions?

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About SPRINT

SPRINT is a 5-year international research project. It investigates pesticides' risks to health and the environment, and aims to accelerate the transition towards more sustainable plant protection.

The SPRINT project is funded by the EU under Horizon Europe. Project number: 862568.

https://sprint-h2020.eu