

# Analysis of Pesticides in organically and conventionally farmed Green Teas and Black Teas

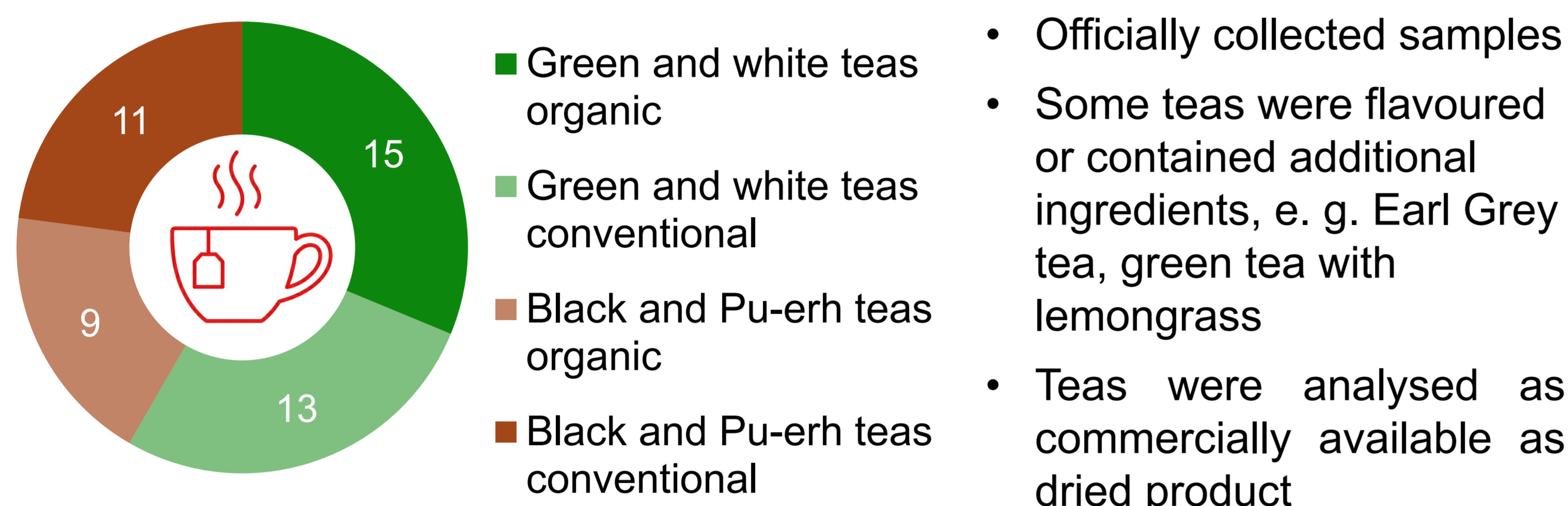
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## Introduction

Although Ireland is the leading European country in tea consumption with 198 L per capita per year, East Frisia, which is a German region on the North Sea coast, surpasses it with 300 L. Tea consumed in Europe comes from third countries. It is made from the leaves of the *Camellia sinensis* plant, which are processed through methods like steaming, rolling, oxidation, fermentation and drying to obtain white, green, Pu-erh and black tea. To ensure high-quality raw materials and prevent crop loss, pesticides may be used.

## Which teas did we analyse?



## Methods

The primary focus was on multi-residue analysis.

### DFG-S19 method for GC-MS/MS (EN 1528-(1-4):1996)

- Fat extraction followed by clean up with gel permeation chromatography (GPC)
- Analysed with Thermo Scientific™ TSQ™ 8000 (QQQ)

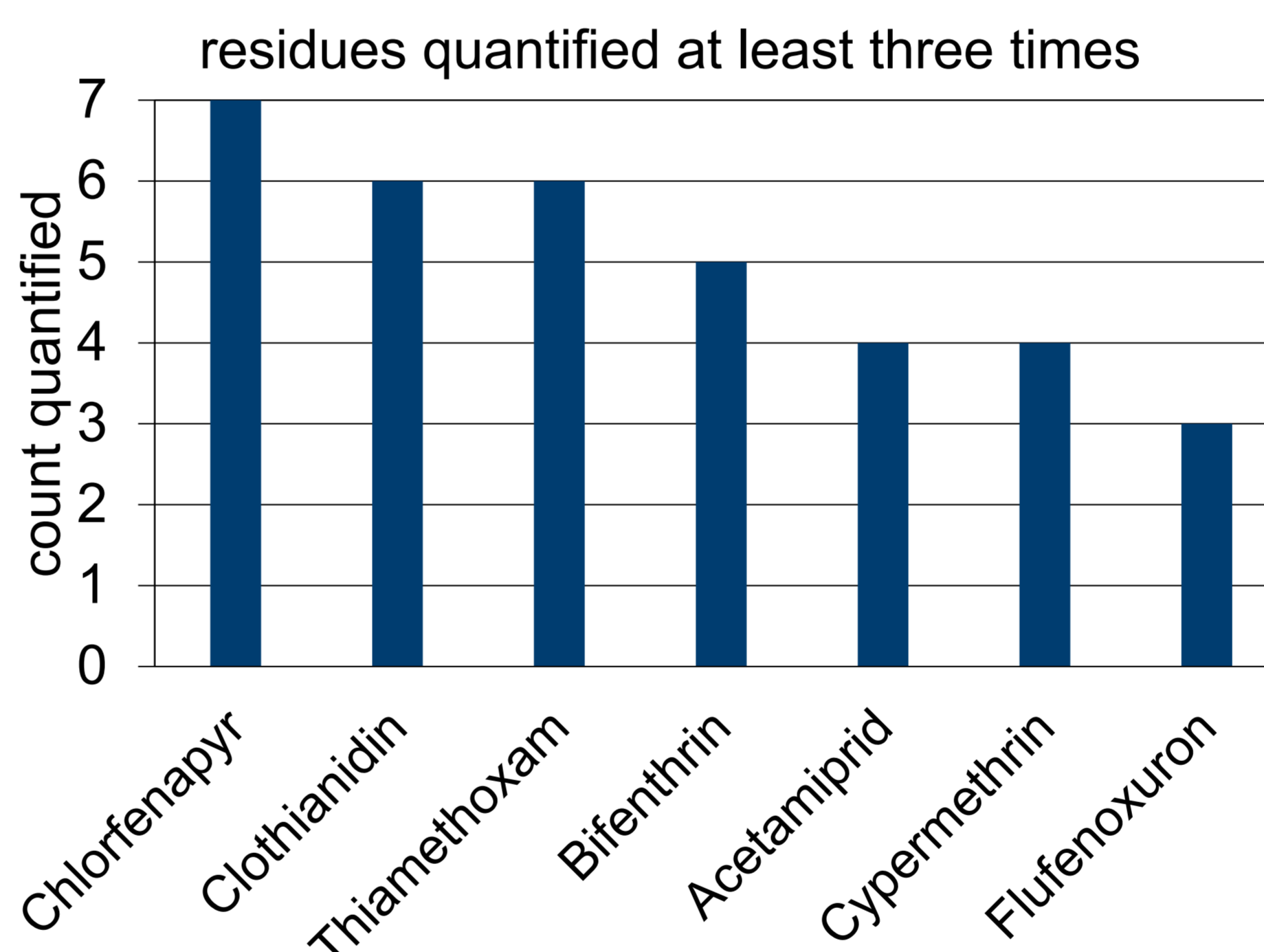
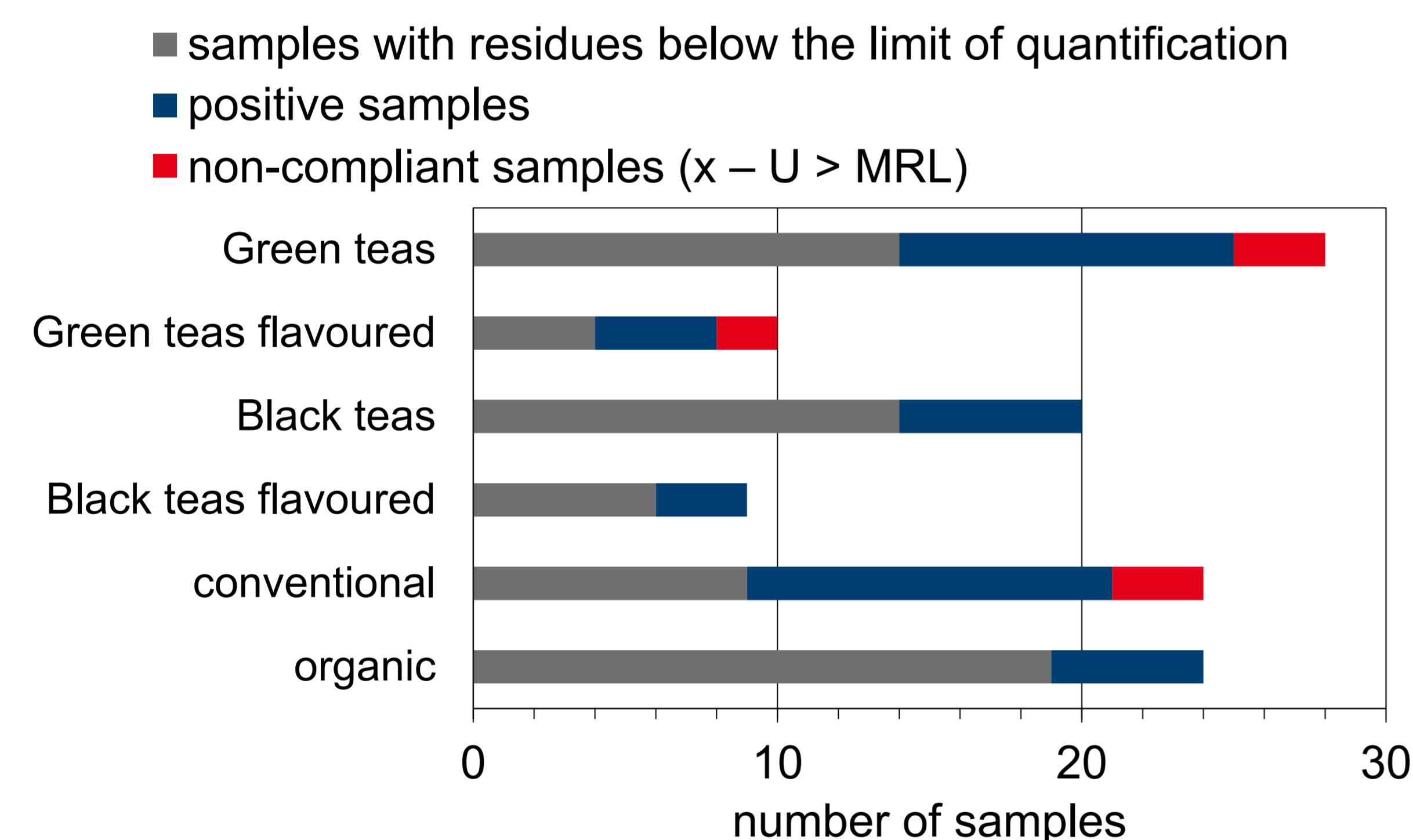
### QuEChERS method for LC-MS/MS (EN 15662:2018)

- Acetonitrile extraction/partitioning and clean-up by dispersive SPE (PSA/C18 for green tea; PSA/ MgSO<sub>4</sub>/ GCB for black tea)
- Analysed with SCIEX QTRAP® 6500+ (QQQ)

## About the Lab in Berlin, Germany

As the state laboratory for the federal states of Berlin and Brandenburg, the Landeslabor Berlin-Brandenburg operates as an official control laboratory.

## How was the residue situation?



### Teas without other ingredients

**38%**

with quantifiable residues  
11 out of 29 samples

### Teas with other ingredients such as flavouring

**47%**

with quantifiable residues  
9 out of 19 samples

- 7% exceeded statutory MRLs taking into account the expanded measurement uncertainty
- 27% of all samples contained multiple residues
- Green teas were more prone to quantified pesticide residues than black teas (50% compared to 30%)
- Residues were quantified in 63% of conventionally farmed teas and 21% of the analysed organic teas

- 5 out of 15 green tea samples labeled as organic with quantified pesticide residues
- Insecticides and fungicides represented the largest pesticide groups found
- Teas with flavorings or other ingredients show a nearly 10% higher rate of quantifiable residues. In flavoured green teas, pesticide residues were quantified in 6 out of 10 samples.

## Conclusion

The prevalence of multi residues highlights the "cocktail effect" (synergistic toxicological effects) making an individual risk evaluation necessary. As synthetic pesticides are prohibited in organic farming, these findings might stem from environmental drift or supply chain contamination rather than application.

