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# QUANTITATIVE ANALYSIS AND COMPARISON OF PESTICIDE RESIDUE IN GREEN TEA

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## INTRODUCTION

Green tea is second most consumed drink in the world. It is made of *Camellia sinensis* leaves and consists of several antioxidants, phenolic compounds, and caffeine. This gives the green tea its' anti-inflammatory, anti-microbial, anti-cancer and stimulative properties. It is often consumed daily as it has no specific pharmacological effects. Due to the high intake of green tea, it is important to determine the safety of the tea. Tea production is jeopardized by pests, who can reduce crop harvest up to 70%. To minimize the loss, pesticides are used in different production stages, but can remain in the final product.

## METHOD

- The experiment was conducted with 5 green teas without additives.
- ❖ Two of the samples were manufactured in Russia, 2 in Poland and 1 in England.
- ❖ Samples were prepared according to the QuEChERS method (EN 15662) and analyzed with gas chromatography-mass spectrometry method. All of the chemicals used in the experiment were of laboratory grade purity.
- ❖ The analysis was carried out with Agilent Technologies 7890B gas chromatography and Agilent Technologies 5977A mass-selective detector.
- ❖ The qualitative analysis was carried out with Agilent MassHunter Qualitative Analysis B.07.00 and quantitative analysis with Agilent MassHunter Quantitative Analysis B.07.00 programs.
- ❖ The results were compared within the limits established by the EU.

Table 1. Residues of pesticides in green tea samples.

Pesticide	LOD µg/kg	Status	MRL mg/kg	Detected in sample µg/kg			
				R01	R02	R03	R05
Hexachlorobenzene	1	Not Approved	0,02	<1			
lambda-Cyhalothrin	10	<10µg/kg	0,1	<10			10
Bifenthrin	10	Not Approved	30	<10	27	<10	19
Fenpropathrin	5	Not Approved	2				9
Chlorpyrifos	5	<5µg/kg	2				<5
Permethrin	5	Not Approved	0,1				38

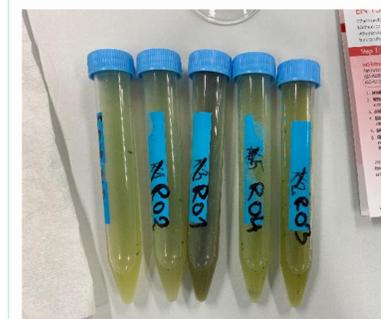


Figure 1. Extracted samples before the analysis

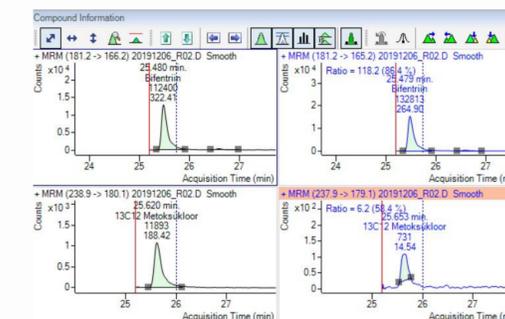


Figure 2. Bifenthrin residue found in sample R02

## AIM/S

- The aim of the research is:
  - ❖ to study green tea and its properties;
  - ❖ to review the impact of pesticides on human health;
  - ❖ to analyze the content of pesticide residues in green tea sold in retail;
  - ❖ to evaluate the pesticide residue content compliance with the limits set in the European Union.

## RESULTS

- ❖ Four out of five samples were found to contain pesticide residues.
- ❖ Two of the five samples revealed traces of pesticides.
- ❖ One sample did not contain any pesticides at all.
- ❖ Two samples were found to contain pesticides above the maximum level authorized in the European Union.
- ❖ One sample was found to contain four pesticides and one pesticide trace.
- ❖ Three of the five pesticides found are banned in the European Union.
- ❖ Four of the six pesticides identified in the study are banned in the EU - hexachlorobenzene, bifenthrin, fenpropathrin and permethrin.

## CONCLUSION

Green teas sold in Estonia contain traces of pesticides. None of the sampled teas contained pesticide residues above the EU standards, although some pesticides found are prohibited in the EU. Further research is needed to determine the rate of pesticide residue transmission into beverage during brewing.

## REFERENCES

Jia, W., Chu, X., Zbang, F. (2015). Multiresidue pesticide analysis in nutraceuticals from green tea extracts by comprehensive two-dimensional gas chromatography with time-of-flight mass spectrometry. *Journal of Chromatography A*, 1395, 160–166. DOI: <https://doi.org/10.1016/j.chroma.2015.03.071>

The 2016 European Union report on pesticide residue in food. (2018). European Food Safety Authority. <https://efsa.onlinelibrary.wiley.com/doi/epdf/10.2903/j.efsa.2018.5348>