

Mixtures of agrochemicals reshape soil microbial phenotypic structure more than individual applications

Melinda Haydee Kovacs, Dalma Eموke Kovacs

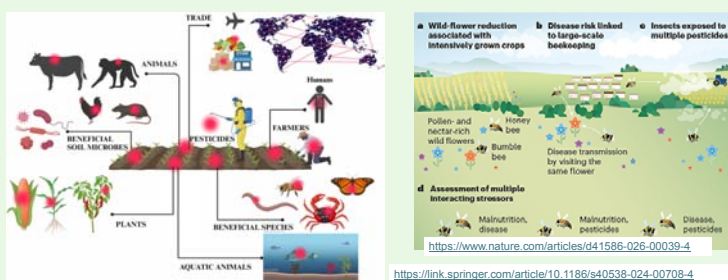
Research Institute for Analytical Instrumentation, INCDO INOE 2000, Cluj Napoca, Romania

Background

Agrochemical mixtures are widely used in agriculture to protect crops and ensure sustainable harvest.



However, the combined mechanism underlying their impacts on the soil microbiota remains unknown.



Methods

Steps from sample handling and sample preparation for analysis



Soil samples

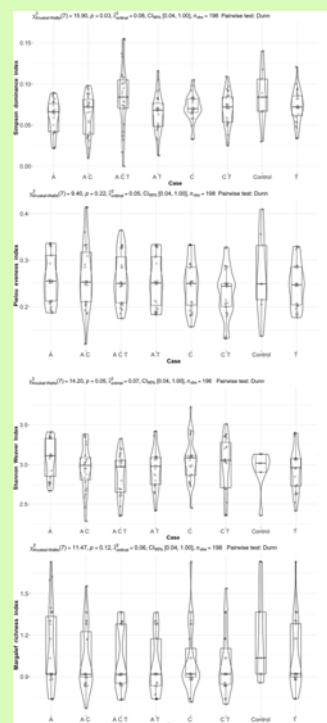


Sample handling

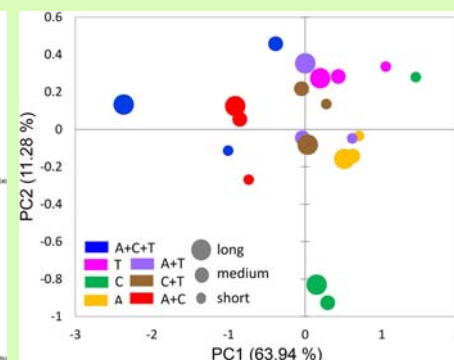


Mass spectrometric analysis (MALDI TOF/TOF and GC-MS/MS)

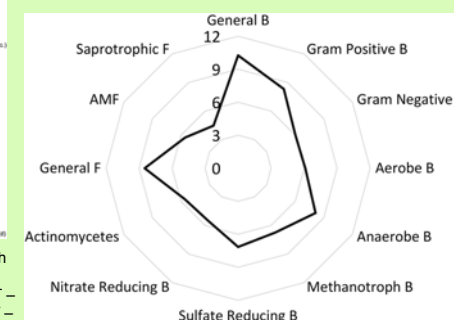
Results and discussions



Soil microbiome diversity index variation through exposure to single mixtures and mixtures of agrochemicals. A – atrazine; C – chlorpyrifos; T – thiamethoxam; AC – atrazine + chlorpyrifos; AT – atrazine + thiamethoxam; CT – chlorpyrifos + thiamethoxam; ACT – atrazine + chlorpyrifos + thiamethoxam



Principal component analysis of soil microbiome diversity variation through exposure to single and mixtures of atrazine (A), chlorpyrifos (C), and thiamethoxam (T) for short (1 h), medium (15 days), and long (30 days) time periods



Comprehensive influence of studied experimental conditions on each identified phenotypes in soil

Conclusions

The results demonstrated that studied pesticides, either individually or in combination, have different effects on the soil microbiome. A significant effect on the phenotypic structure and abundance of the microbiome, diversity index, and dominance ratio was observed. According to the results of our toxicity assessment, a lower impact was observed for fungal phenotypes than for bacterial phyla. We observed that there were phenotypic groups that reacted positively to certain exposure conditions. These findings suggest that there are microorganisms that can deplete the tested pesticides and use them as nutrient or energy resources. These findings can contribute to a better understanding of the response of the soil microbiome to potential challenges posed by management practices.

Acknowledgement

Project: **SOILSERV**

Sensing, mapping, interconnecting: tools for soil functions and services valuation –760104/23.05.2023, cod CF 245/29.11.2022

<https://icia.ro/en/soilserv>



Finanțat de
Uniunea Europeană
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