

Ecotoxicity impacts of pesticide use in Finnish field vegetable crops in 2003-2019

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Introduction

- **The use of chemical pesticides:**
 - varies between crops and years
 - may have hazardous effects on the surrounding environment and its organisms
- **There is lack of information on:**
 - the comprehensive use of chemical pesticides on different crops and their impacts on environment for almost all regions worldwide



From left to right: a carrot field, potatoes, swede growing in the field, fresh pea ready for harvesting. Photos: Kati Räsänen, Luke.

Material and methods

- **The data [1]:**
 - Concerns the use of 57 pesticides in 2003-2019 (17 years)
 - Covers more than 100 field vegetable farms in south-western Finland
 - And includes four crops: carrot, potato, swede and fresh pea
- **Models applied for analysis:**
 - Freshwater ecotoxicity impact assessment: the scientific consensus model USEtox 2.13
 - Pesticide emission fractions: the PestLCI Consensus model

Results

- Certain substances had a significant impact on the total impacts.
- **The most hazardous substances:**
 - Carrot: herbicides acclonifen and linuron (not used after 2013), insecticide lambda-cyhalothrin
 - Potato: fungicide mancozeb, herbicide acclonifen
 - Swede: insecticides lambda-cyhalothrin, cypermethrin, and dimethoate (not used since 2018)
 - Fresh pea: herbicide acclonifen, insecticides lambda-cyhalothrin, alpha-cypermethrin.

Results, cont.

- **Proportional ecotoxicity impacts per pesticide group across crops:**
 - 1. Herbicides on carrot (21%)
 - 2. Fungicides on potato (20%)
 - 3. Insecticides on swede (19%)
 - Lowest: Fungicides on fresh pea (0.2%)
- **Ecotoxicity impacts across pesticide groups:**
 - 1. Herbicides (41%)
 - 2. Insecticides (34%)
 - 3. Fungicides (25%)
- **Ecotoxicity impacts (PAF m³ d/ha-yr) across crops (Fig 1):**
 - 1. carrot (36%)
 - 2. potato (31%)
 - 3. swede (24%)
 - 4. fresh pea (9%)
- **Ecotoxicity impacts (PAF m³ d/yr) across crops, when the total sprayed area per crop was taken into account (Fig 1).**
 - 1. fresh pea (44%)
 - 2. carrot (36%)
 - 3. potato (14%)
 - 4. swede (5%)

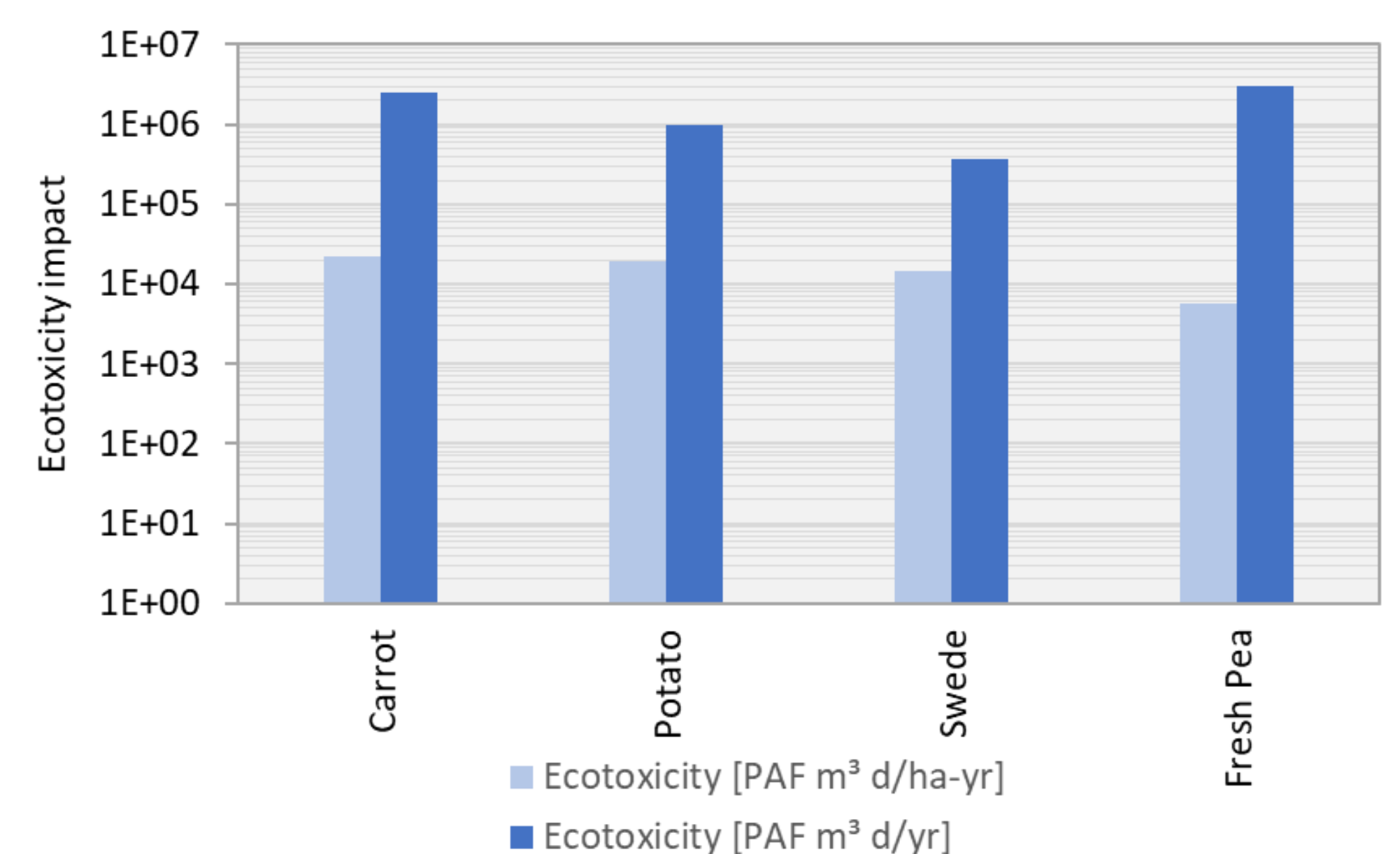


Figure 1. Ecotox impacts as PAF m³ d/ha-yr and as PAF m³ d/yr for the studied crops across years 2003-2019. The order for the impacts across crops changed, when the total sprayed area was taken into account.

Summary

- **Based on a long-term study on the impacts of pesticides used in four field vegetable crops in the boreal zone:**
 - Individual hazardous substances could be identified for their potential substitution by less harmful ones
 - Results can be used to reduce the environmental impacts of pesticides and developing pest management in a more sustainable direction

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Reference:

[1] Räsänen, K., Hannukkala, A., Kurppa, S., Aaltonen, M., Rahkonen, A., Kukkonen, J.V.K. and Vänninen I., 2022. The use of chemical plant protection products in field vegetable farms in a central industrial vegetable growing area in Finland. *Agricultural and Food Science*. 31: 54–69. <https://doi.org/10.23986/afsci.112827>

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