

PESTICIDE RESISTANCE LEVELS IN FIELD AND GREENHOUSE POPULATIONS OF *Tetranychus urticae*

Joseane Moreira do Nascimento¹, V. Zhurov¹, H. Varonina¹, J. Spenler¹, Z. Čulo¹, A. Rahn¹, E. Surman¹, J. Gallo¹, I. Scott², D. Lizotte³, T. Baute⁴, T. MacDonald⁵, N. Bennett⁶, M. Grbić¹, V. Grbić¹

¹Department of Biology, The University of Western Ontario, London, ON

²Agriculture and Agri-Food Canada - London Research and Development Centre, London, ON

³Department of Computer Sciences, The University of Western Ontario, London, ON

⁴Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA), Ridgeway, ON

⁵Plant Products Inc, Leamington, ON

⁶Ontario Greenhouse Vegetable Growers (OGVG), Leamington, ON

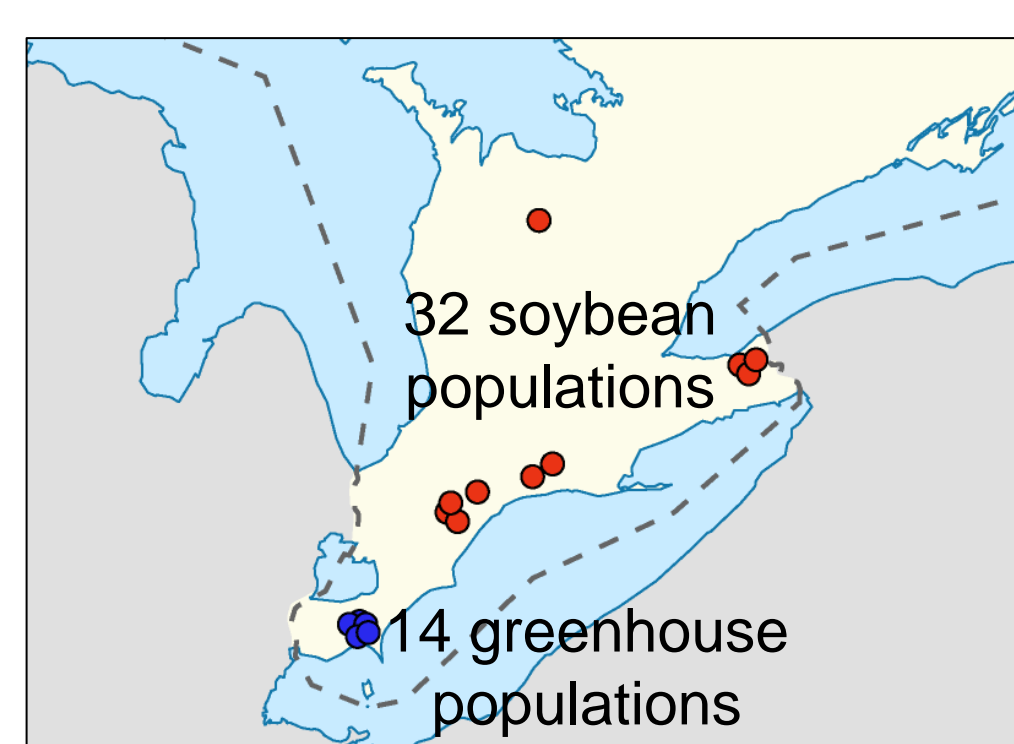
Introduction

Two-spotted spider mite (TSSM), *Tetranychus urticae* (Koch), is a chelicerate herbivore with an exceptionally wide host range. It is a frequent pest of a wide variety of economically important crops.

While low-level infestations are controlled by biological agents such as beneficial predatory mites, midges, and bugs, chemical controls are regularly implemented against persistent pest populations. However, pesticide resistance is frequently reported in *T. urticae* populations across the globe.

Materials and Methods

Here we present a 2021-2022 assessment of the pesticide resistance of *T. urticae* populations from Southwestern Ontario. Mite populations were collected from a variety of crops (cucumber, pepper, strawberry, tomato, and soybean), and production systems (greenhouse and field). Mite resistance was assessed against following active compounds: abamectin, bifentazate, cyflumetofen, dimethoate, etoxazole, pyridaben, and spiromesifen.

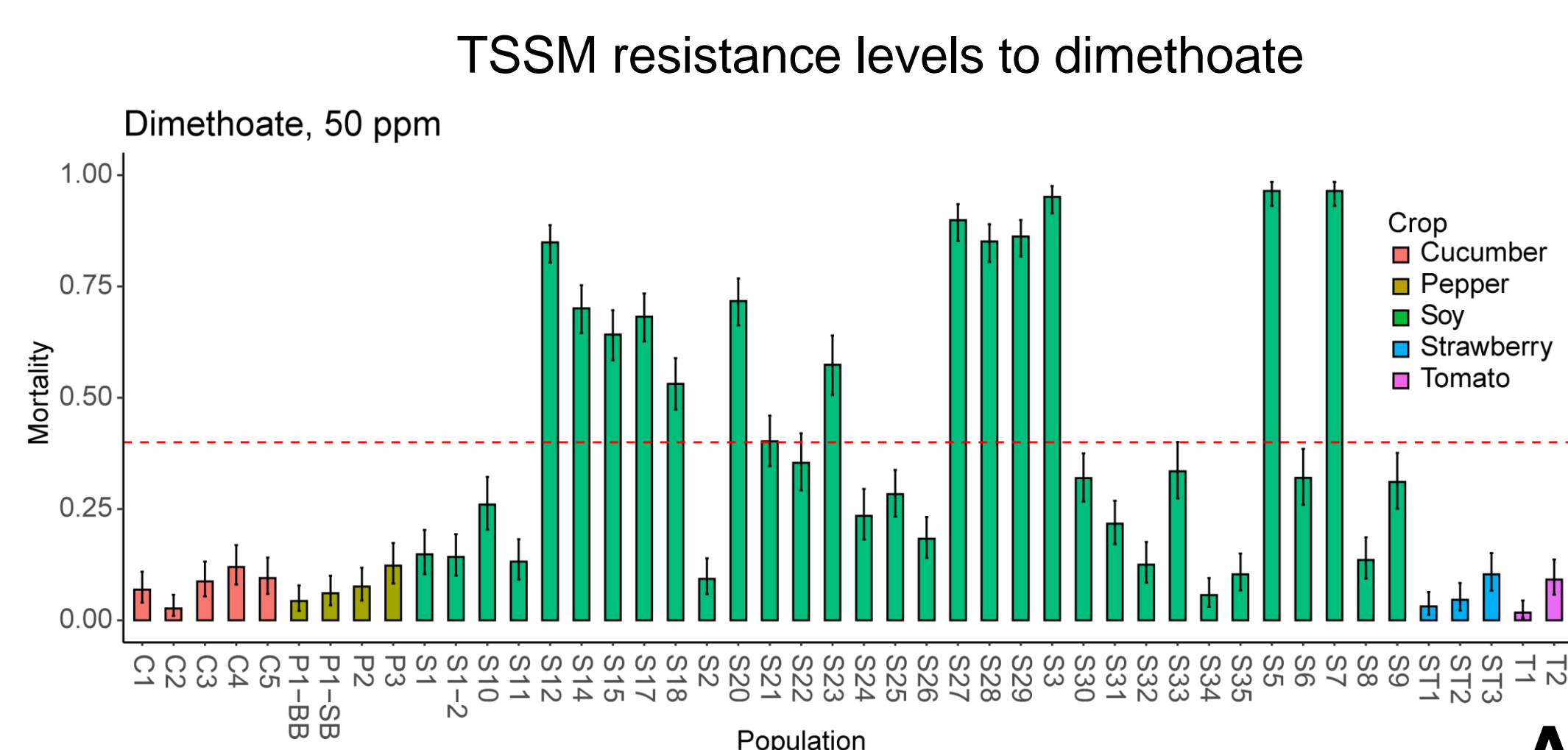


We used two types of bioassays, depending on the mode of action of the analyzed pesticides:

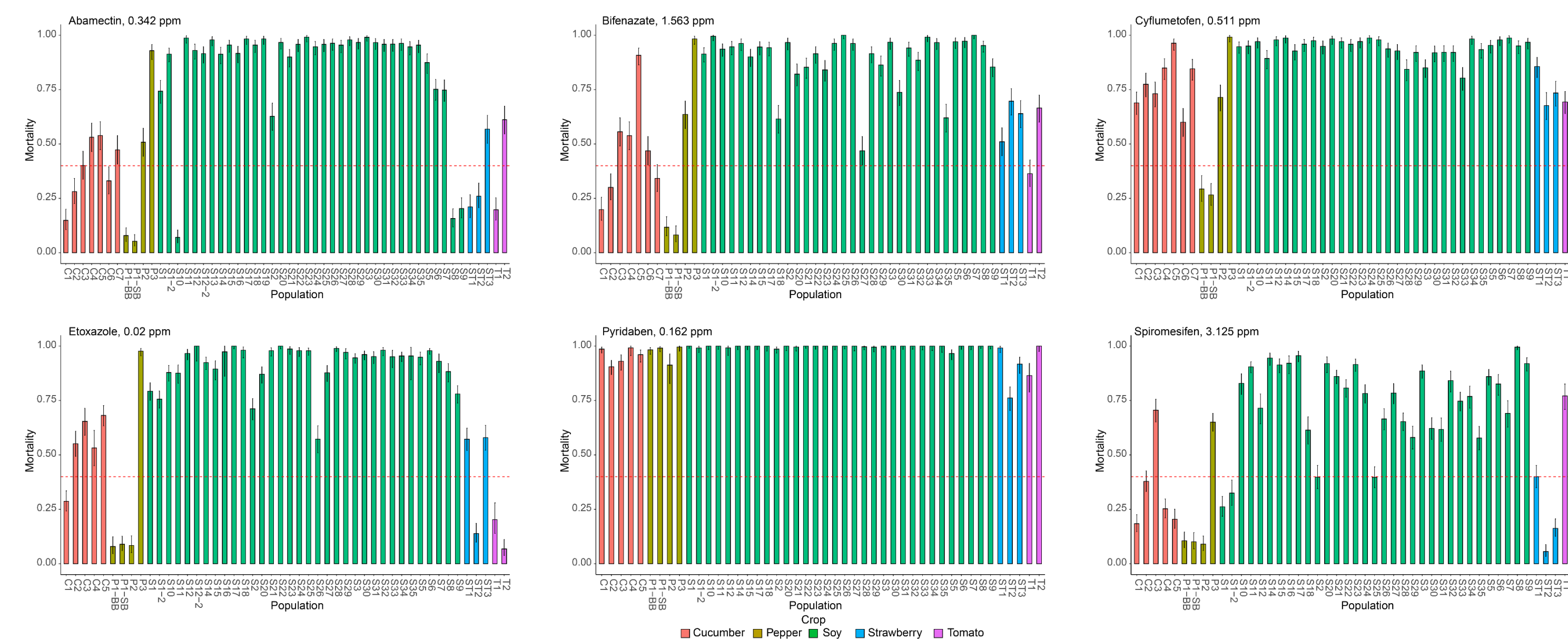
- High throughput soaking-based protocol (adulticidal), to assess mite mortality;
- Traditional leaf disk dipping protocol (ovicidal and adulticidal), to assess mite egg mortality or adult female mite fecundity.

Results

Dimethoate is the only registered pesticide for spider mite control on soybeans in Ontario. 18/32 mite populations collected from soybean and all greenhouse populations were resistant to dimethoate.



TSSM resistance levels to pesticides used in greenhouses

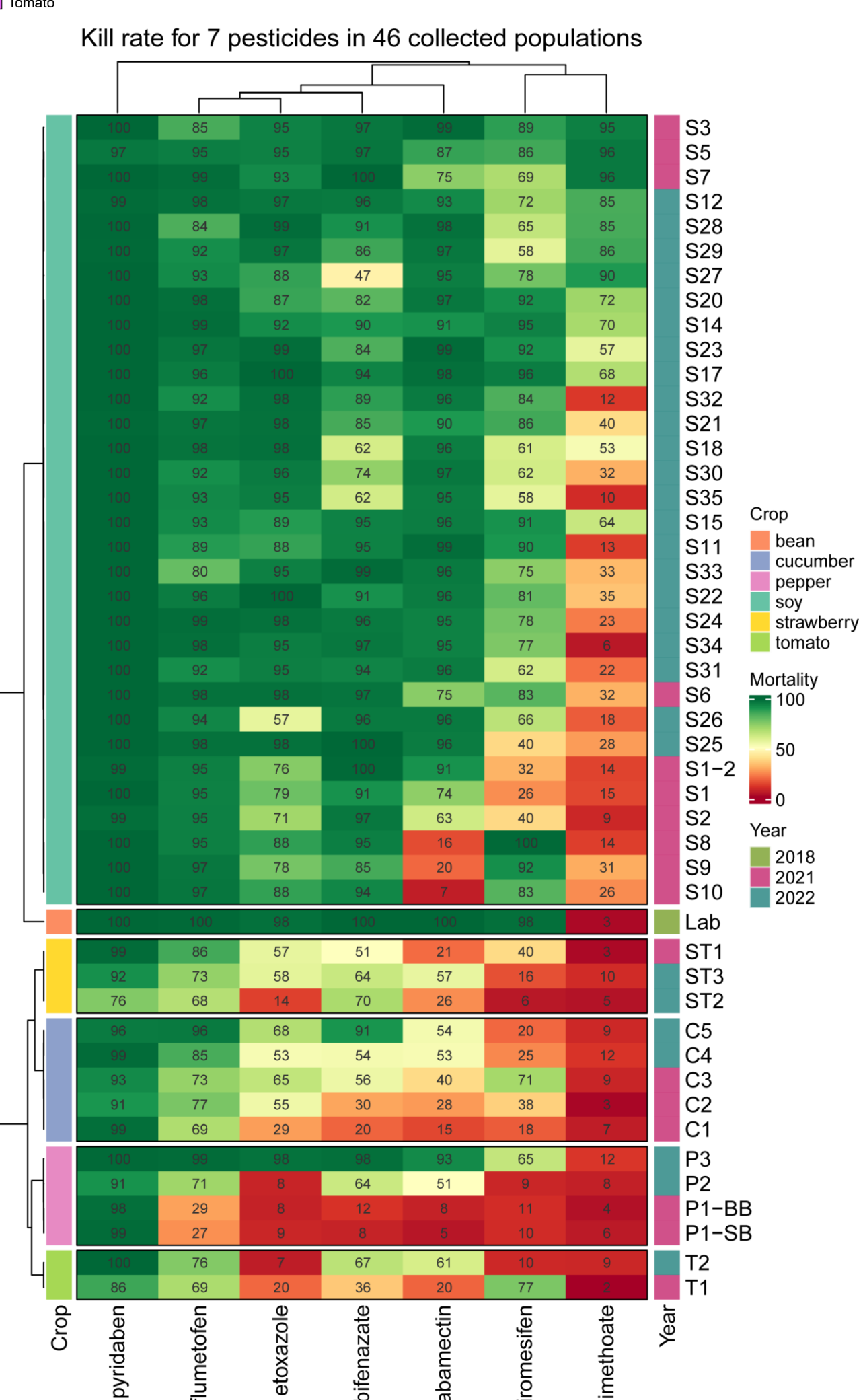


We have considered mortality rate at or below 40% as a resistance threshold. At this kill rate threshold only 14/46 populations were fully susceptible to all tested compounds.

Our results indicate that resistance to multiple pesticides was present in the significant proportion (21/46) of the sampled populations, with the greenhouse-collected populations being the most resistant.

Soybean collected populations demonstrated frequent resistance to dimethoate (18/32). A few soybean populations were also resistant to abamectin (3/32) and spiromesifen (4/32).

All tested greenhouse populations showed high resistance levels to the majority of tested pesticides apart from pyridaben.



Summary of determined mortality levels in collected *T. urticae* populations grouped by crop and subsequently clustered by the degree of response similarity.

Conclusions

Our assessment may inform a choice of additional pesticide registration for spider mite control on soybean, considering that dimethoate has limited effectiveness.

Bifenazate, cyflumetofen, etoxazole, and pyridaben could be potential new products to be registered for the soybean crop.

These results may be used to prioritize and plan pesticide usage on crops where multiple products are registered.

We are continuing this survey. Additional TSSM populations will be collected in Southwestern Ontario in Summer of 2023.

Acknowledgements



Agriculture and
Agri-Food Canada



Ministry of
Agriculture, Food &
Rural Affairs



PLANTPRODUCTS®