The Effect of Targeted Vegetation Sampling on variability of the data sets of Mite Population from natural habitats

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Introduction

Mites are an important group of Non-Target Arthropods in the environmental risk assessments of PPP (Plant protection products). However, their composition (diversity and abundance) in the field is influenced by various abiotic and biotic factors, such as temperature, food availability or plant species composition (especially for herbivorous mites). As a result, high spatial variation is regularly observed, posing challenges for data analysis.

Here, we investigate whether “targeted sampling” (focusing on mites from targeted plant species with particular traits) can produce less variability in the data sets compared to the conventional indiscriminative approach: vegetation sampling followed by extraction using the Berlese Tullgren method. Additionally, we assessed how representative the mite community obtained through targeted sampling was in comparison to the indiscriminative approach.

To explore the influence of plant species on the mite community composition in meadow habitats, we examined the effects of plant characteristics on mite communities' diversity and abundance, and especially the variation between plants.

Effect of plant characteristics on mite composition

Method

Mite populations were collected from four different plant species from a meadow in The Netherlands (Figure 1). The species were categorized as: monocots, dicots, hairy and glabrous plants (see Figure 1). Each species had 15 replicates, thus in the end each group dicot, monocot, hairy and glaborous had 30 replicates included in the analysis. Sampling was done in spring 2024. The mites were extracted using the wash bottle method (Bakker & Hartman 2011) from approx. 20- 150 g of plant mass. The number of mites from each sample was then standardized to 45 g of plant mass. The different groups were compared using the Coefficient of Variance (CV). A diagram of the entire research workflow is provided in Figure 2.

Figure 1: The four different plant species used in sampling.

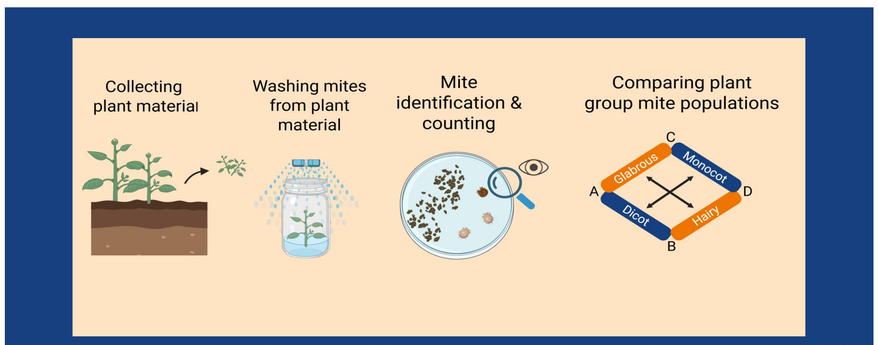

Figure 2: Diagram displaying the workflow of the comparisons performed in this study *

Results

A total of 875 mites were identified, of which more than 50% were found on *Urtica dioica*, the hairy dicot. The 6 most abundant taxa and the plants they were associated with are displayed in figure 3. The CV values for each sampling group is provided in Table 1. Results show that:

- The mite community from hairy plants was less variable (CV=0.458) compared to glabrous plants (CV = 1.343)
- The mite community from dicot plants was less variable (CV=0.482) compared to monocot plants (CV =0.742).

Table 1: CV values for the different sampling groups

Sampling group	CV
Dicot	0.482
Monocot	0.742
Hairy	0.458
Glabrous	1.343

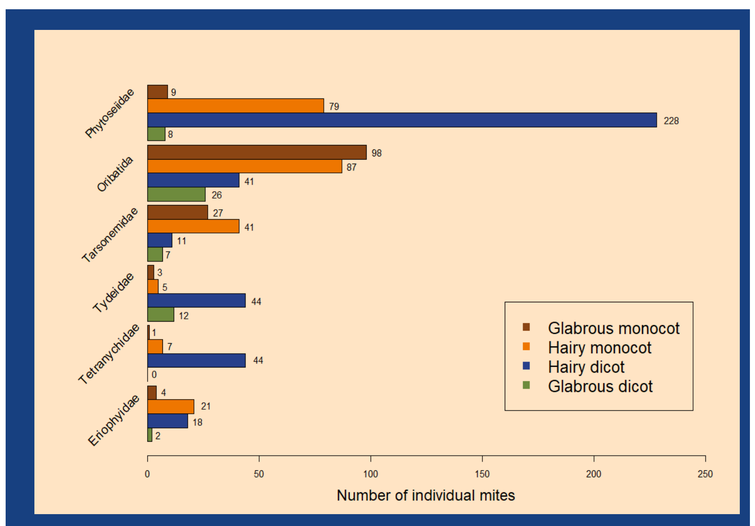

Figure 3: The 6 most abundant mite taxa across the four plant species.

Targeted vs. indiscriminative sampling

Results and Discussion

In the current off-crop field studies for the registration of PPP, the mite populations are assessed using an indiscriminate sampling of vegetation followed by extraction using the Berlese Tullgren method. In such studies the plant communities are dominated by either grasses (monocot) or broad leaf plants (dicot), with each community having a unique composition of hairy or glabrous species (Tabel 2 for three examples). Mite samples (n=4) from such fields usually have CV values ranging between 0.6 (best cases) to over 1 (worst case), which is higher than the results shown here with the targeted sampling of hairy species. Increasing the sampling effort in these type of studies, to reduce the variability of the data, is difficult due to the size of the fields needed and it is also not cost efficient. When we compared the diversity of taxa between the two sampling methods, the only discrepancy was the absence of Oribatid mites from targeted sampling. This is expected as this groups of mites are found on top of the soil or in mosses.

Table 2: Coverage of different plant groups of study area in off-crop habitats, as % of total study area

	Country		
Plant group	Netherlands	France	Spain
Monocot hairy	43	18	23
Monocot glabrous	50	34	30
Dicot hairy	0	27	28
Dicot glabrous	7	21	19
CV range*	0.77-1.06	0.61-1.09	0.61-0.94

*- Values range for approx. 180 samples with 4 replicates each

Conclusion

A targeted vegetation sampling, focussing on hairy plants as a new approach for off crop field studies has a high potential to improve the data analysis and the risk assessment.

Next step: A field study with both sampling techniques included for a direct comparison.

References:

Bakker F. & Hartman L. (2011). Monitoring predatory mite populations in the field. A valdation of assessment tools. Poster at SETAC Europe Annual Meeting Milano, May 2011.

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