Optimisation of the Berlese method for estimating cabbage stem flea beetle larvae (CSFB) pressure.

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Plan d'action sortie du phosmet

CONTEXT

In France, the Berlese method is the **most widely used method** for estimating CSFB larvae pressure. It is a passive extraction method that involves leaving plants to dry over a container and waiting for them to emerge before counting them.

It began to replace plant dissection in 2013 and **is now the only official method recognised** by the French authorities to justify some treatments against CSFB.

This method is used by **experimenters and agricultural advisors**. Although it has its advantages – **observing the larvae is made easier** and it is **less tedious** than plant dissection - it also has its drawbacks: it is **cumbersome**, **time-consuming** and, above all, the **response time is long**.

OBJECTIVES

1) Can the Berlese time be reduced by modulating the temperature or sample preparation?

2) Is it possible to estimate the number of larvae per plant without waiting for Berlese to finish?

MATERIEL & METHODS

1) Improvement of Berlese conditions.

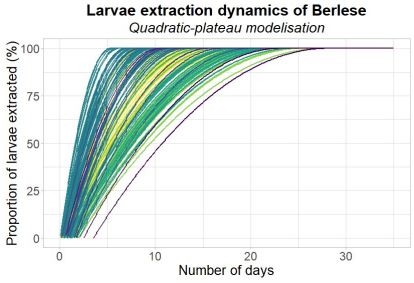
1 modality = 10 plants

Examples of experiments	Number of modalities
Impact of plant biomass x ambient temperature	6
Impact of plant biomass x cutting of petiole	6
Impact of leaf blade removal	2
Impact of ambient humidity	2

2) Prediction of the level of infestation

Methods inspired from *Seimandi et al., 2022.*

Step 1 - Modeling the extraction dynamics of Berlese : determination of the number of days required to extract 100% of the larvae for each Berlese (x_v)



139 Berlese on 12 trials in 2024

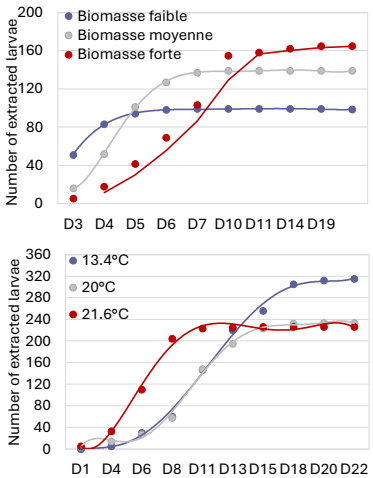
Step 2 : Determination of the parameters influencing x_v

Step 3 : Determination of a predictive model and evaluation of prediction quality

-> work in progress (not presented)

RESULTS

1) Improvement of Berlese conditions.



- Extraction time depends on the biomass : 5 days to 9-10 days for biomasses between 15 and 100 g/plant
- The higher the temperature is, the faster the speed of extraction is **BUT** the number of extracted larvae is also reduced
- The leaf blade removal reduce the extraction time **BUT** the number of extracted larvae is also reduced (not presented)

2) Modelisation of the dynamics of larval extraction as a function of Berlese conditions.

- In 2024, the data base is unbalanced (ex : overrepresentation of high-biomass plant batches in a high-temperature context)
- Variables are sorted by levels.

Preliminary results :

$$lm\ (x_v \sim Plant\ biomass\ per\ plant + Number\ of\ larvae\ per\ plant + Temperature\ in\ the\ room)$$

Variable	Sum Sq	Df	F value	P value	
Biomass	273.05	4	8.30	0.00	2
Number of larvae	51.15	4	1.55	0.19	
Temperature	1835.98	2	111.60	0.00	1
Residuals	1052.88	128			

df	r.squared	adj.r.squared	N
10	0.75	0.73	139

73% of variability is explained by the model

CONCLUSION & PERSPECTIVES

- This work has helped to **clarify the conditions of Berlese extractions**:
  - ✓ temperature range: 19-22°C
  - ✓ sample preparation: be careful with the removal of leaf blades
- The work **on predicting Berlese extraction dynamics** based on execution conditions **will continue in 2025**. The goal is to develop a model capable of predicting infestation levels a few days after the plants are set to dry, based on implementation conditions.
- An application featuring **an algorithm to automatically count flea beetle larvae** is also in development.

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