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Egg-laying behaviour of *Plutella xylostella* on cabbage undergreenhouse



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Introduction

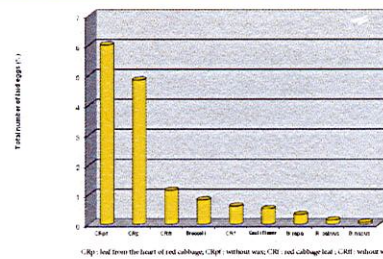
Plutella xylostella is one of the most important pest of the cruciferous crops. In the general framework of developing a biological control program of *Plutella xylostella* (*Lepidoptera Plutellidae*) using egg parasitoids (*Trichogramma* sp.) on cabbages under greenhouse, we tried also to associate a trap plant and even a bank plant. For that, we studied the egg-laying behaviour of the pest on various cabbage cultivars. We aimed to (i) precise the factors impacting *P. xylostella*'s decision to lay eggs on various cabbage plants, and (ii) identify the preferred sites for oviposition of *P. xylostella*.



Methodologie

To know which plant is more attractive for *Plutella xylostella*, nine cabbage cultivars are compared in greenhouse with a high RH. 10 replicates with random distribution. 100 *Plutella xylostella* adults are released in the greenhouse for 24 hours. Laid eggs are then counted.

Choice of cultivar by *Plutella xylostella*



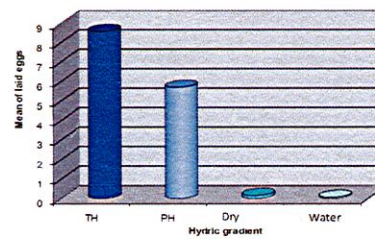
Results

Leaves from red cabbage hearts (group A) are more attractive ($p=0.0001$) for *Plutella xylostella* laying (more eggs) than other supports (group B), if the leaf wax was removed (CRpf) or not (CRp).

Impact of hydric gradient on *Plutella xylostella* oviposition

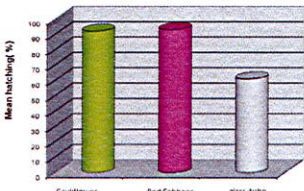
Red cabbage leaf being the more turgescient, it is interesting to know if *Plutella xylostella* follows an hydric gradient when choosing where to lay eggs. Different cabbage cultivars were put (leaves from the heart of cabbages, cauliflower's leaves, broccoli's leaves, chinese cabbage flowers), on plastic dishes filled with clean gravel, in greenhouse, following 4 protocols in random distribution:

- Very humid gradient: the gravel is covered with water, "TH"
- Low humidity gradient: the gravel is dry, "PH"
- Dry gradient: the gravel is dry, and the leaf was oven-dried, "Dry"
- No-leaf gradient: the dish is filled with gravels and covered with a shrink wrap "Water" (control).



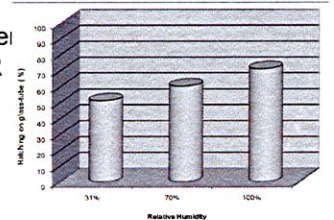
Data analysis shows that the number of laid eggs is significantly different with varying hydric gradients (TH, PH, Sec, Eau), for a given type of leaves ($p>0.0001$). *Plutella xylostella* lays significantly more in a humid environment.

Impact of the surrounding humidity and of the cultivar on *Plutella xylostella* eggs' development



In order to study the influence of the surrounding humidity and of the egg-laying support on the development of *Plutella xylostella* eggs, layings were placed on several cultivars with different water contents (leaves from red cabbage hearts, cauliflower's leaves, inert support (glass tubes)) and in different relative humidity conditions: 31%, 70%, 100%

The *P. xylostella* eggs develop better on vegetable (cauliflower and red cabbage leaves) than on inert substrat, whatever HR ($p<0.001$). For the glass tube, the number of eggs which hatch seem to increase according to the relative humidity, however, the results are not significantly different ($p>0.05$).

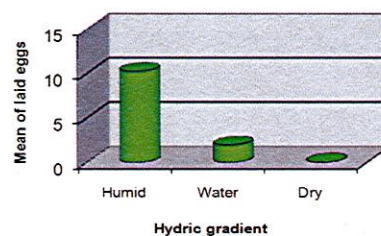


Impact of Relative humidity on *Trichogramma* oviposition

We studied the impact of an hydric gradient on the laying behaviour of *Trichogramma*. Three protocols were applied to supports carrying *Ephesia kuehniella* eggs:

- Humid gradient: gravel is soaked with water "Humid"
- Dry gradient: gravel is dry "Sec"
- Water: the dish is filled with water and covered with a shrink wrap.

The number of laid eggs (black eggs) is counted.



Trichogramma lay more ($p=0.0005$) on *E. kuehniella* eggs placed on a humid support (group A) than on eggs placed in dry conditions « Dry » or on plastic support in humid conditions « Water » (group B).

Data analysis

For all experimentations, tests were conducted with the SAS software (GLM procedure and ANOVA) and Excel (Student) with a 5% threshold.

Conclusion

P. xylostella females showed preference, among the several cabbage cultivars tested, for *Brassica oleracea* var. capitata f. rubra. These leaves are very turgescient. Females oviposited mostly on plants in high humidity conditions.

However, the pest's eggs developed better on vegetable leaves than on inert support, whatever was the relative humidity.

So, the microclimate surrounding the eggs seems to be a more important factor than the relative humidity contained in the air, for the development of the pest eggs.

In the same way, *Trichogramma* sp. showed preference to oviposit in high humidity conditions.

These results could help growers in (i) using red cabbage cultivars with water underneath for instance, as trap plants for *P. xylostella* in their cabbage greenhouse crops, and (ii) releasing more precisely potential biological control agents against *P. xylostella* (like *Trichogramma* sp.) for maximizing their effect on the eggs of the pest.

These trap plants may then also have the potential for becoming banker plants and thus to enable the parasitoids to sustain in the crop.