Which processes shape grapevine moth immune response against parasitism?

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Introduction

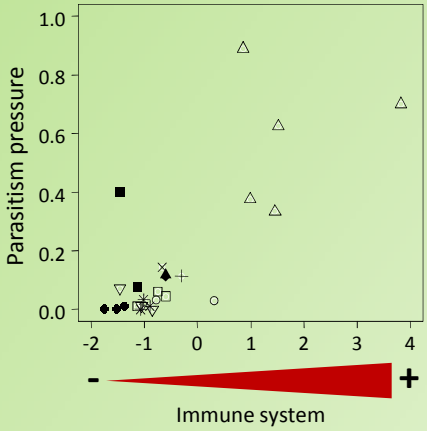
Identification of the selective forces shaping immune traits of organisms in natural conditions is a central question in the field of ecological immunology. The immune response is expected to be the evolutionary response to selective pressure from parasites and pathogens.

In a previous study, we found that natural populations of *Lobesia botrana* with strong immune systems are the more parasitized by parasitoids.

Two hypotheses could explain this result:

(1) a **plastic effect:** larvae could detect parasitoids and plastically increase their immune system in response to parasitism pressure.

or (2) **local adaptation:** larvae with a strong immune system could be selected over time in response to parasitism pressure.



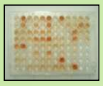
➔ **Which hypothesis best explains this correlation?**

Material and methods

(1) Testing the `plastic effect´ hypothesis

Exposing laboratory stock 4th instar larvae to the **presence/absence** of parasitoids for 5 days after which 3 key immune parameters are measured

Haemocyte count 

Total-PO activity 

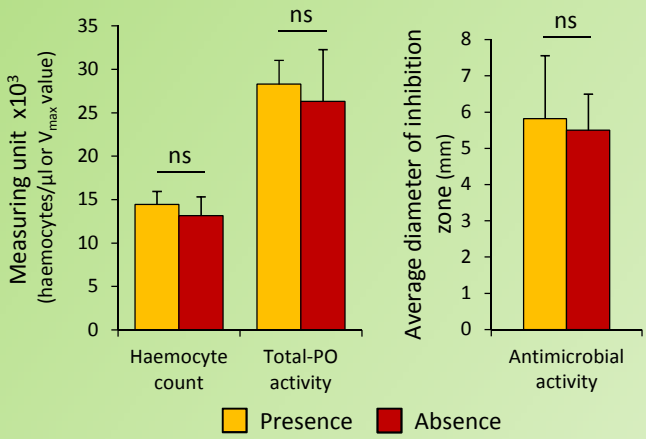
Antimicrobial activity 

(2) Testing the `local adaptation´ hypothesis

Performing a survey of the parasitoid selective pressure in 9 different vineyards from 2008 to 2012, measuring 3 key immune parameters on the resulting **wild** larvae sampled in 2012.

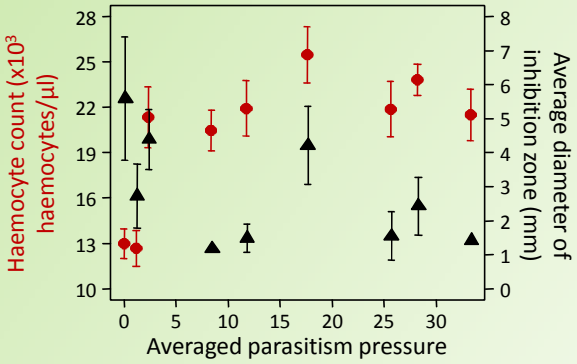
Results

(1) Testing the `plastic effect´ hypothesis



➔**No change in immune parameters of the larvae exposed to parasitoids.**

(2) Testing the `local adaptation´ hypothesis



➔ **Populations with a high level of haemocytes are more parasitized.**

➔ **Populations with a high level of antimicrobial activity are less parasitized.**

Conclusion

Our results appear to **refute the `plastic effect´ hypothesis** in which moth larvae would be able to adjust their immunity in response to the presence of parasitoids in the environment, but **support the `local adaptation´ hypothesis** in which the level of investment in immunity is shaped by its relative costs and the benefits against parasitoids.