



Biological pest control by stimulating biological interactions in food forest design.

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Background

Food forests make use of biological processes and interactions to create a productive, self-sustaining and diverse forest with mainly harvestable plant species. Designing of a food forests requires a lot of knowledge on biological interactions and may serve several purposes. However, biological control as a purpose of food forest designing has hardly received any attention yet.

Objective

The goal of this study was to examine all the relations that exist between animals and plants around the apple tree. By studying how these species interact, we can eventually find out how we can attract beneficial animals to a food forest. These beneficial animals can help to control possible damaging insects and micro-organisms, and thus improve apple production in food forests.

Introduction

The most logical plant to analyze in Food Forest Droevendaal is the apple tree. Seven insects and three micro-organisms affecting apple yield in conventional production systems were chosen as main characters in this study. But an organism is never on its own. Studying all the plants and animals around them is necessary to really understand them.

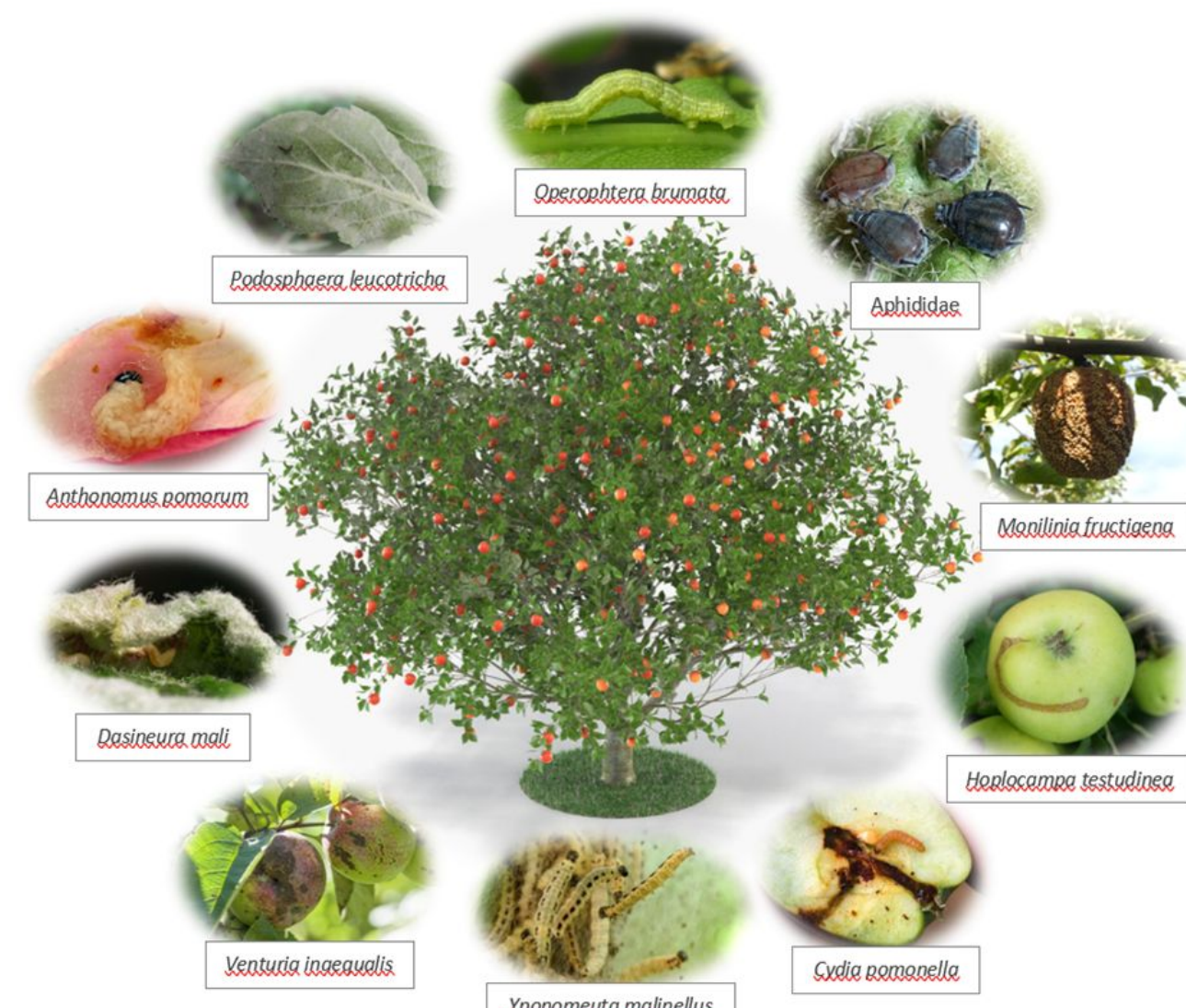


Figure 1. Many organisms live in and on apple trees – this study chose ten of those organisms as main characters.

Results

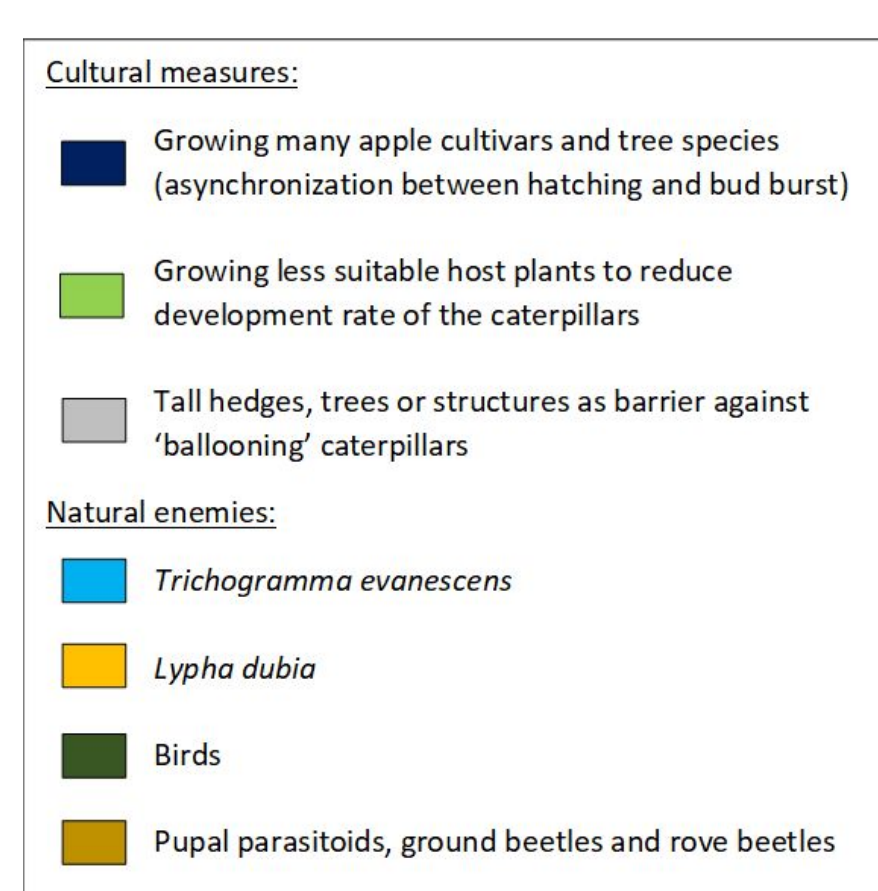


Figure 2. Life cycle of the winter moth (*Operophtera brumata*). In each life stage, the moth has different requirements and different interactions, that can be used to reduce damage.

Each insect or micro-organism goes through several life stages – which makes it hard to think of only one way to control it, but also gives multiple opportunities to do so.

Results

Natural enemies can be attracted in multiple ways:

- Provide shelter
- Provide alternative food sources
- Provide alternative hosts



Figure 3. Apple ermine (*Yponomeuta malinellus*), a caterpillar feeding on apple leaves.

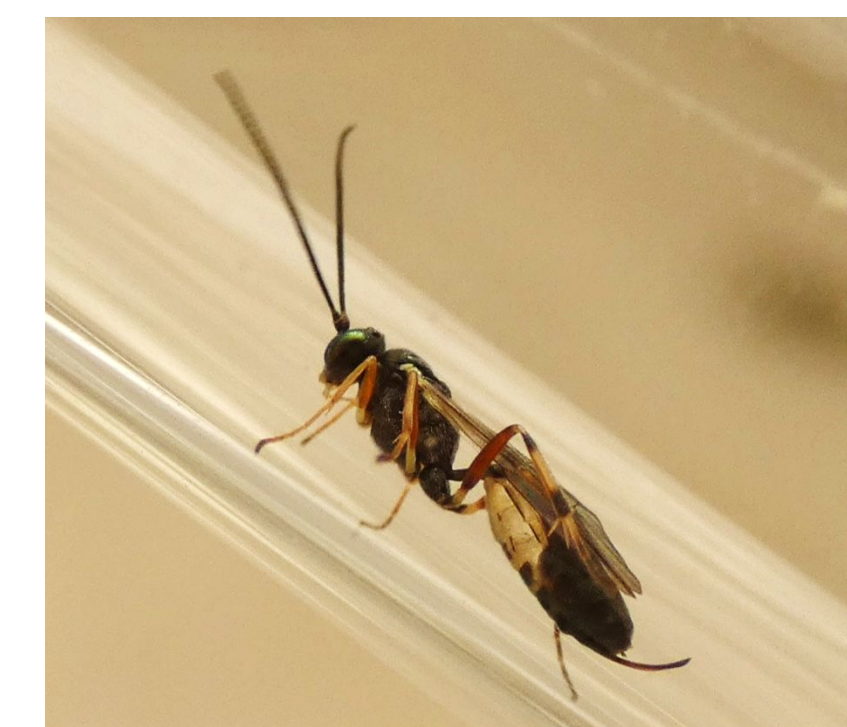


Figure 4. *Diadegma* sp. *D. armillata* is a parasitic wasp on a number of *Yponomeuta* species.



Figure 5. Spindle ermine (*Yponomeuta cagnagella*), another host of *D. armillata*, but does not feed on apple

Conclusions

Combining all organisms and their relationships, it is possible to gain an insight on how a food forest design might affect the community of insects and micro-organisms around the apple tree. No perfect design exists, but knowing what your main plant for harvest in the food forest will be, allows for design not only for the plants, but also for all the organisms around them.

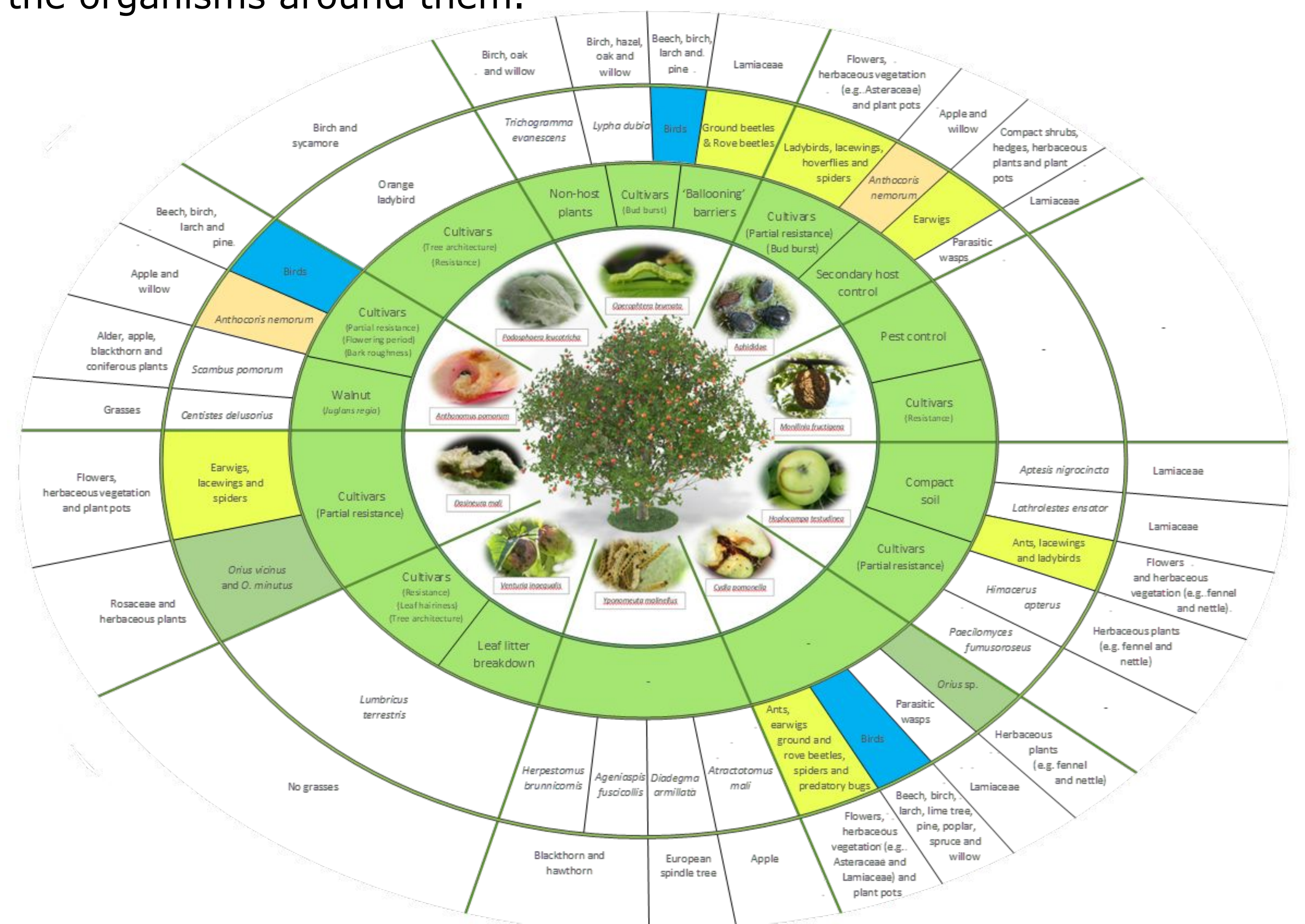


Figure 6. Full overview of the seven insects and three micro-organisms living on the apple tree, together with all the natural enemies and plant species related to them. Understanding these relationships can help understand how a food forest should be designed and maintained.

Acknowledgements

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