



Attract-and-infest strategy to disseminate *Metarhizium brunneum* among adult Japanese beetles

Magdalena Wey,
PhD student Agroscope/ETH Zürich



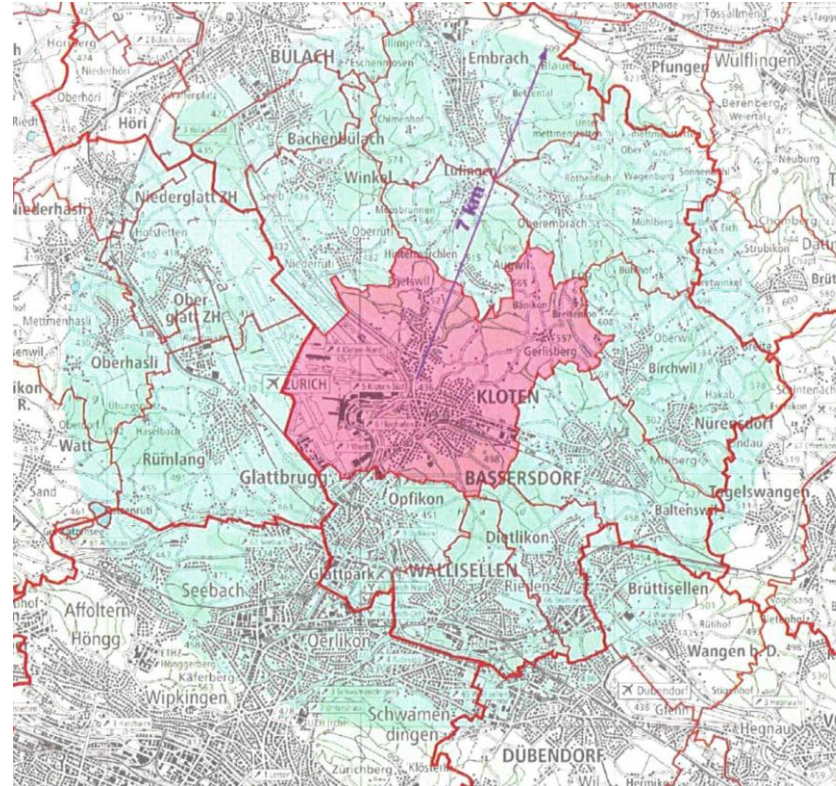
Insights into the development of an innovative control strategy against adult Japanese beetles

Magdalena Wey,
PhD student Agroscope/ETH Zürich



Complex situation for Japanese beetle control

- Agricultural areas
- Airport
- Private gardens
- Golf lawns
- Football fields
- Wetland



- Different stakeholders
- Different land use types

Kloten, Zürich, Switzerland



Complex situation for Japanese beetle control

- Agricultural areas
- Airport
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Challenge: Find a versatile tool to control beetles in **agricultural and non-agricultural areas**

- Different stakeholders
- Different land use types

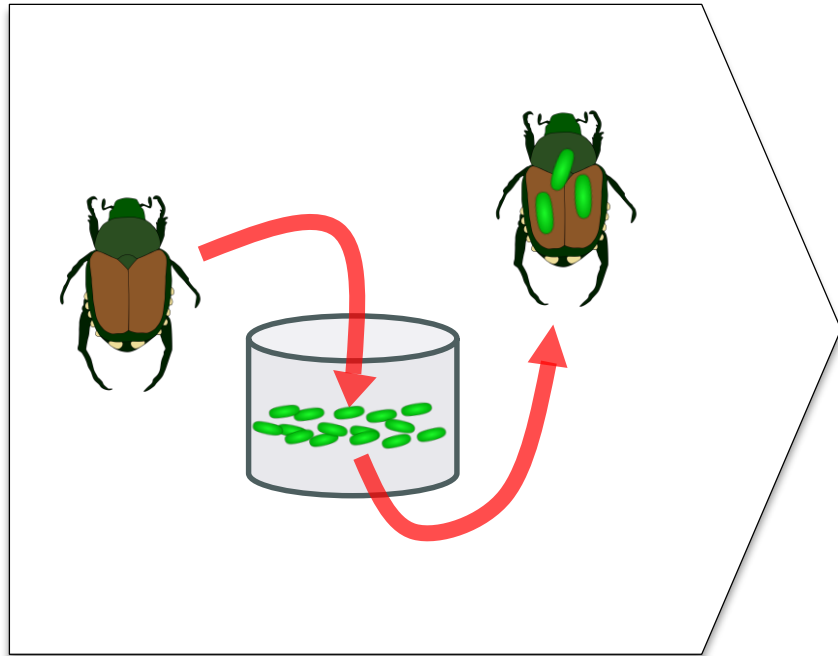


Kloten, Zürich, Switzerland



Attract-and-infest strategy

Attract Infest Release



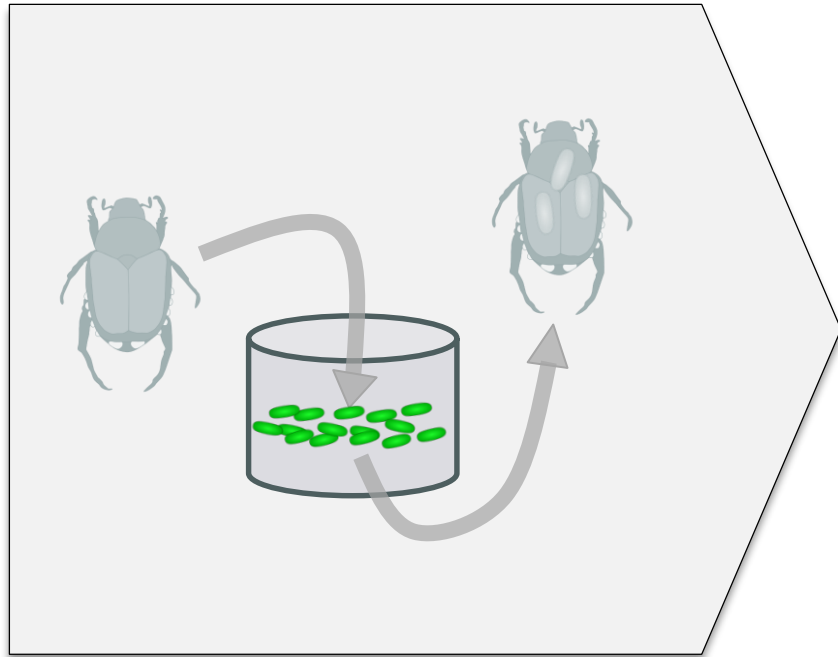


Attract-and-infest strategy



Swiss strain of the fungus
Metarhizium brunneum (ART 212)

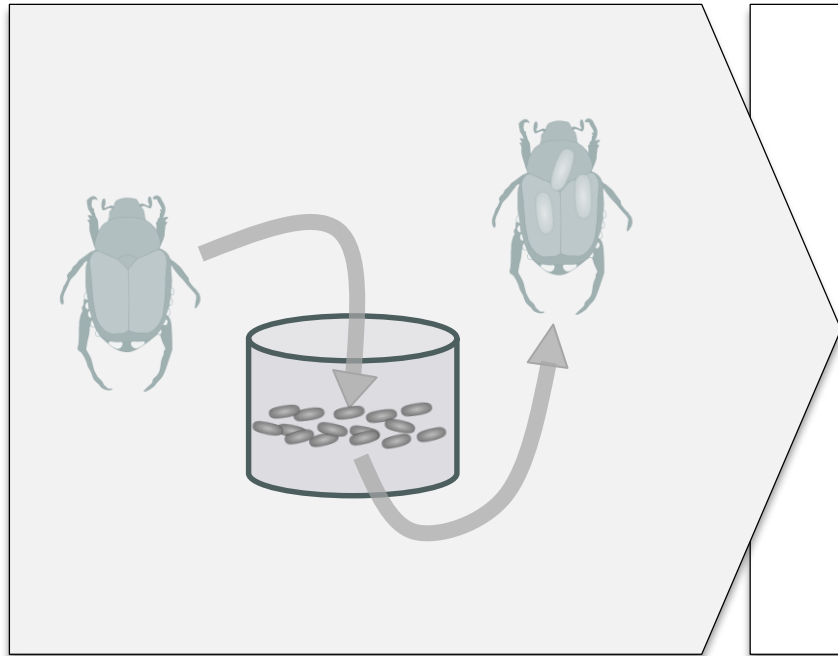
Attract Infest Release



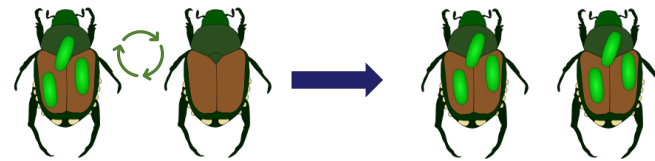


Attract-and-infest strategy

Attract Infest Release



Autodissemination

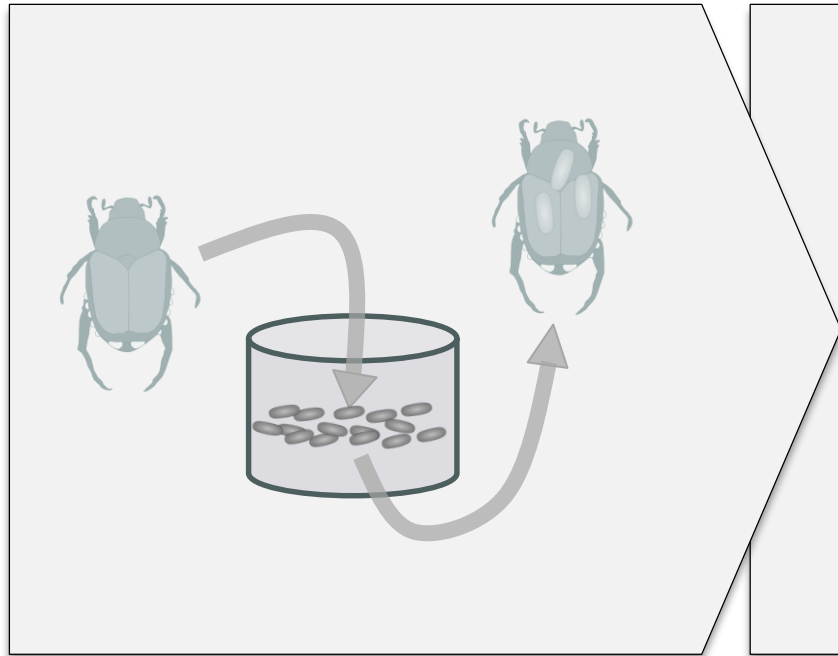


Horizontal Transmission

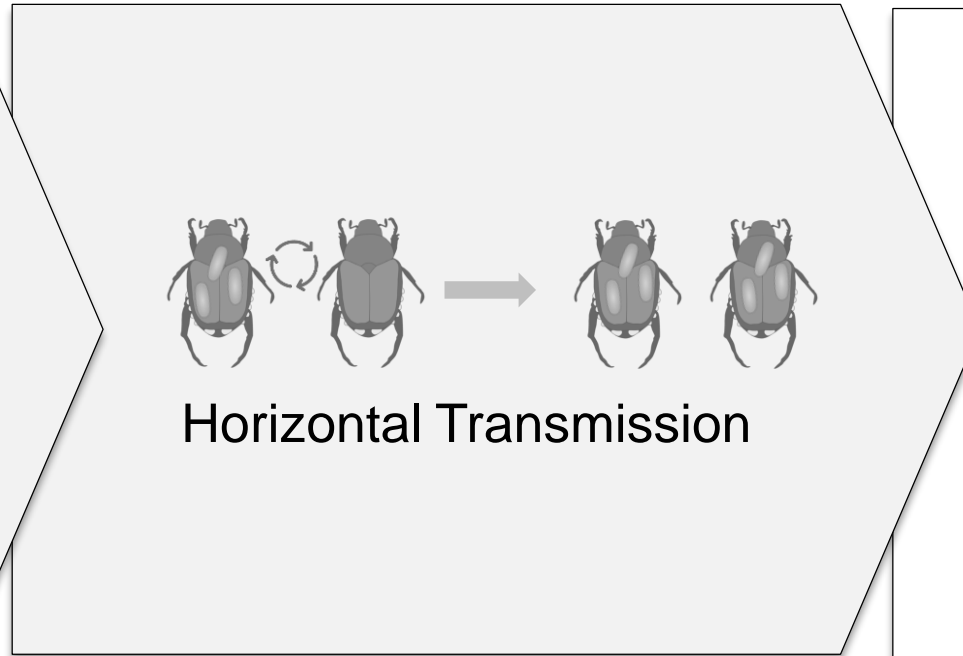


Attract-and-infest strategy

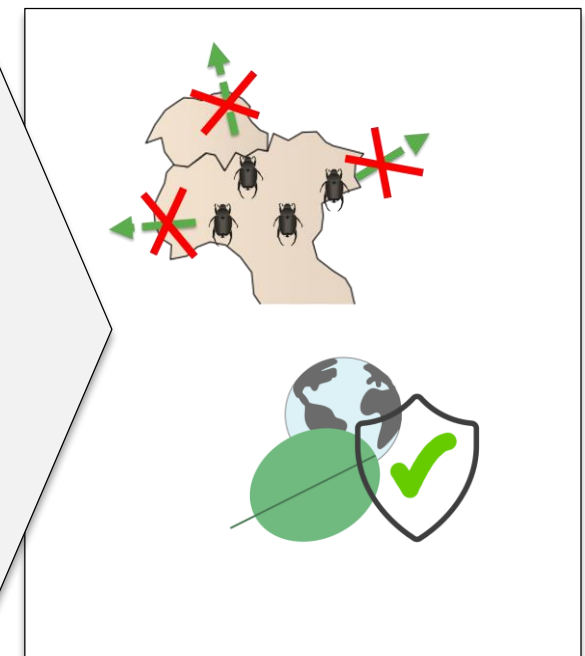
Attract Infest Release



Autodissemination



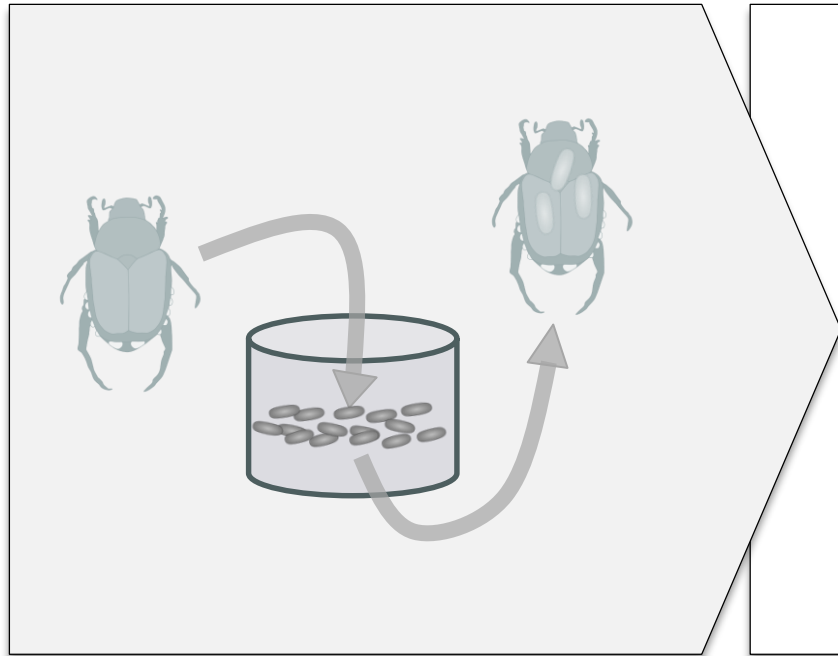
Goal



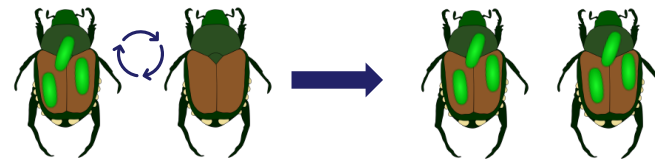


Attract-and-infest strategy

Attract Infest Release



Autodissemination



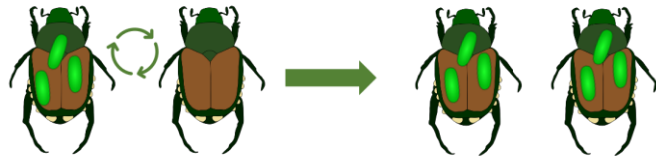
Horizontal Transmission

Goal



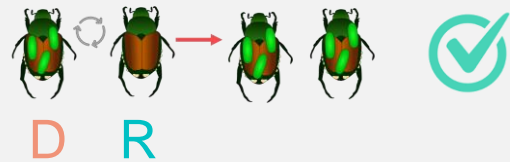


Step 1: Quarantine lab experiments



Donor Recipient

Spore transmission



R Day 0 – Day 1 – Day 2

Mortality



Donors

~ 7 days
after inoculation

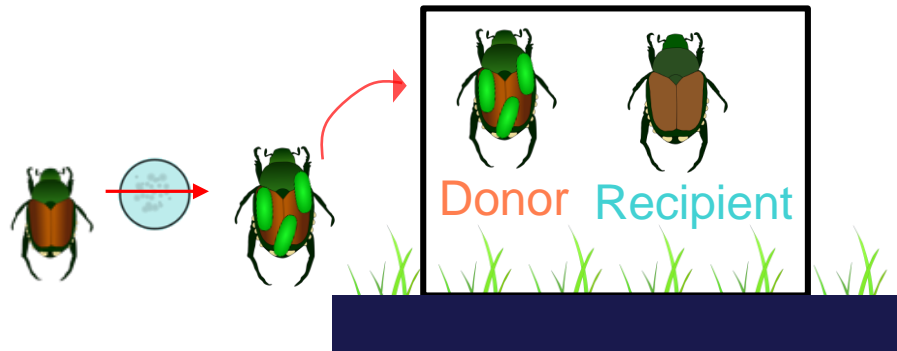


Recipients

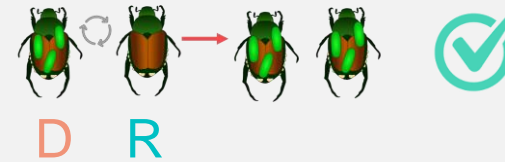
The **more spores** on the beetle,
the **faster** the control effect
(14 - 21 days)



Step 2: Field cage experiment



>1/4 of the Recipients = mycosed





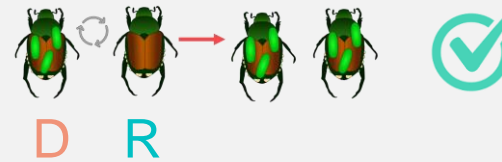
Step 3: Field experiments

2023/2024

Mark-Release-Recapture



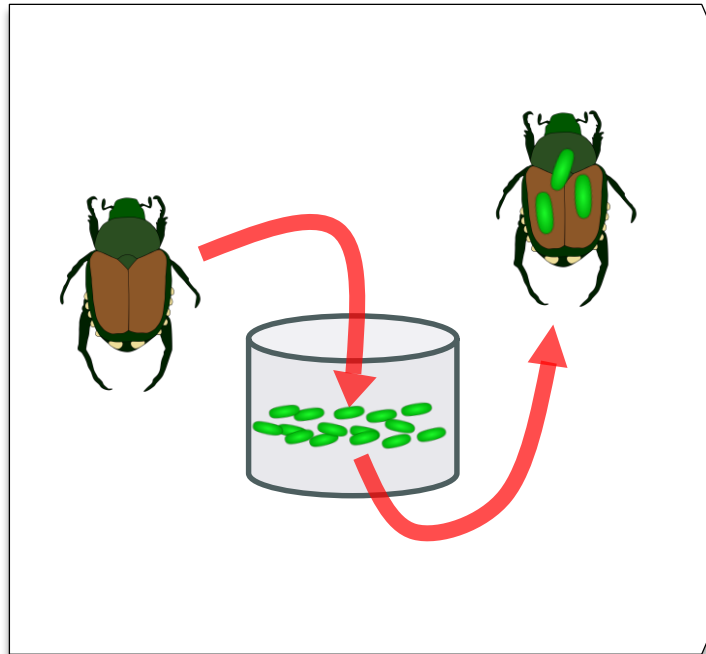
~ 80% of the **Donors** = mycosed
>1/4 of the **Recipients** = mycosed



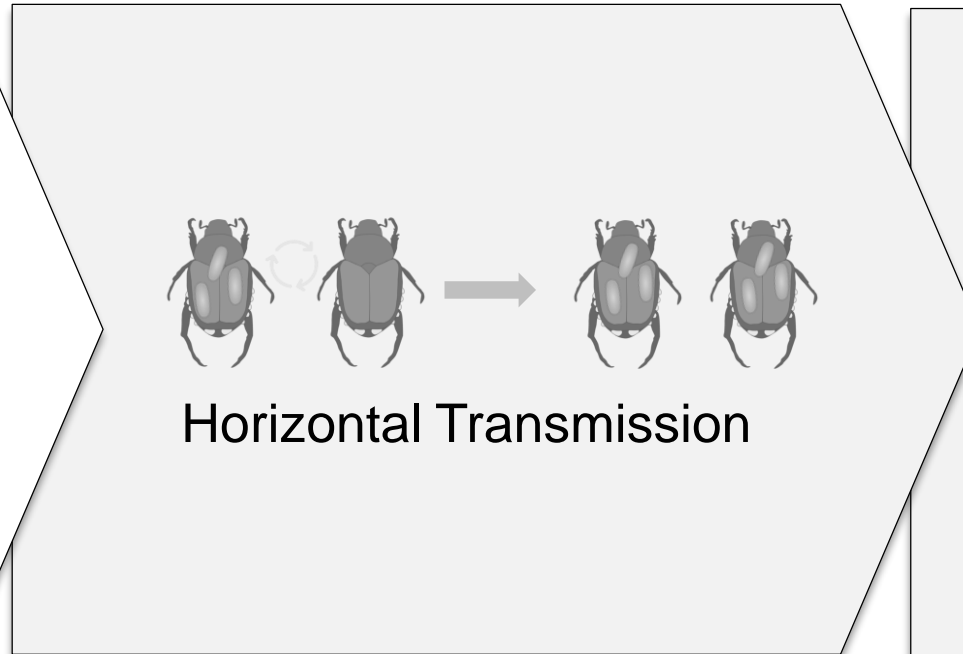


In parallel to experiments: Trap development

Attract Infest Release



Autodissemination



Goal

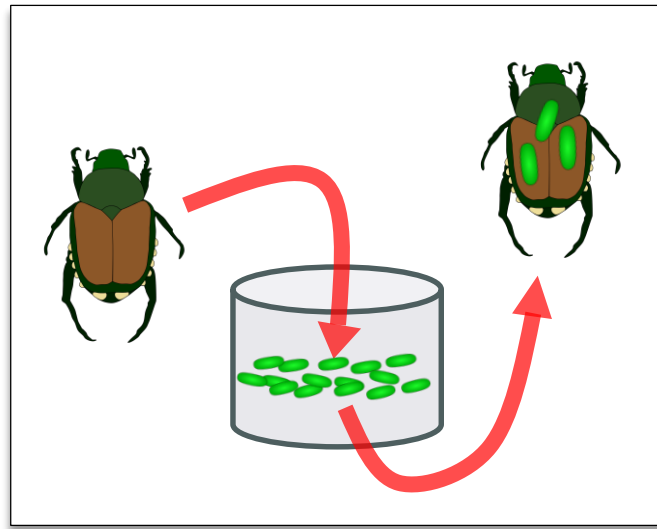




Requirements for attract-and-infest device

Highly attractive

High dose of the inoculum





Evolution of the attract-and-infest device



“spillover”

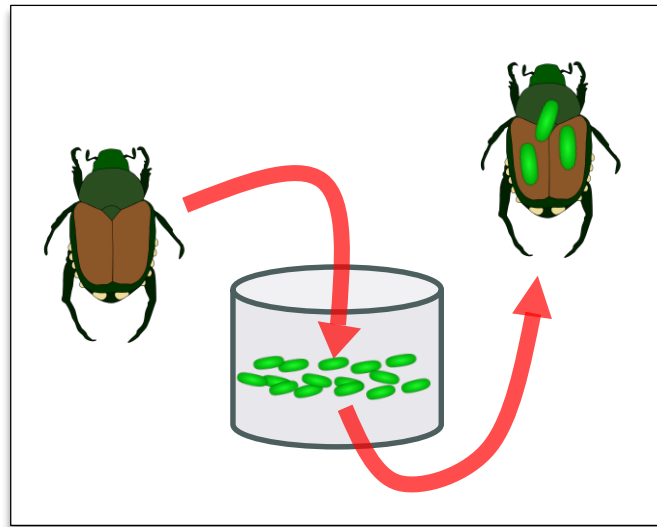
2021



Requirements for attract-and-infest device

Highly attractive

High dose of the inoculum



Easy for beetles to enter & leave



Evolution of the attract-and-infest device



2022



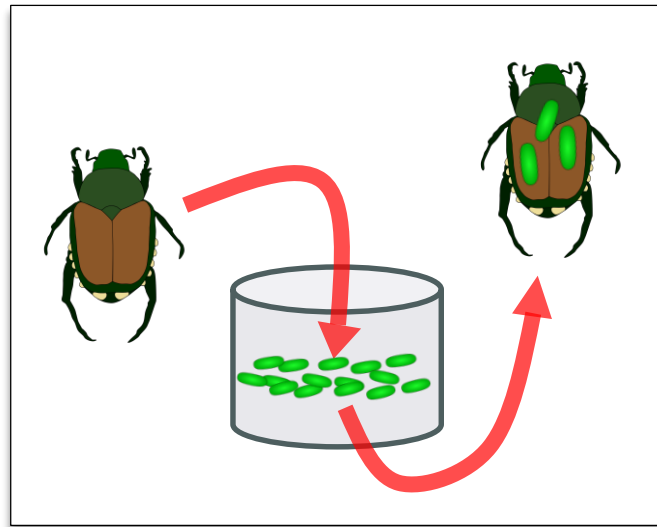
Fungal inoculum

Fast decrease of germination rate (viability)



Requirements for attract-and-infest device

High dose of the inoculum



Highly attractive

Easy for beetles to enter & leave

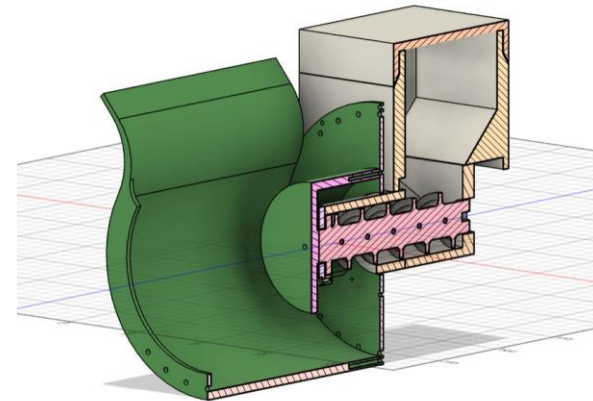
Constant availability
of viable spores



Evolution of the attract-and-infest device



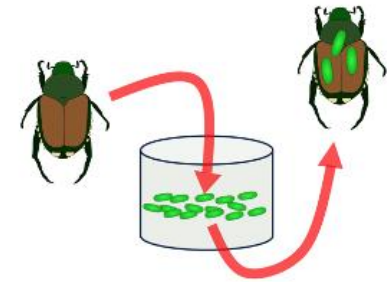
- Nicola Storni, electrical engineer, ETH Zürich
- Container with fungus colonized barley kernels: UV-protection, thermal isolation
- Portions of kernels every 2 hours
- Rotating part to release beetles



2024



Conclusion





Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Federal Department of Economic Affairs,
Education and Research EAER

Agroscope

Thank you!



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Biocontrol Team

Plant Pathology Group, ETH Zürich

ETH zürich

Collaborators and partners

IPM Popillia

Nicola Storni, ETH Zürich



IPM Popillia

Integrated Pest Management of Japanese Beetle

