



SCIENCE AND
EDUCATION **FOR**
SUSTAINABLE
LIFE



Centre for Biological Control, CBC

We contribute to the development of new knowledge concerning the use of living organisms to control pests and diseases. CBC is a competence driven actor in biological control, both nationally and internationally.

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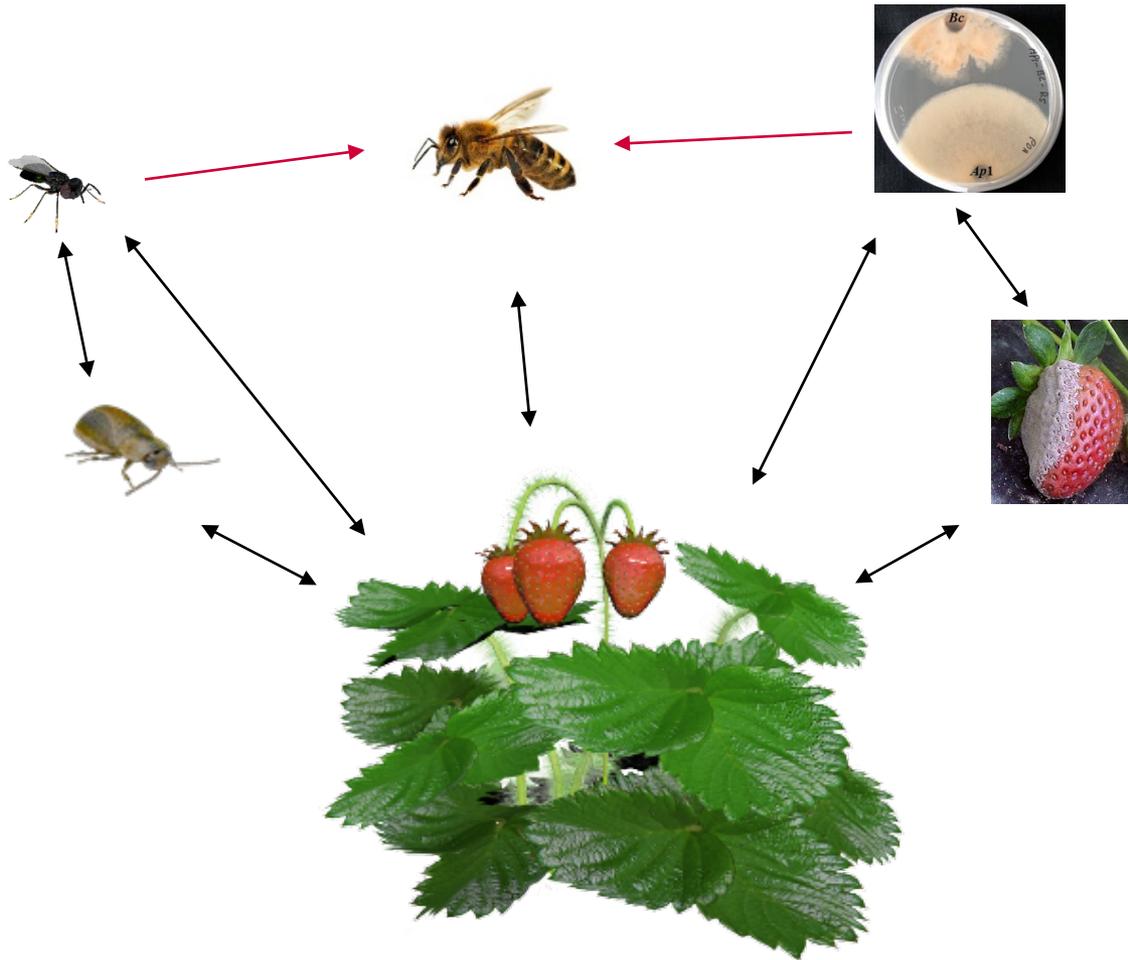
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Integrating biocontrol agents and pollinators into the extended phenotype of plants

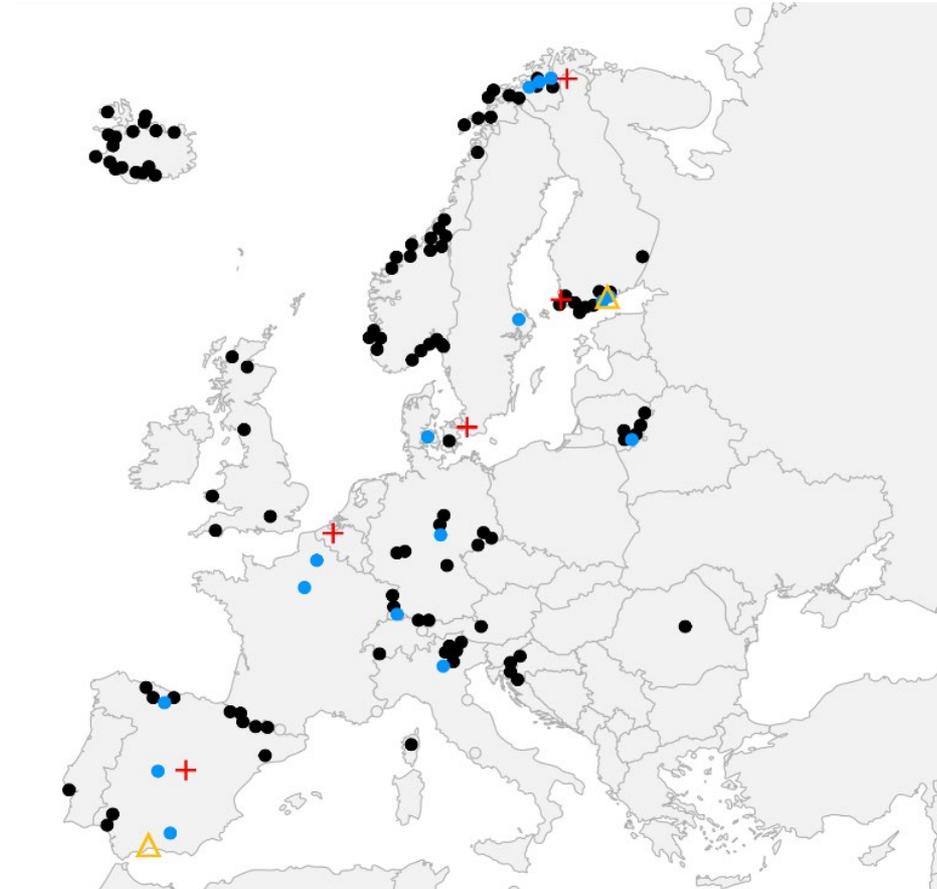
Johan A. Stenberg

The extended phenotype

Integrated Pest Management (IPM)



Studies of extended phenotypes requires phenotypic variation



Germplasm collection

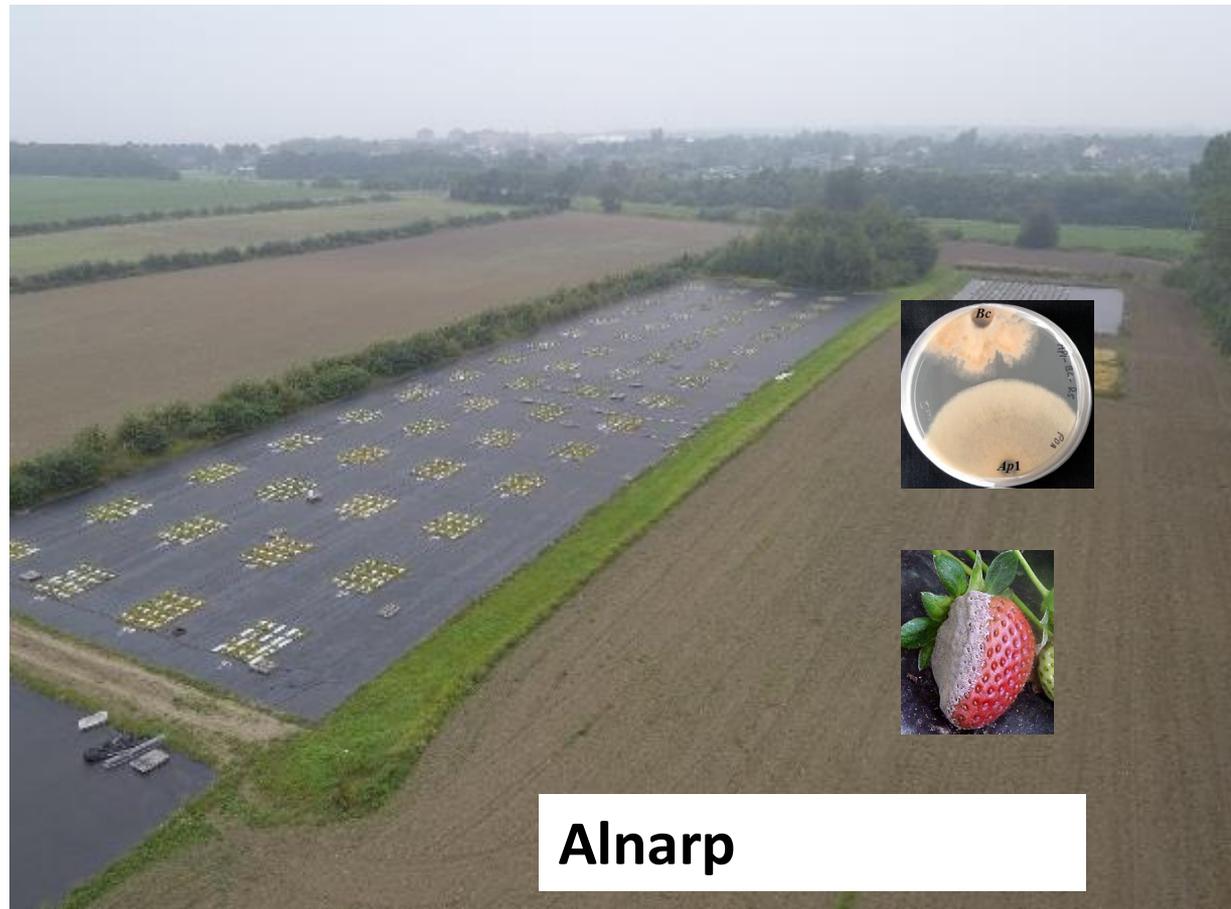


Wild strawberry

Fragaria vesca

Screening of traits

- frost tolerance
- resistance to herbivores
- resistance to pathogens
- suitability to biocontrol agents
- reproductive traits
- fitness (yield)



Alnarp

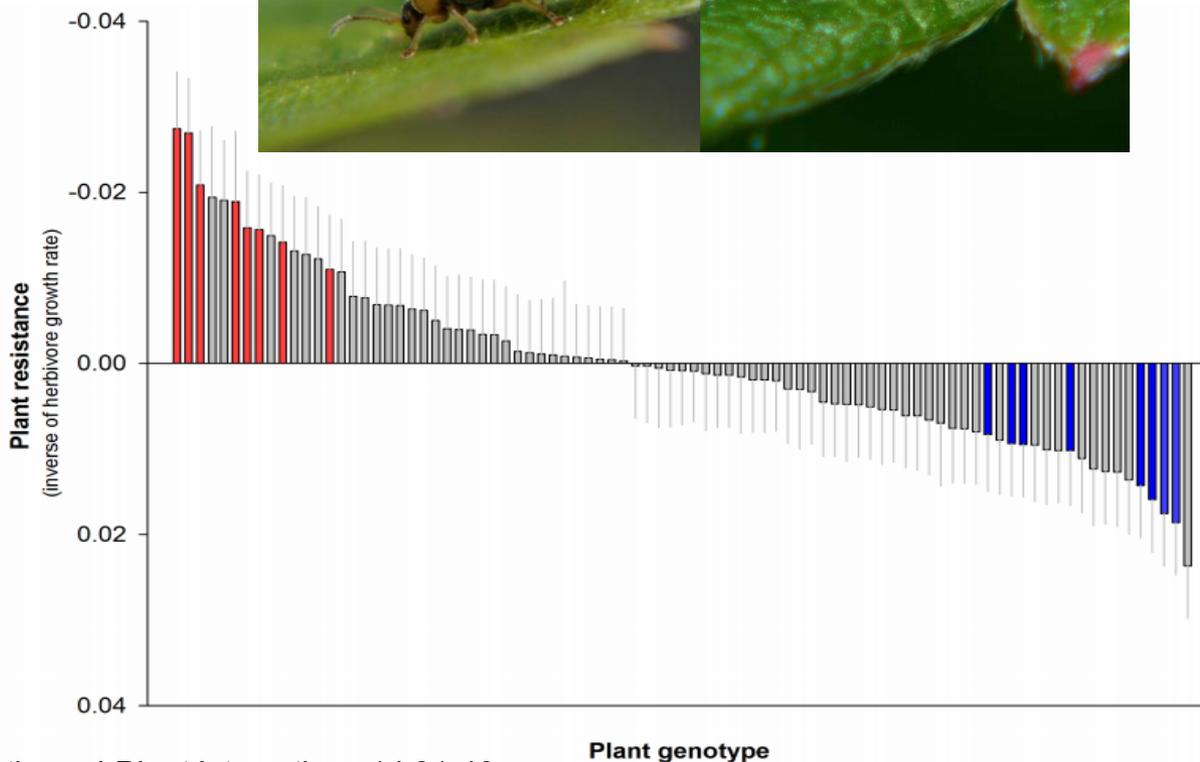


Uppsala

Variation in plant resistance to herbivores



Daniela Weber

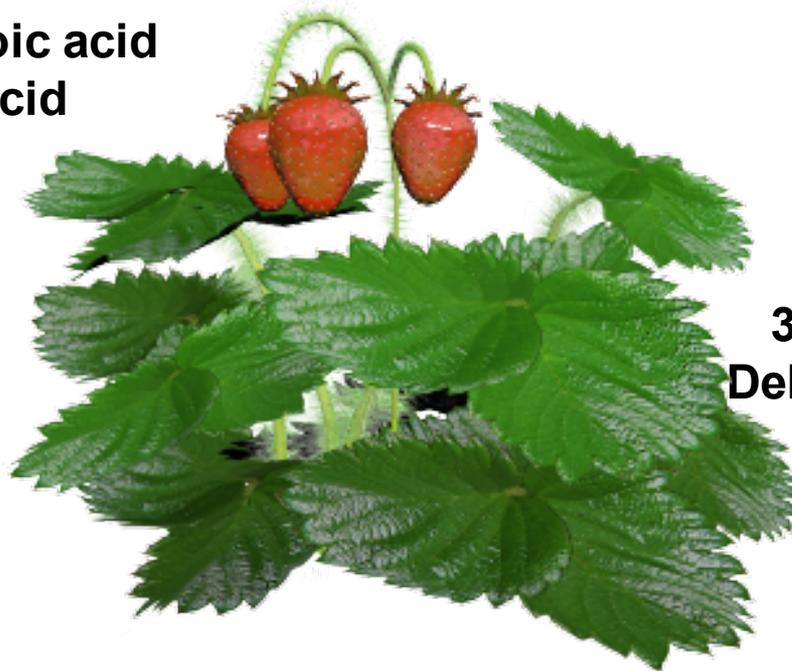


Weber et al. 2020a. *Arthropod-Plant Interactions* 14:31-40
Weber et al. 2020b. *Scientific Reports* 10:5899
Muola et al. 2017. *Frontiers in Plant Science* 8: 823

Chemical markers for resistance and biocontrol suitability

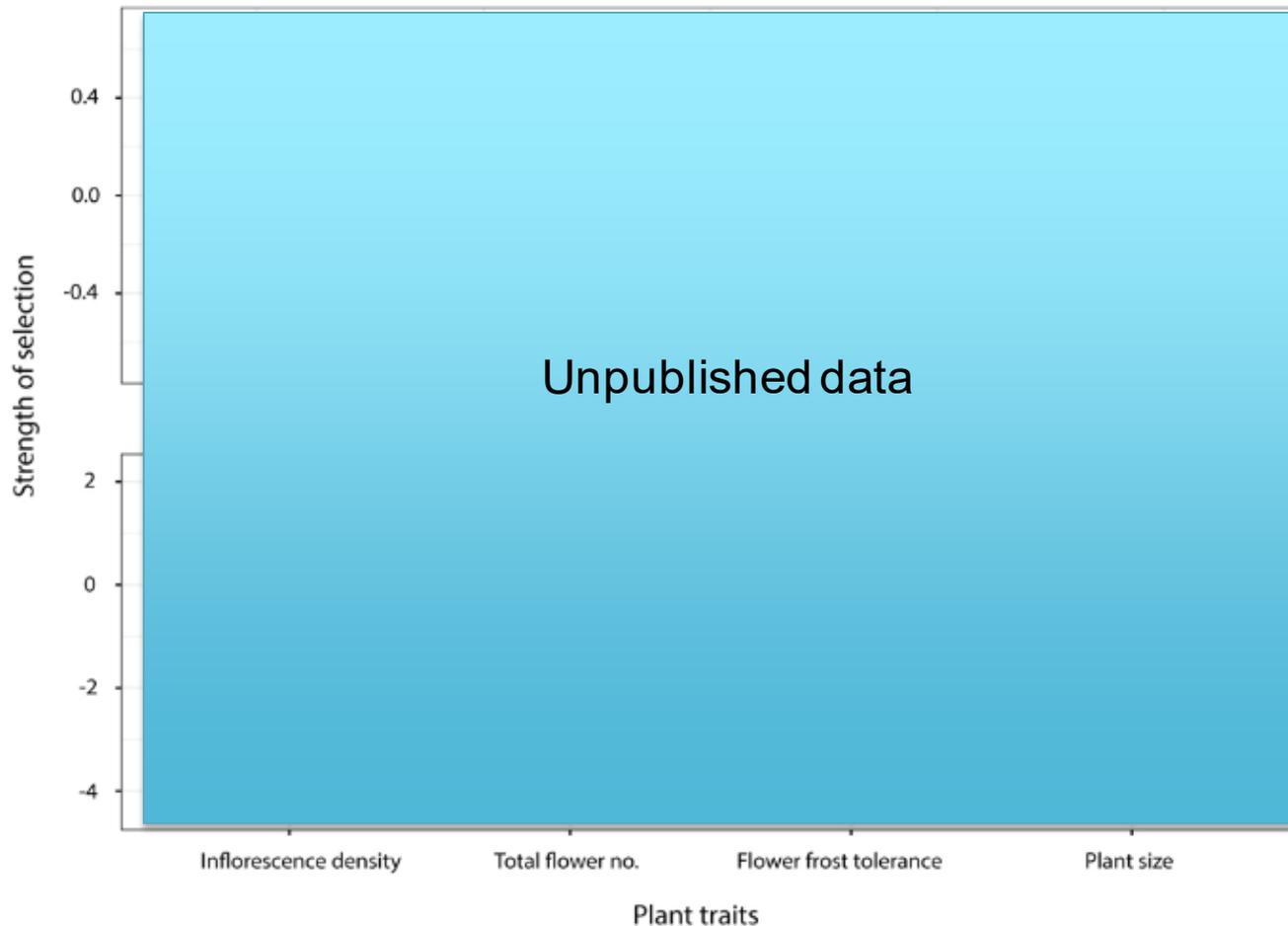


Dihydroxybenzoic acid
Hydroxybenzoic acid
2-oxoglutaric acid
 β -alanine
Catechin
Palmitic acid
Stearic acid
Proline
Shikimic acid
Tartaric acid



Citric acid
Palmitic acid
Arganine
 β -cyano-L-alanine
4-hydroxybenzoic acid
3,4-dihydroxybenzoic acid
Dehydroascorbic acid dimer
Erythritol
Galacturonic acid
Glyceric acid
Sucrose

Natural selection on the plant traits in the field



Paul Egan

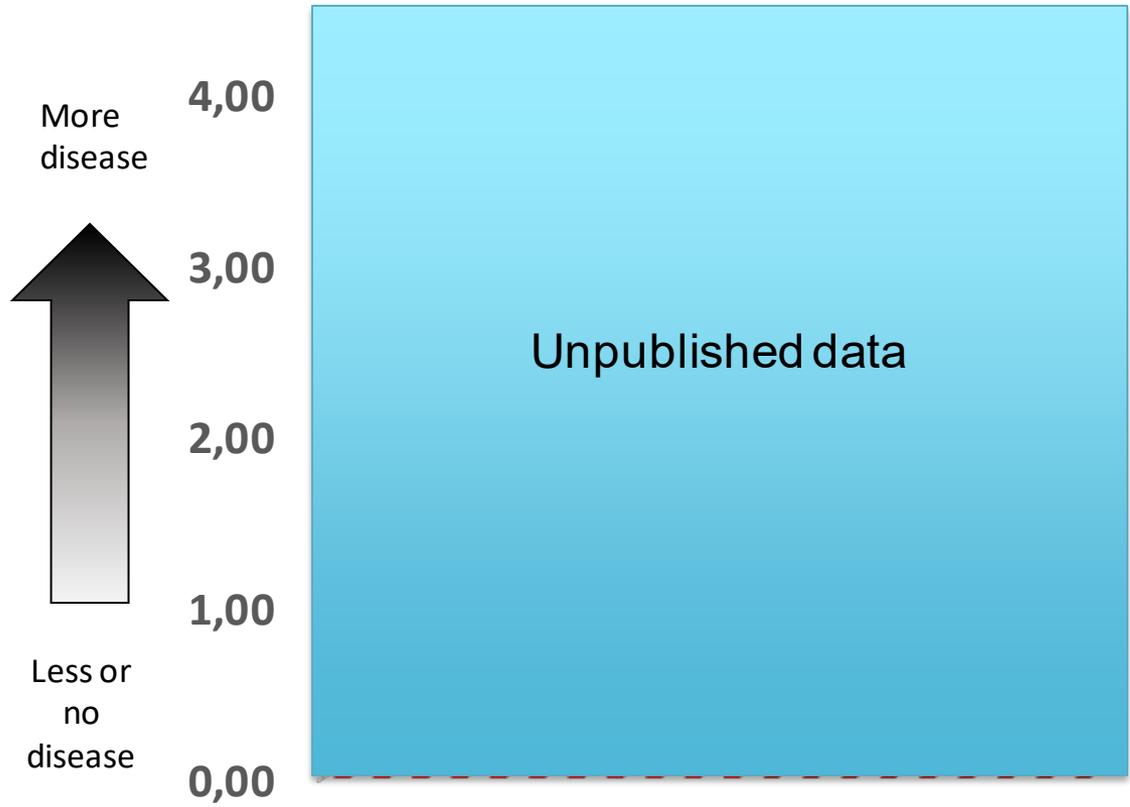


Variation in plant resistance to phytopathogens?

Anthracnose disease (*Colletotrichum acutatum*)



Daniel Amby



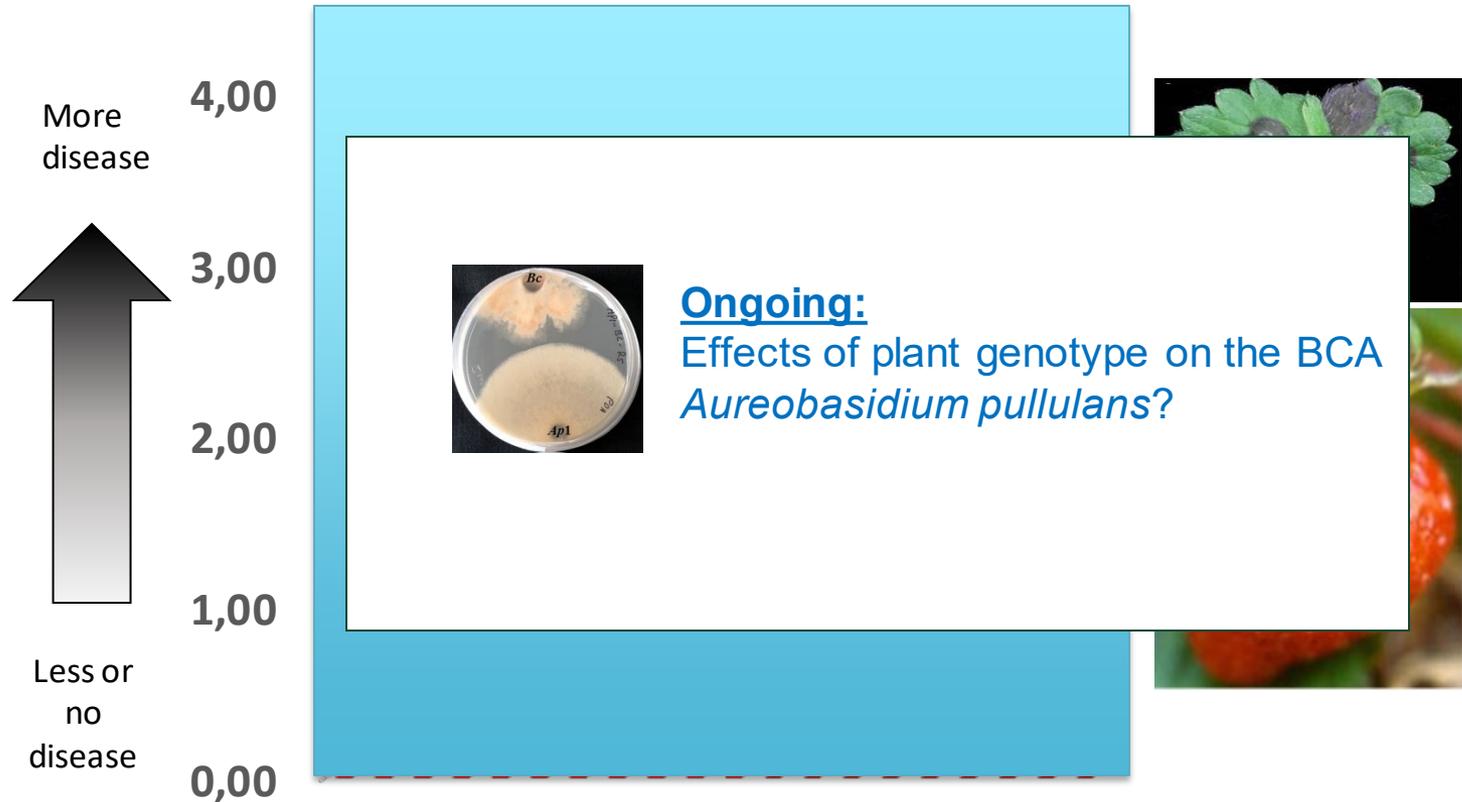
Amby, Andreasson et al. *unpublished*

Variation in plant resistance to phytopathogens?

Anthracnose disease (*Colletotrichum acutatum*)



Daniel Amby



Conflicts between pollination and biocontrol

When flying doctors take the medicine



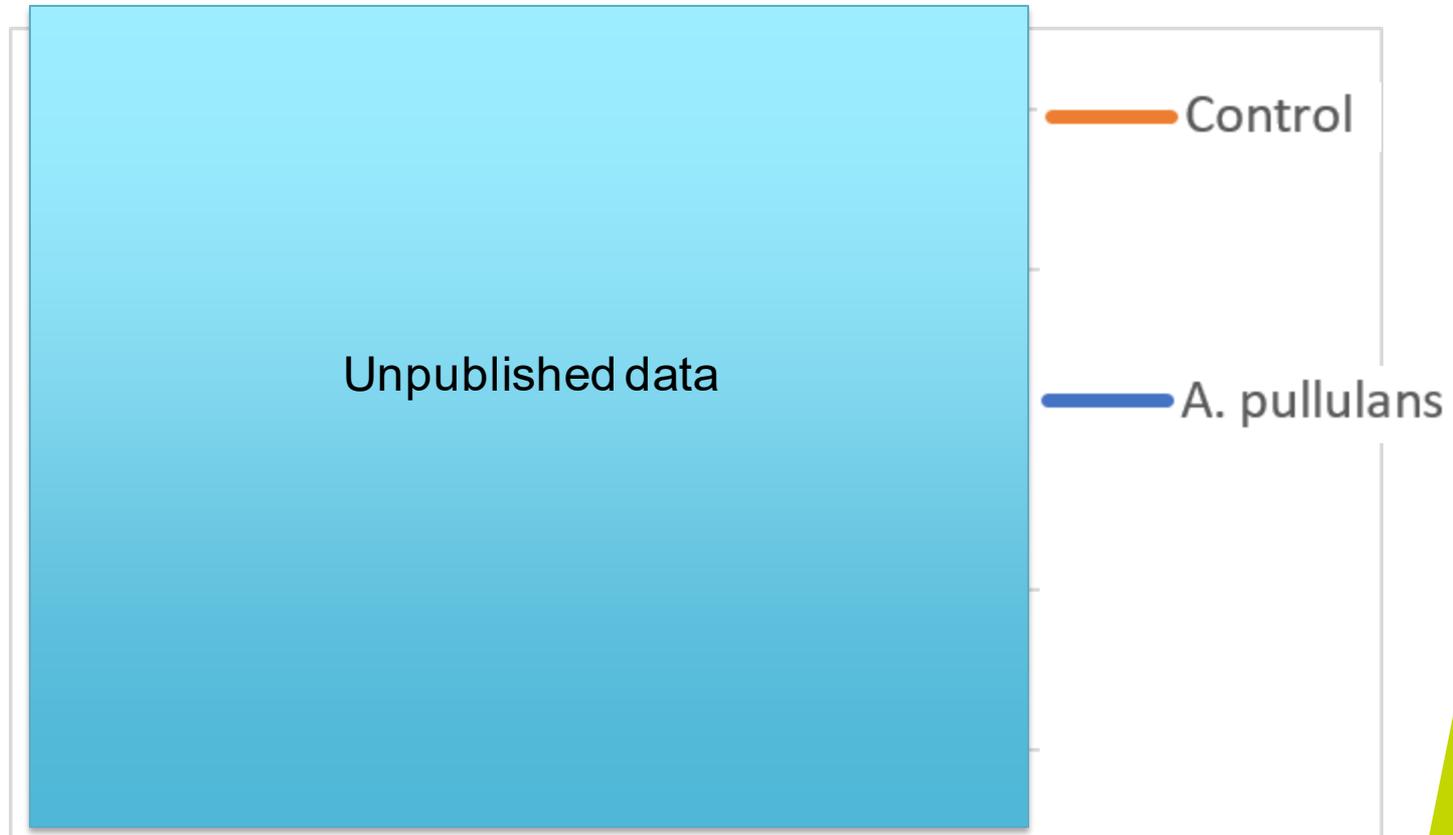
Are the bees negatively affected by fungal biocontrol agents?



Bee hive with *Aureobasidium pullulans* dispenser

Bee activity is negatively affected by *A. pullulans*

→ reduced pollination



Conclusion

Holistic perspective needed when breeding for extended phenotypes and designing IPM strategies with biologicals



Thank you!

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