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Agroecological pest control in sugar beets

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Supervised by
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Background

- Gaucho banned since 2019
- Yield loss (Mahillon et al. 2022)
- Virus Yellows
- Transmitted by aphids
  - Most efficient vector → *Myzus persicae*

Green peach aphid (*Myzus persicae*).

Sugar beet with symptoms of Virus Yellows.

Background

- Possible solutions:
  - Resistant varieties (IFZ, Strube)
  - New specific pesticides (e.g. Casas et al. 2023)
  - Seedlings (FiBL)
  - Attracting beneficial insects

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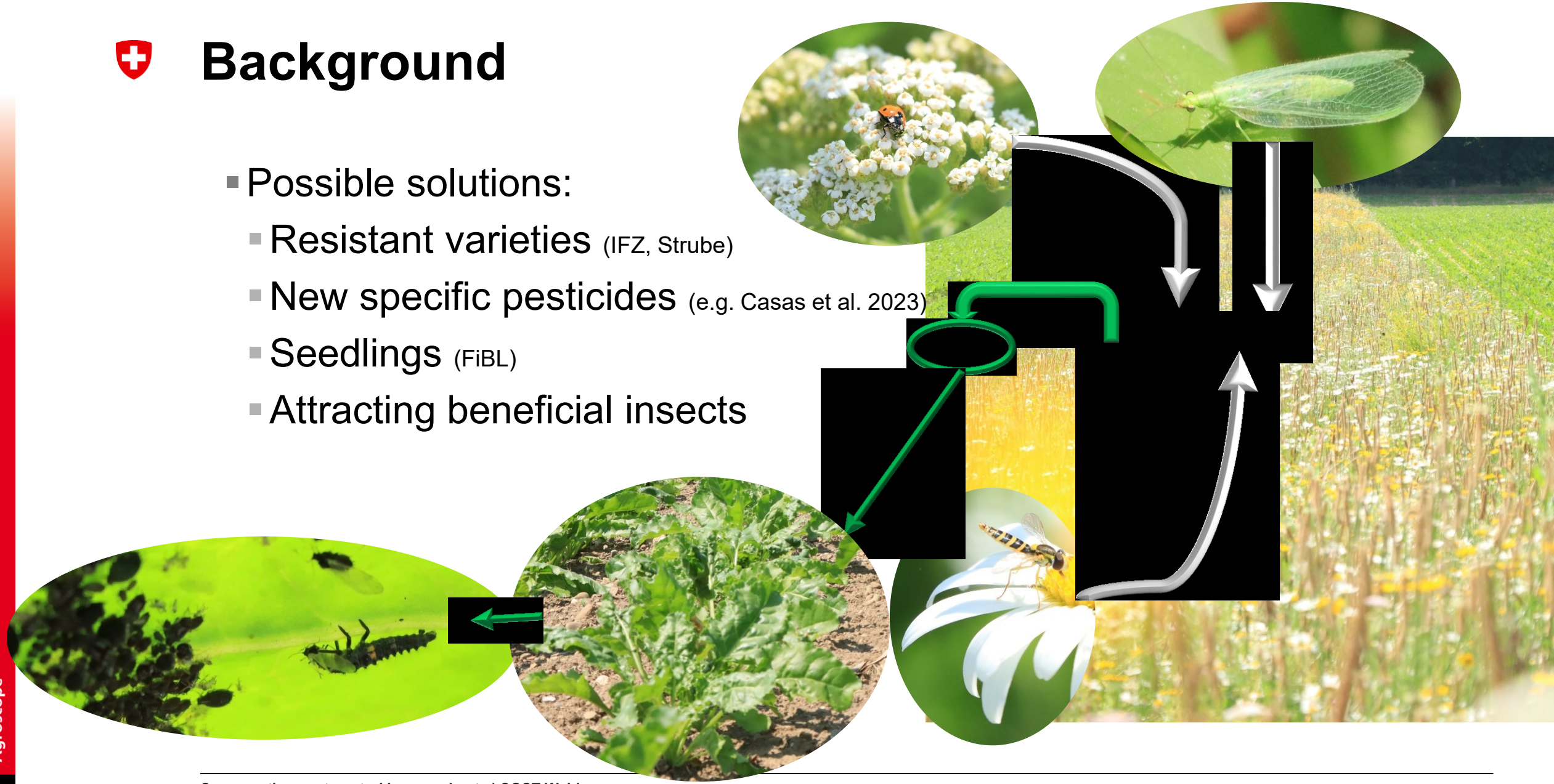
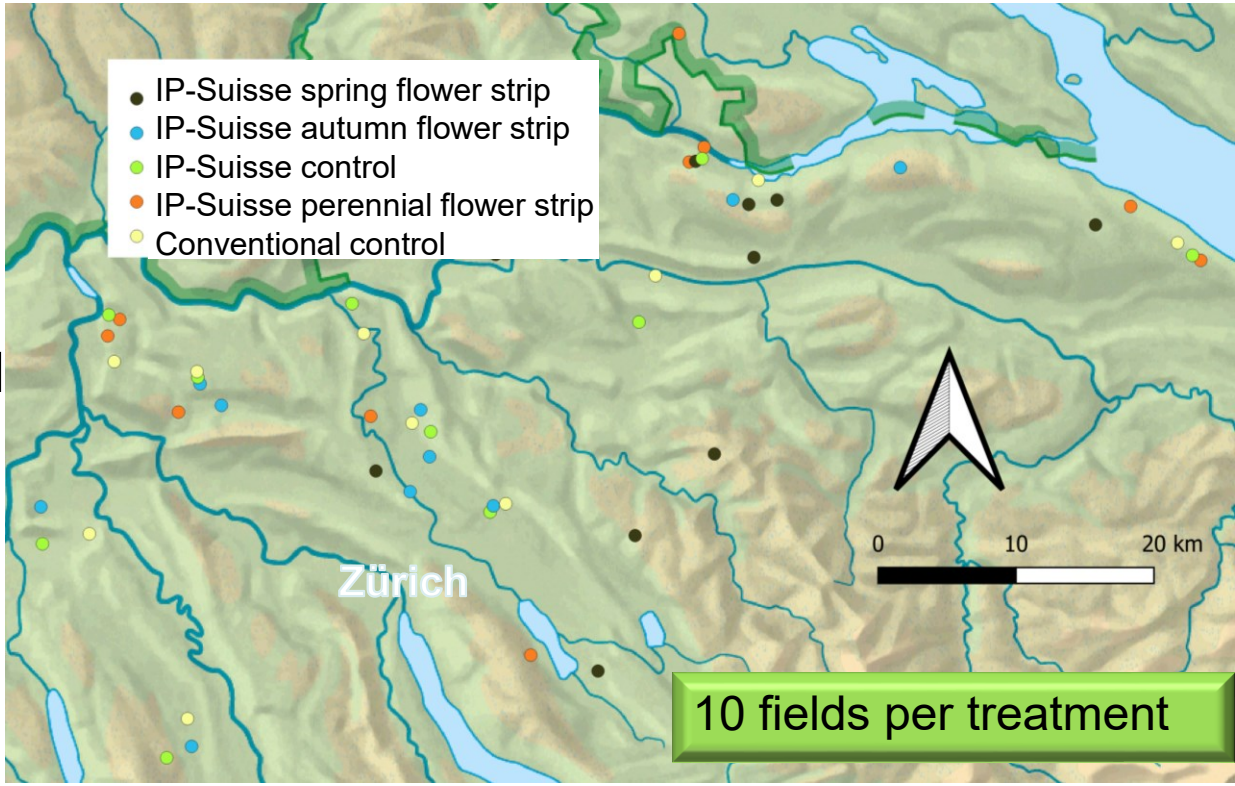


Study design and research questions

- Comparison of different flower strip mixtures

- Questions:
  - Does the mixtures have different effects on the number of aphids and especially *Myzus persicae*?
  - What effect do the flower strip mixtures have on the incidence of the virus in sugar beets adjacent to the strip?



Field season 2023: Overview of the different seed mixtures

Autumn flower strip (AFS)
Annual

Large food supply for natural enemies due to a few annual species such as: Garden chervil, field mustard, cornflower, coriander.

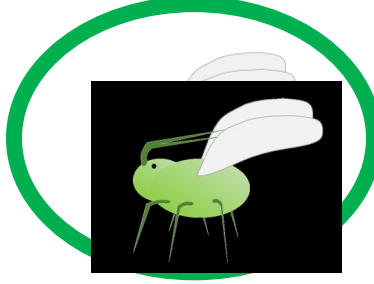
Spring flower strip (SFS)
Annual

Large food supply for natural enemies due to a few annual species such as: Buckwheat, camelina, cornflower, coriander, dill.

Perennial flower strip (PFS)
Perennial

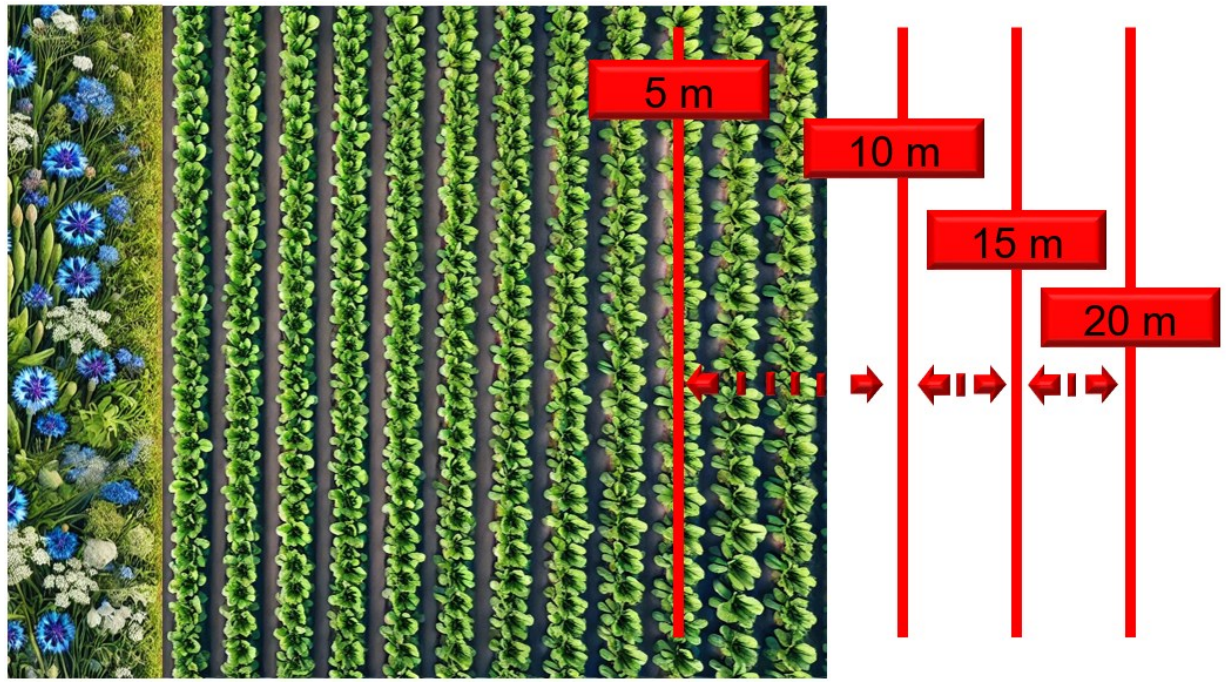
Diverse food supply with twice as many mostly perennial species to encourage as many wild bees and other beneficial insects as possible.

Aphid counting on 40 sugar beets



- Does the mixtures have different effects on the number of **aphids** and especially *Myzus persicae*?

Samplings:
Beginning May, End of May,
Mid June, End of June



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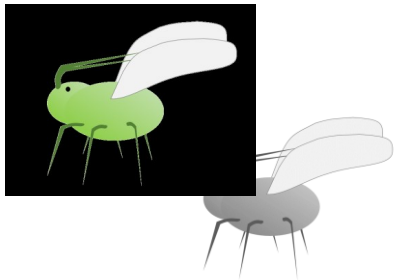

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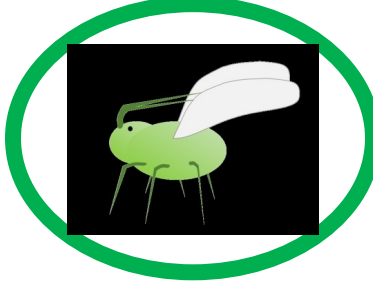
Myzus persicae sampling on 100 sugar beets



- Does the mixtures have different effects on the number of aphids and especially ***Myzus persicae***?

Samplings:
Beginning May, End of May, Mid June

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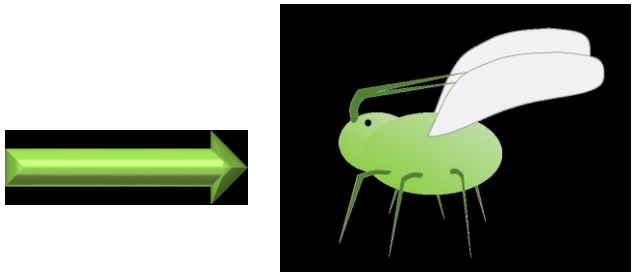

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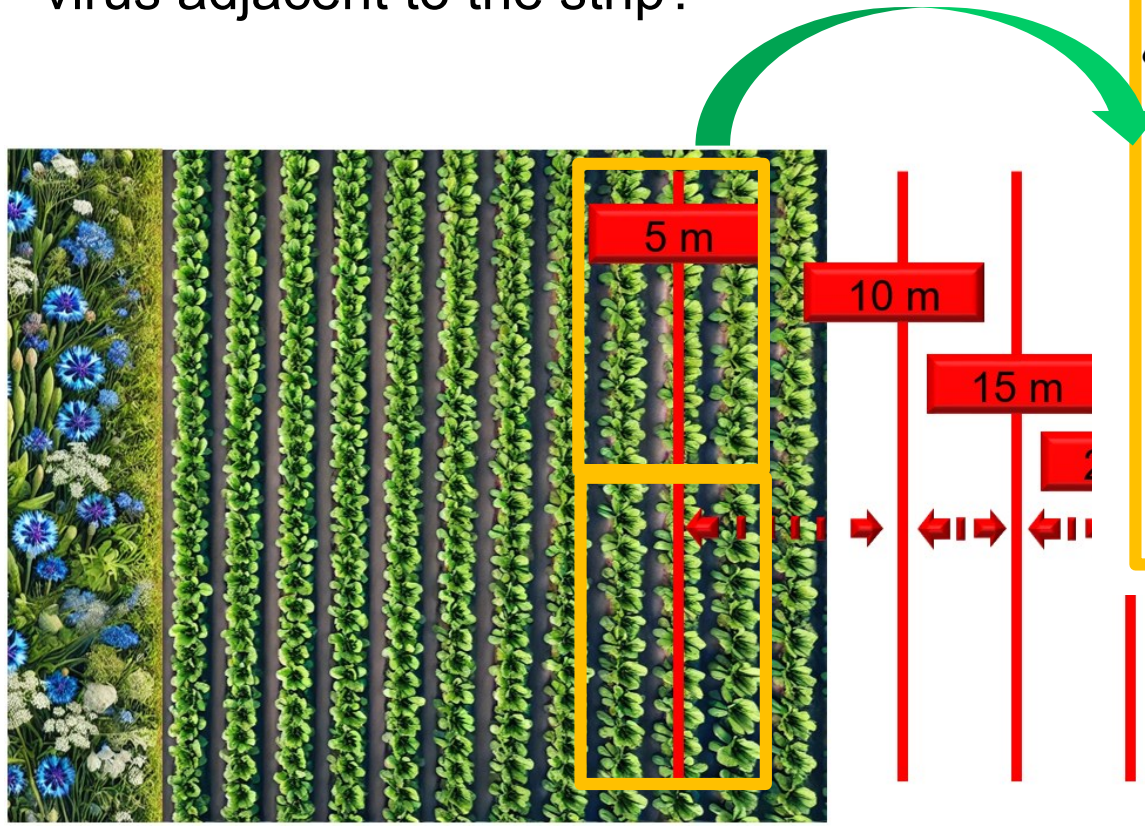
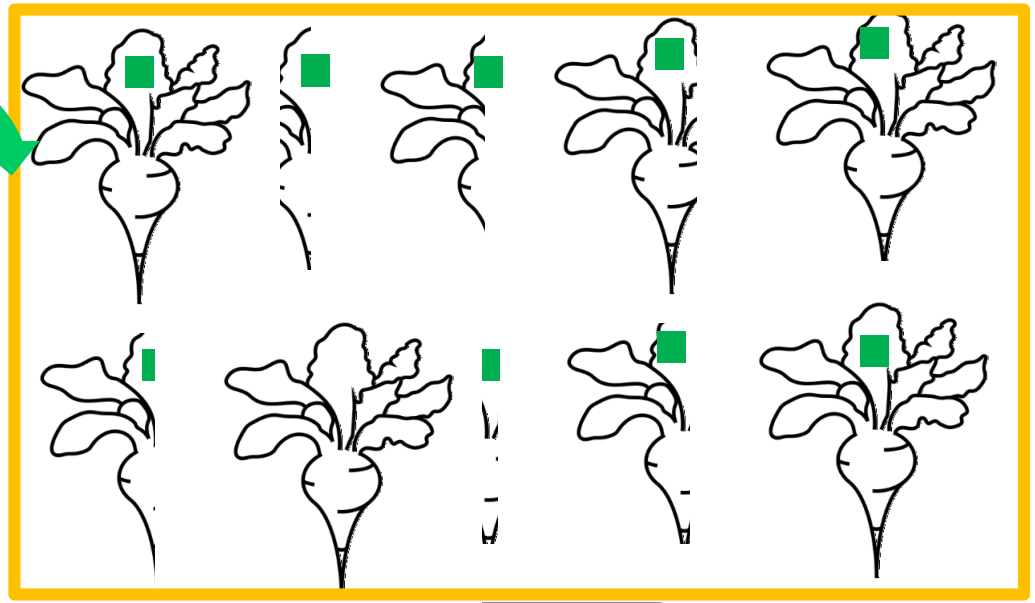
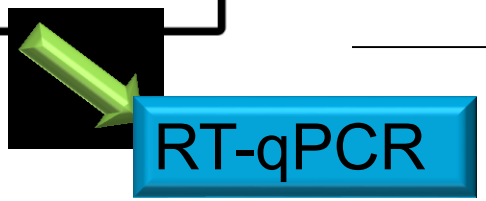
Leaf sampling and virus detection

Sampling:
Beginning of September

- What effect do the flower strip mixtures have on the incidence of the virus adjacent to the strip?







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Aphids in different treatments

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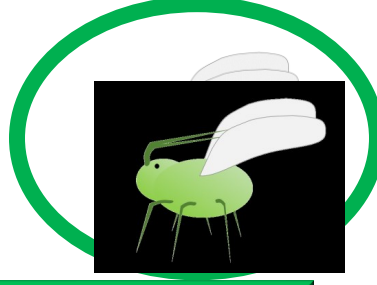

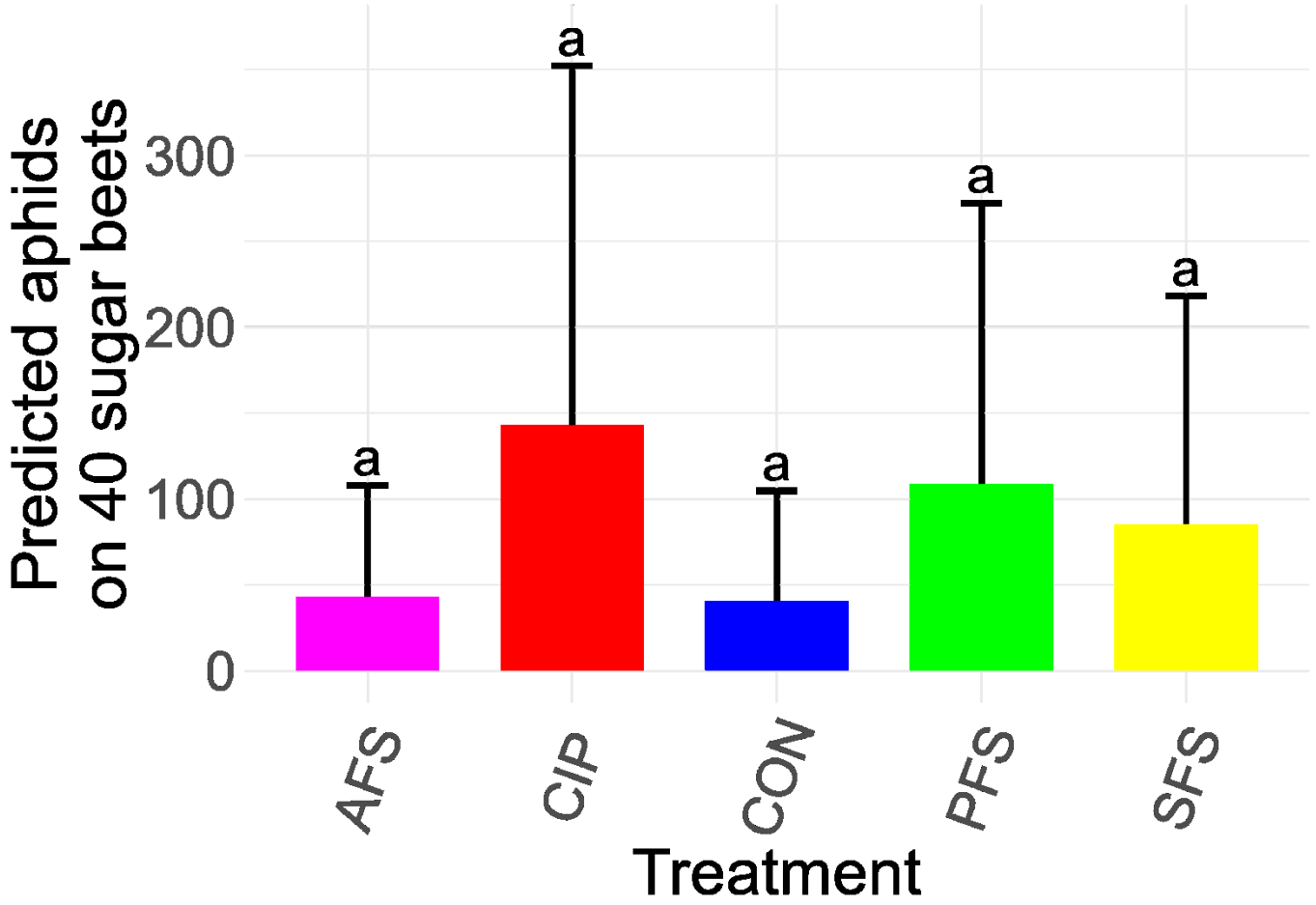

ids per field~ Treatment + Sampling round + (1|Field)

AFS = autumn flower strips (no insecticide)
SFS = spring flower strips (no insecticide)
PFS = perennial flower strips (no insecticide)
CIP = control IP Suisse (no insecticide)
CON = conventional control (insecticide)

contrast	Ratio	SE	p-value
AFS / PFS	-0.929	0.653	0.613
CIP / CON	1.255	0.656	0.310
CON / SFS	-0.741	0.665	0.798

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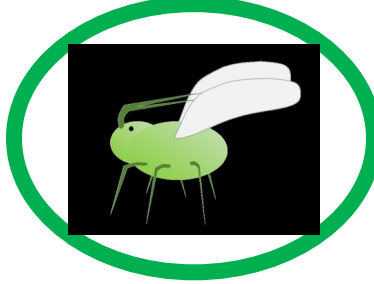
Myzus persicae in different treatments



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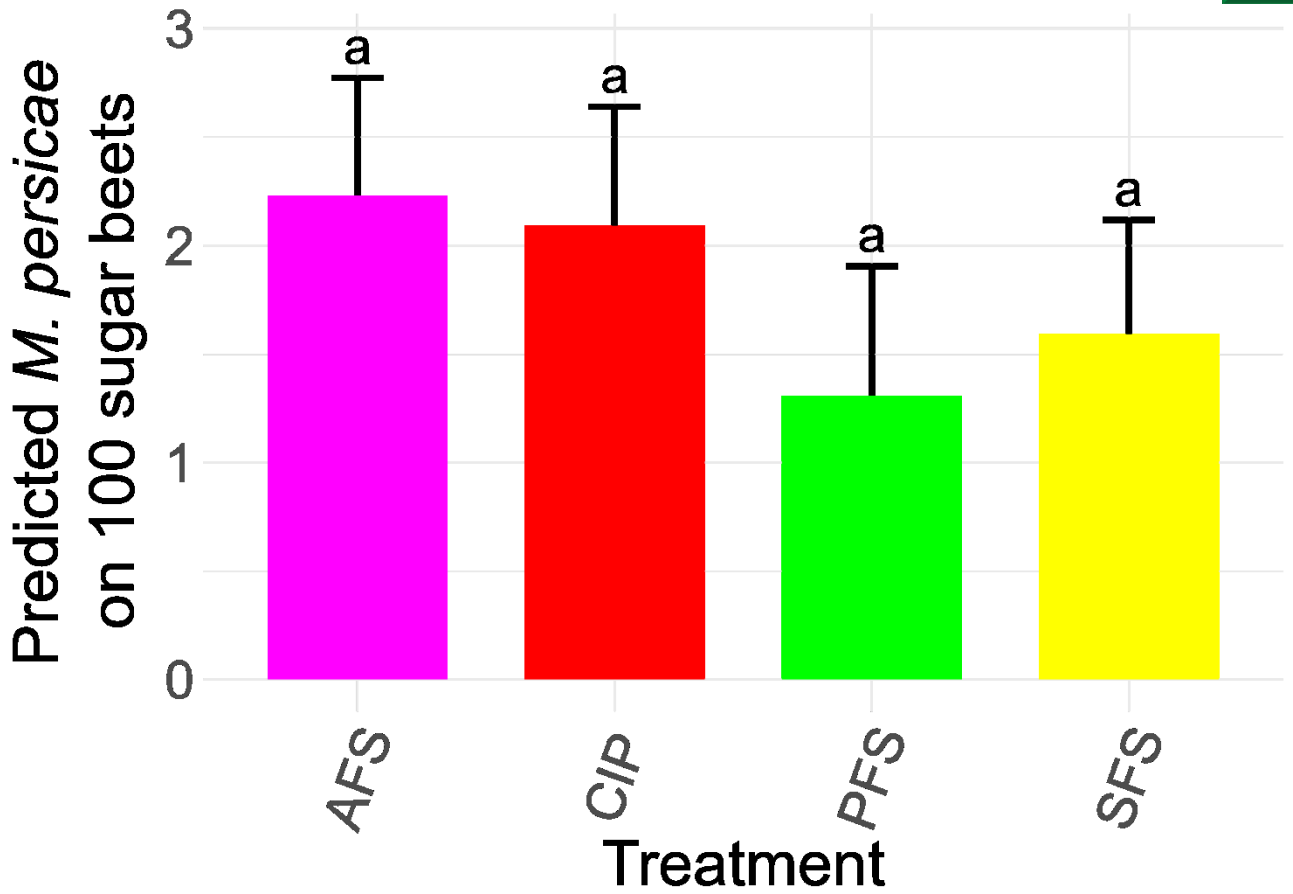
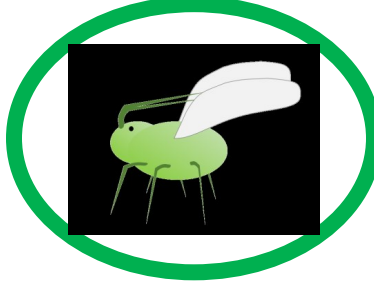


M. persicae ~ Treatment + Sampling round + (1|Field)

AFS = autumn flower strips (no insecticide)
SFS = spring flower strips (no insecticide)
PFS = perennial flower strips (no insecticide)
CIP = control IP Suisse (no insecticide)

contrast	Ratio	SE	p-value
AFS / PFS	2.536	0.947	**0.061**
CIP / SFS	1.860	0.695	0.344
PFS / SFS	0.676	0.255	0.726

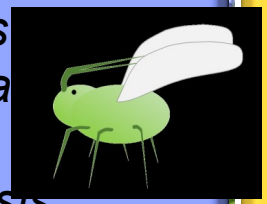
Myzus persicae in different treatments



- Does the mixtures have different effects on the number of aphids and especially ***Myzus persicae***?

Autumn flower strip (AFS)
Annual

Anthriscus cerefolium
Camelina sativa
Sinapis arvensis
Centaurea jacea
Papaver rhoeas
Anthemis arvensis



Perennial flower strip (PFS)
Perennial

Trifolium pratense
Vicia sativa

M. persicae ~ Treatment + Sampling round + (1|Field)

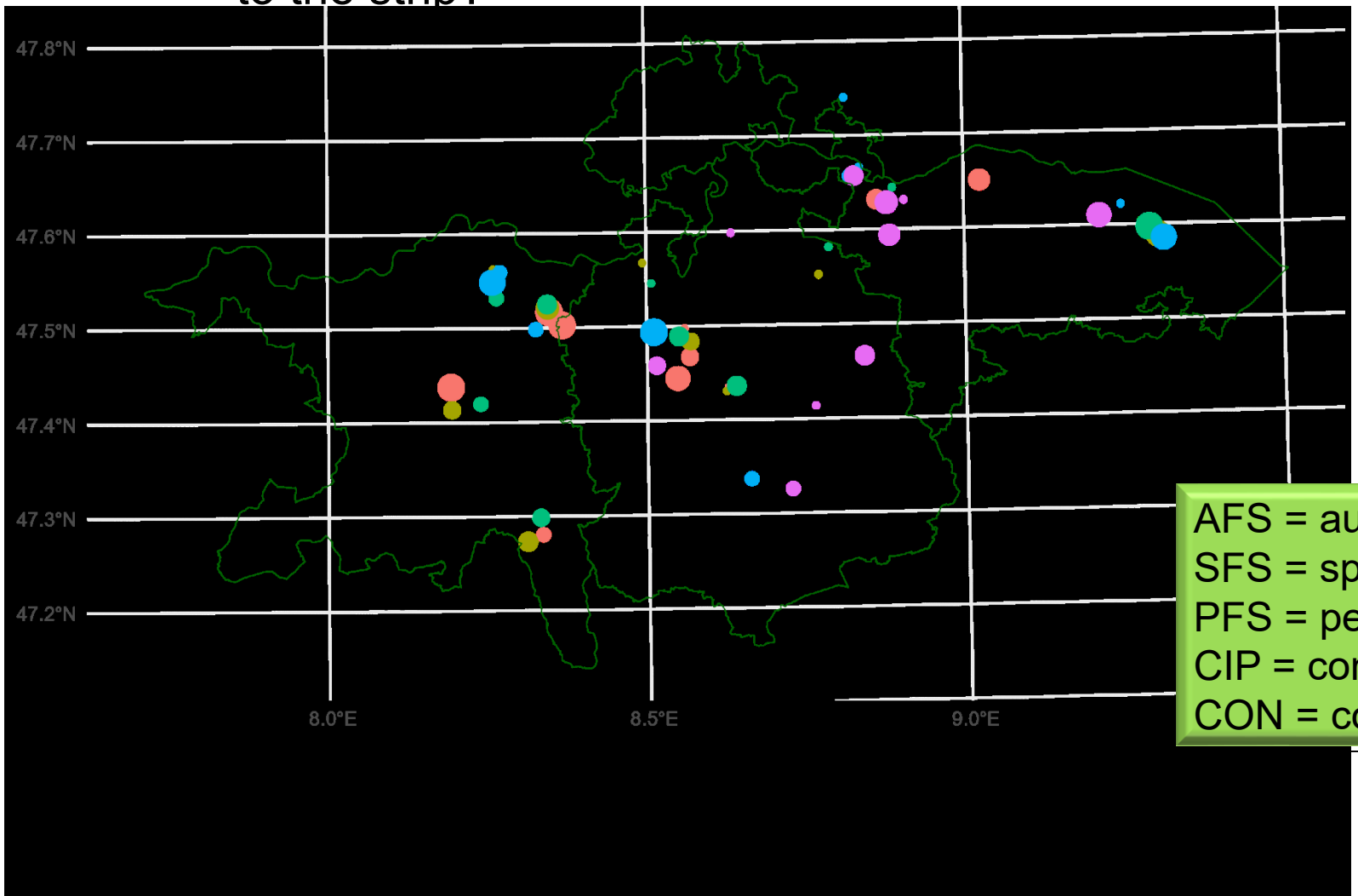
AFS = autumn flower strips (no insecticide)
SFS = spring flower strips (no insecticide)
PFS = perennial flower strips (no insecticide)
CIP = control IP Suisse (no insecticide)

Possible reason:

- AFS includes many plants that are attractive for *M. persicae* while PFS do not (internal data from Linda Näpflin, Masterstudent)

Beet yellows virus within the study area

- What effect do the flower strip mixtures have on the incidence of the virus adjacent to the strip?



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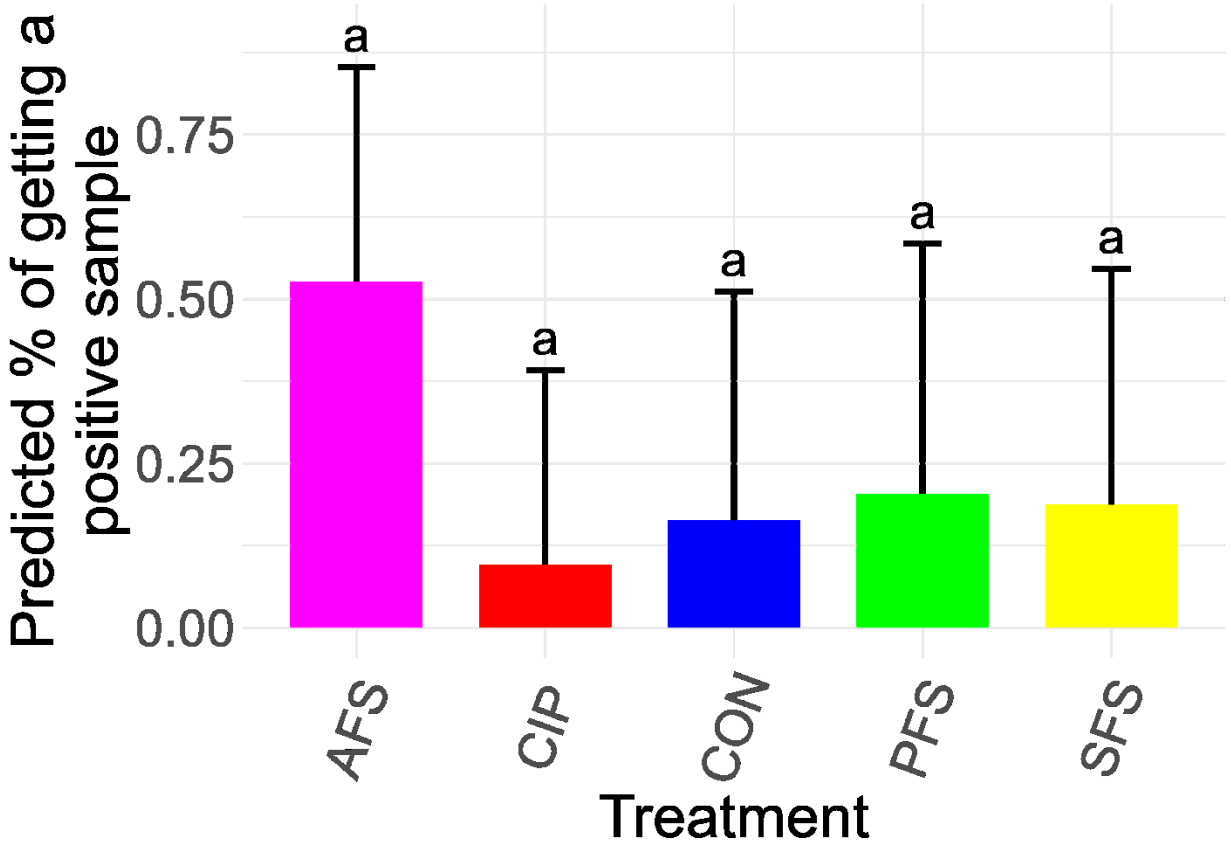
Beet yellows virus in investigated sugar beet fields

- What effect do the flower strip mixtures have on the incidence of the virus adjacent to the strip?



% of BYV positive samples ~ Treatment + (1|Field)

AFS = autumn flower strips (no insecticide)
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No significant difference

Conclusion

- Autumn flower strip showed a tendency of reducing aphids in adjacent sugar beet fields.
  - They occur in larger numbers compared to *M. persicae*.
  - Promising for other cultures that need early predation.
- Sugar beets close to autumn flower strips showed slightly elevated numbers of *M. persicae*.
  - Could be due to favorable host plants for *M. persicae* (e.g. Nikolakakis et al. 2003).
- The incidence of Beet Yellows Virus was not influenced by the presence of a flower strip on the field. Sugar beets close to autumn flower strips showed a slightly higher, but not statistically significant, incidence of Beet Yellows Virus.
  - Could be a potential virus reservoir (e.g. Stevens et al. 1994).
  - Favorable host plants could attract *M. persicae* (e.g. Nikolakakis et al. 2003).

Outlook

- Strip mixtures could be adapted including more plants that repel *M. persicae*.
- It is important to investigate whether the plants in the mixture could serve as virus reservoir

- With the presented data:
  - Include environmental variables to potentially explain the huge variance between fields.

I'm coming to the end…

Thanks!

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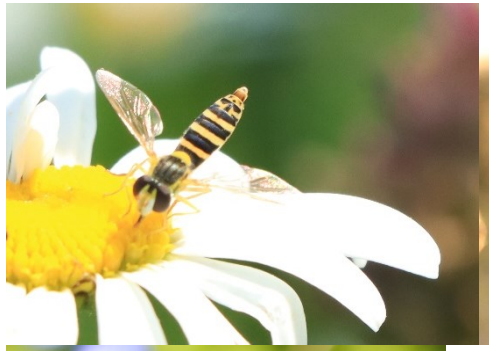
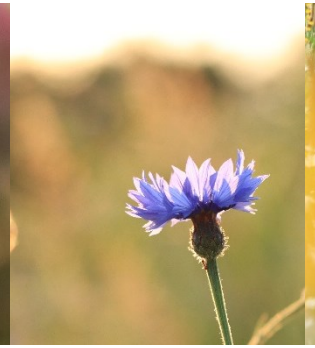
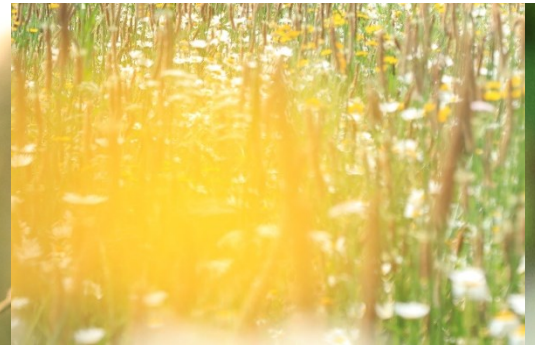
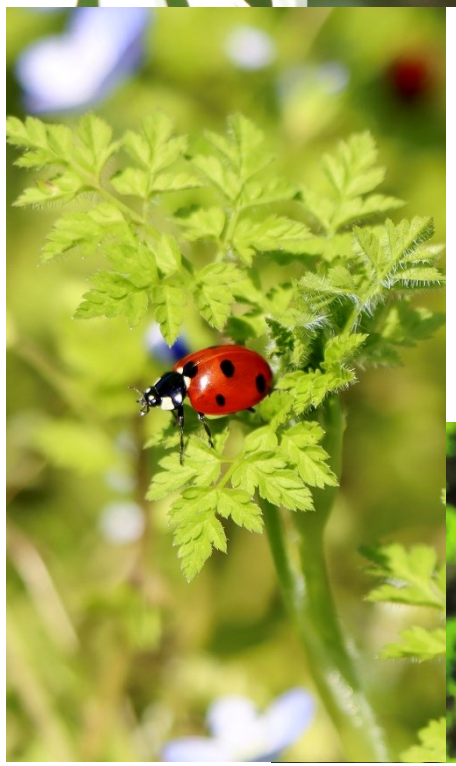
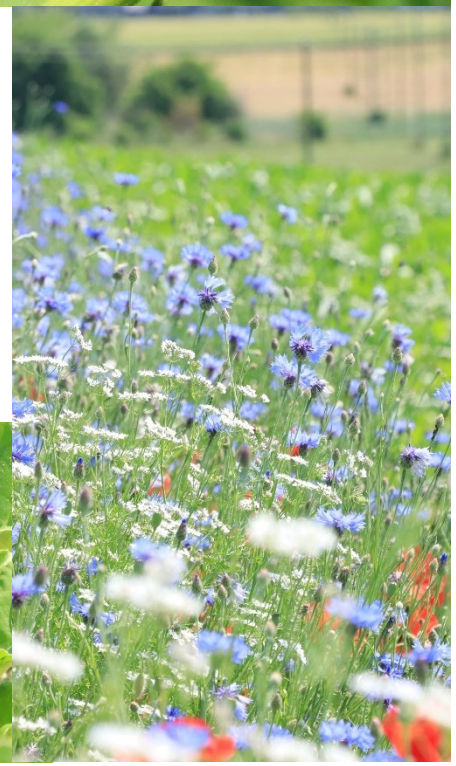






Thank you for listening

any questions left?





References

- Performance of Myzus persicae (Hemiptera: Aphididae) clones on different host-plants and their host preference (Nikolakakis et al. 2003)
- The host range of beet yellowing viruses among common arable weed species (Stevens et al. 1994)