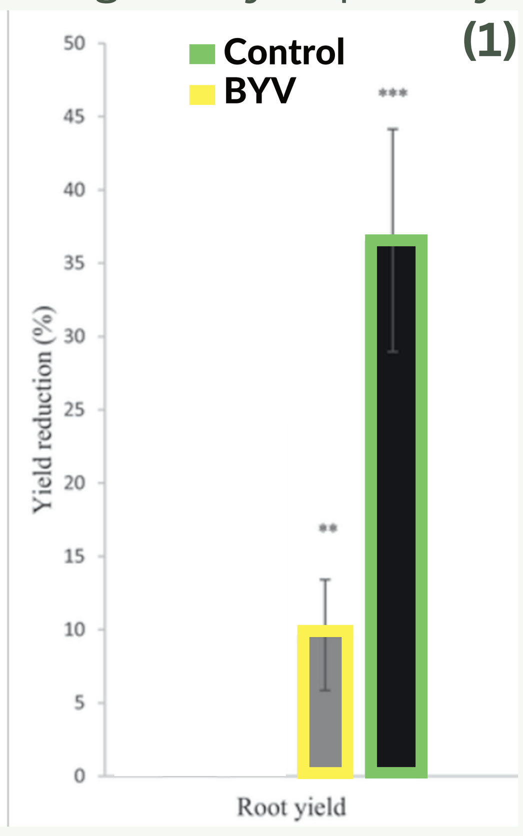
Transmission risks of Beet Yellows Virus by *Myzus persicae* and *Aphis fabae* aphids in diverse experimental conditions

Olivera Popov[1,2], Amélie Monteiro[3], Anas Cherqui[1], Kévin Tougeron[1,4]

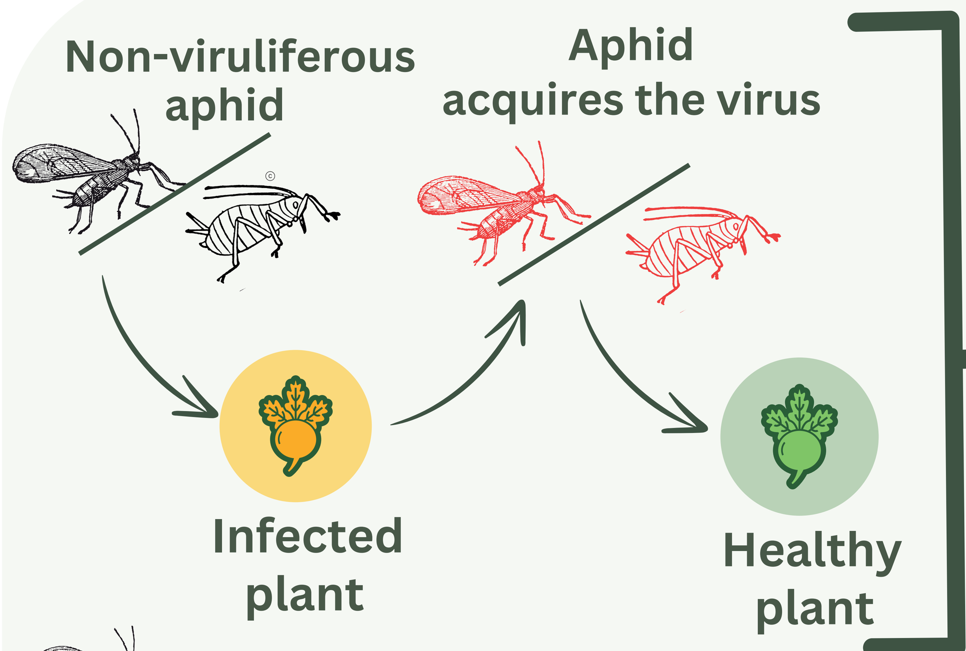
1. UMR CNRS 7058 EDYSAN (Écologie et Dynamique des Systèmes Anthropisés), Université de Picardie Jules Verne, 33 rue St Leu, 80039 Amiens, France
2. Institute of Field and Vegetable Crops, 30 Maksima Gorkog , 21000 Novi Sad, Serbia
3. ITB (Institut Technique de la Betterave), 45 Rue de Naples, 75008 Paris
4. Université de Mons, EICG laboratory, Institut de Recherche en Biosciences, 6 Av. Champ de Mars, 7000 Mons, Belgium

GENERAL BACKGROUND

Beet yellows virus (BYV) is a sugar beet virus that negatively impacts yields (1)



Reduction of leave photosynthetic area and root sugar contents



The main vectors of the BYV are aphids:[1] *Myzus persicae* (the green peach aphid) & *Aphis fabae* (the black bean aphid)[2]

Semi-persistant transmission while feeding & virus dispersion in the field (1)

Neonicotinoids (NNIs) were controlling BYV efficiently for more than 30y by repressing its main vectors (1)

OBJECTIVES

1 **Main aspects: VIRUS-VECTOR interactions**

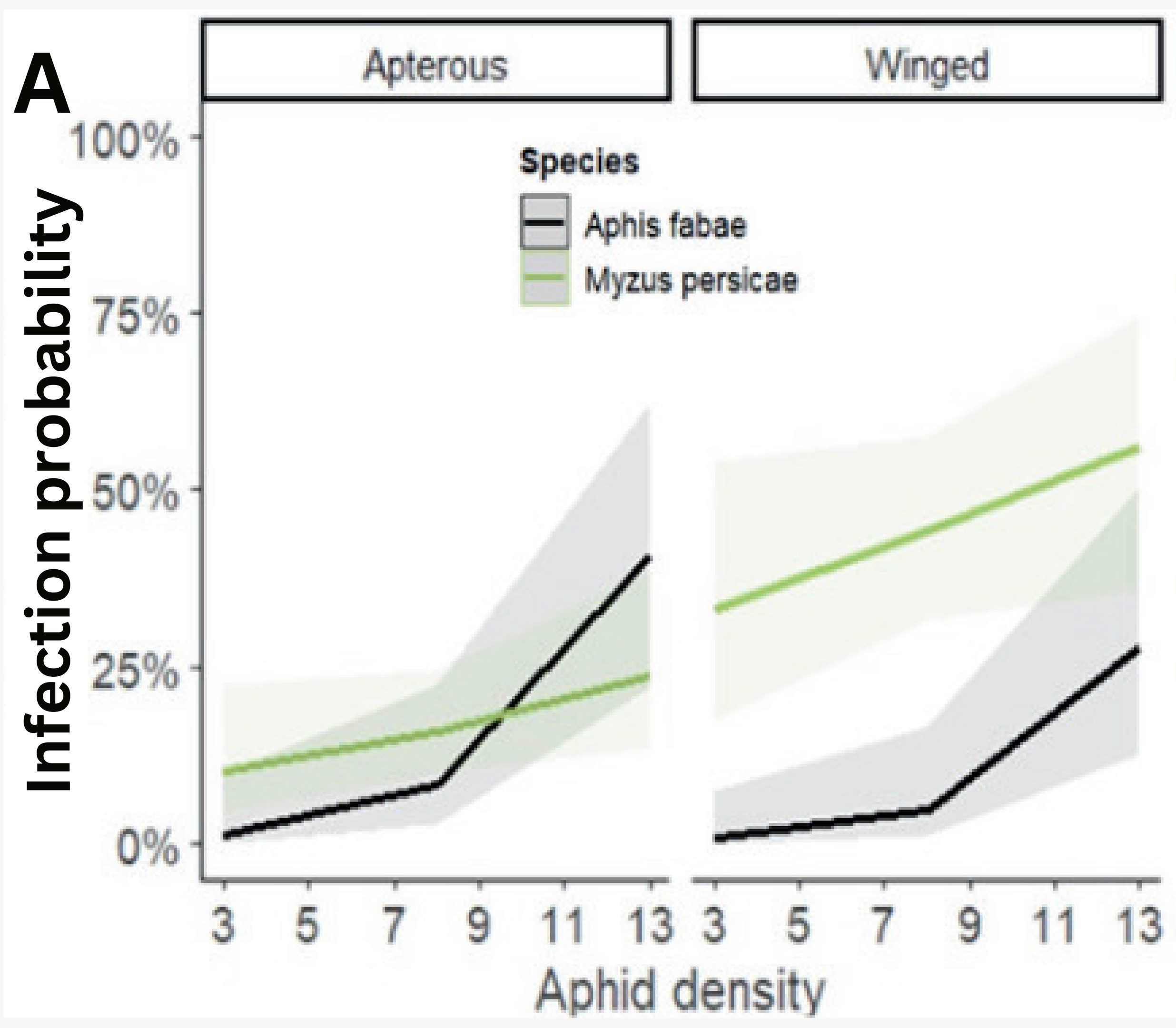
Laboratory experiment — Investigating of the virus transmission by:

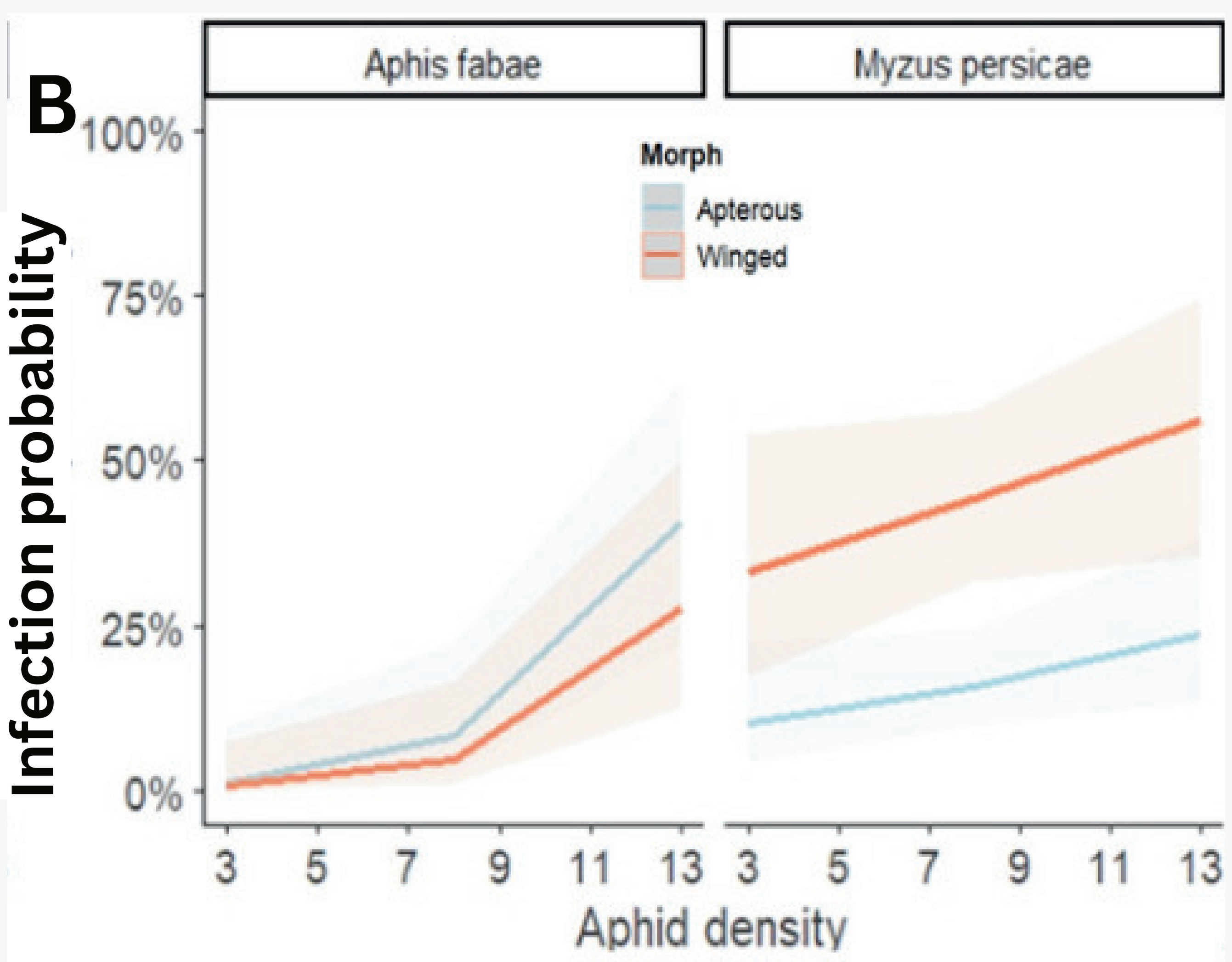
1. Different aphid densities
2. Two aphid species
3. Two aphid morphs
4. Spatio-temporal dynamics

2 Greenhouse experiment

RESULTS

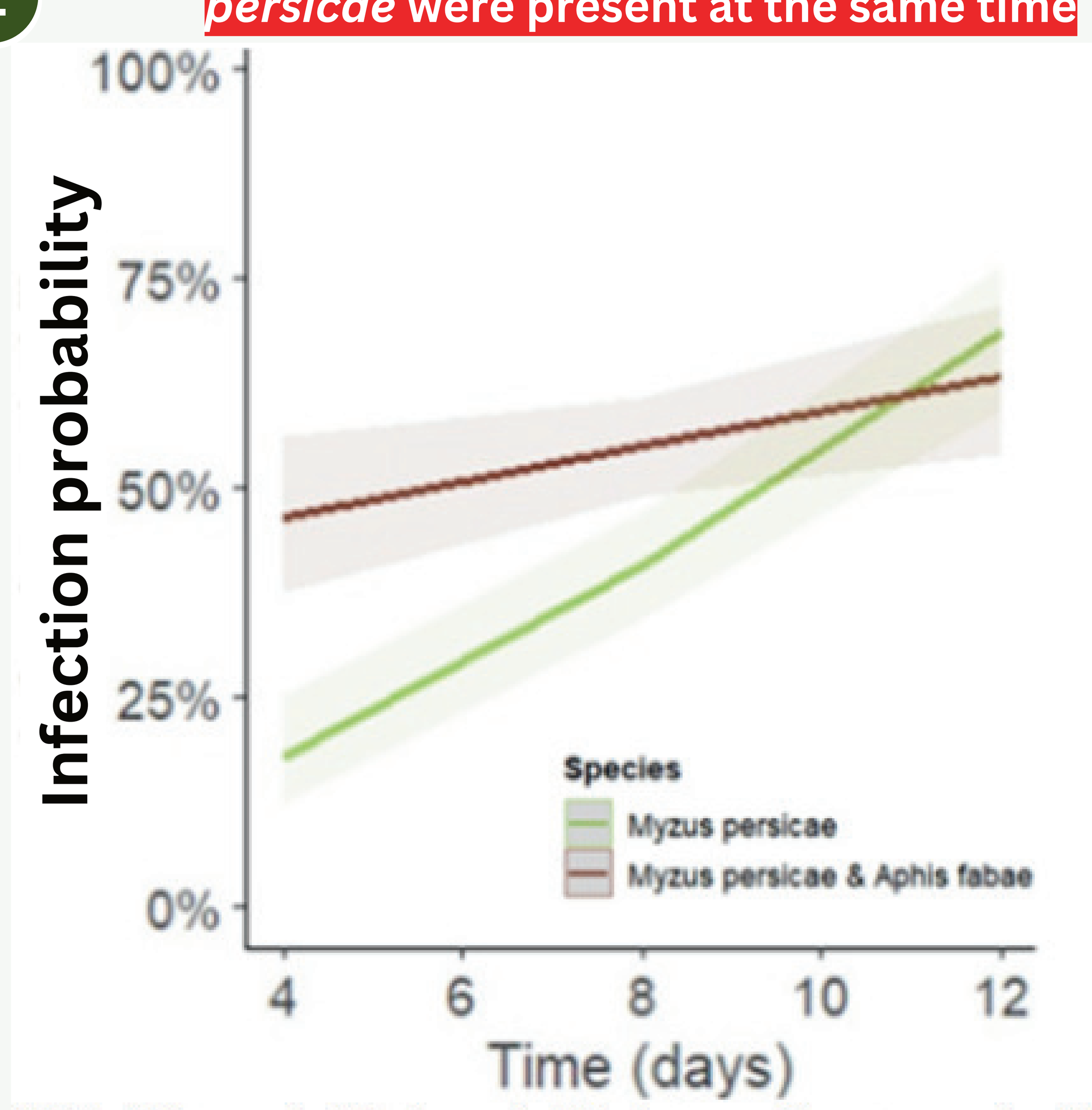
1 **The most efficient vector is winged *M. persicae***





Infection probabilité between (A) alates and apterous aphid morphs, or (B) aphids species (A. fabae or M. persicae) based on aphid density. N=6 per treatment (density, morph, species) Line represents estimated values from the model and the envelope represents 95% confidence intervals

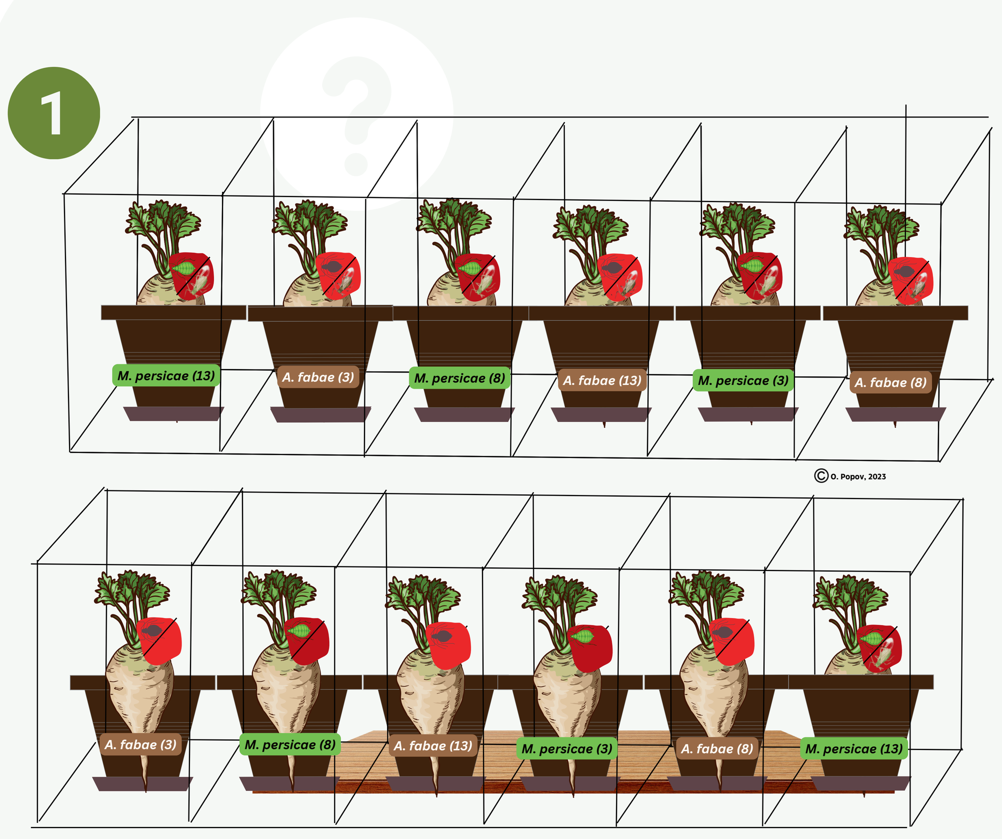
2 **The best infection probability was observed when both vector species *Aphis fabae* & *Myzus persicae* were present at the same time**



The difference in infection probability between the vector species *M. persicae* and its combination with *A. fabae* based on the duration of infestation. Line represents estimated values from the model and the envelope represents 95% confidence intervals

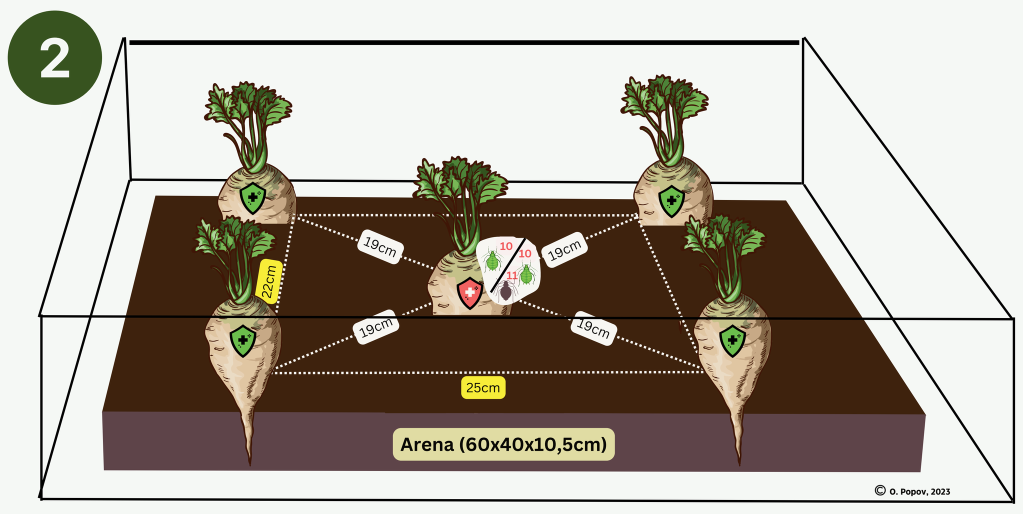
MATERIAL & METODS

1



Cage (95x58x60cm)

2



Growth chamber:
1) Constant temperature 21 ± 1°C,
2) Photoperiod of 16h:08h Light:Dark
3) Relative air humidity of 60 ± 10%
4) Watering every second day

DISCUSSION & CONCLUSION

1

-Indirect manipulation of the vectors by the virus (2) ?

-Feeding behaviour-probing capacity (3, 6)

-Salivary proteins expression (3)

2

-Competition between aphids(7)

-Feeding behaviour -stimulated feeding (4)

-Aphid density (5)

LITERATURE

1.Hossain R., Menzel W., Lachmann C., Varrelmann M. 2021. Plant Pathology. 70(3): 584-593.

2. Blua J., Perring M. 1992. Alatae production and population increase of aphid vectors on virus-infected host plants. Oecologia. 92(1):65-70.

3.Jiménez J., Tjallingii W., Moreno A., Fereres A. 2018. Newly distinguished cell punctures associated with transmission of the semipersistent phloem-limited beet yellows. Virus. J Virol. 92(21):e01076-18.

4.ten Broeke M., Dicke M., van Loon J. 2017. The effect of co-infestation by conspecific and heterospecific aphids on the feeding behaviour of Nasonovia ribisnigri on resistant and susceptible lettuce cultivars. Arthropod-Plant Interactions. 11(6), 785–796.

5. Kershaw W. 1965. The spread of yellows viruses in sugar beet. Ann. Appl. Biol. 56(2), 231–241.

6.Paprocka M., Dancewicz K., Kordan B., Damszel M., Sergiel I., Biesaga M., Mroczek J., Garcia A., and Gabryś B. 2023. Probing behavior of Aphis fabae and Myzus persicae on three species of grapevines with analysis of grapevine leaf anatomy and allelochemicals. The European Zoological Journal. 90(1): 83-100.

7.Muller C., and Godfray J. 1997. Apparent Competition between Two Aphid Species. J Anim Ecol. 66(1):57–64.