

Aphids increase leaf fungal endophyte diversity & abundance across a plant community regardless of viral infection status & plant nutrition

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Key Questions:

1. Do aphid vectors increase the diversity, abundance, and composition of leaf fungal endophytes in a plant communities?
2. How does infection of plant virus and plant nutrition shape endophyte diversity, abundance, and composition?
3. Are there changes in endophyte community composition with Aphids, virus, Fertilization, location in the dorm, or their interactions?

Take Home Points:

1. Presence of aphids increase endophyte richness & abundance, regardless of viral status and fertilization.
2. There were no differences in richness & abundance, but fertilization shifted fungal endophyte community composition (not shown).

Virus and endophyte transmission

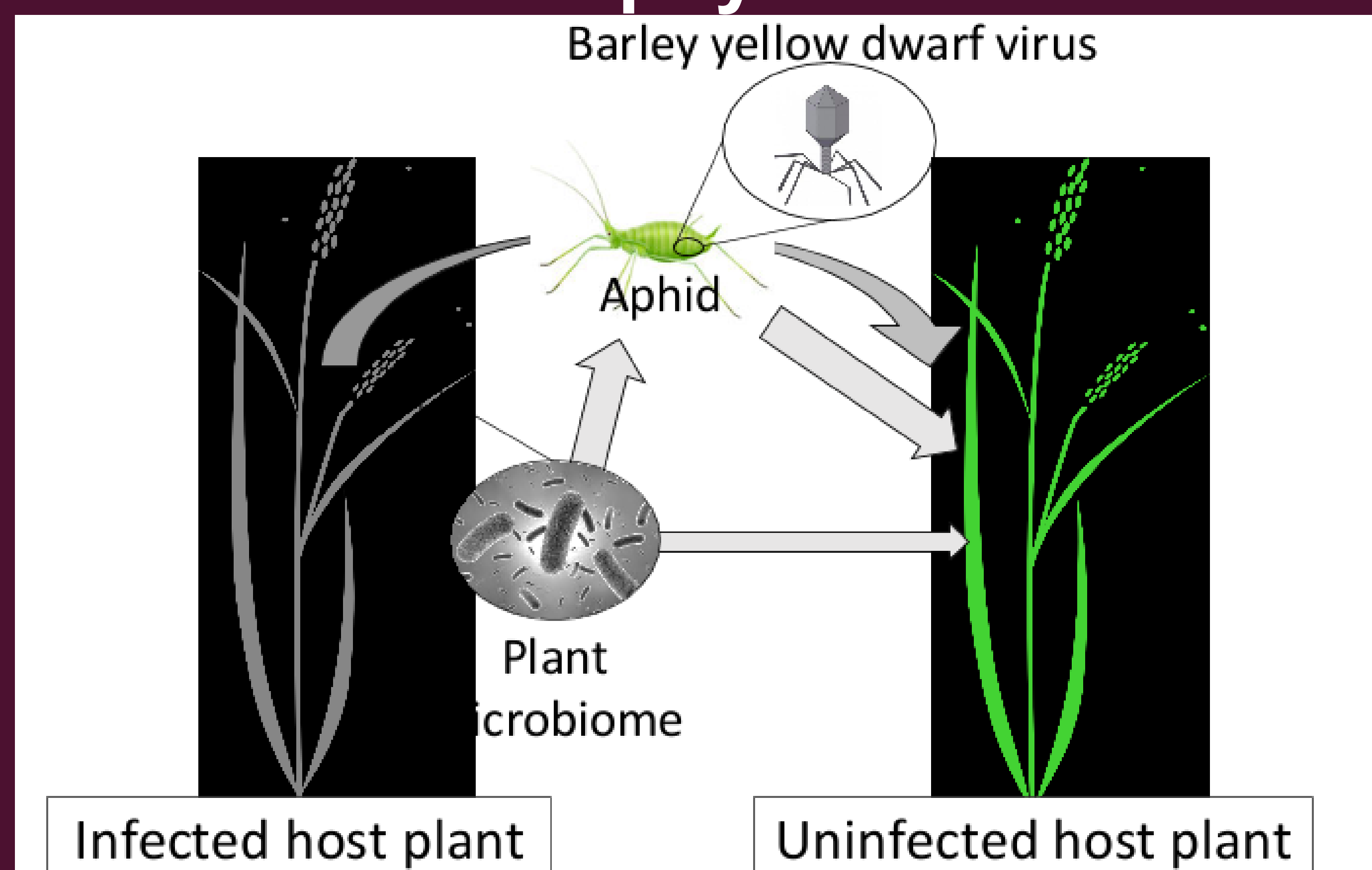


Fig. 1 Hypothesized relationship between plants, virus, aphids, and microbiome organisms. Barley/cereal yellow dwarf viruses (B/CYDVs) are aphid-vectored viruses that infect grasses worldwide. Viral infection reduces photosynthesis and fitness. Aphid vectors acquire the virus by feeding on infected plants and transmit to uninfected hosts after dispersing and feeding on them. We hypothesize that aphids will also transmit other microbiome organisms leading to higher abundance and diversity in our communities.

Experimental design

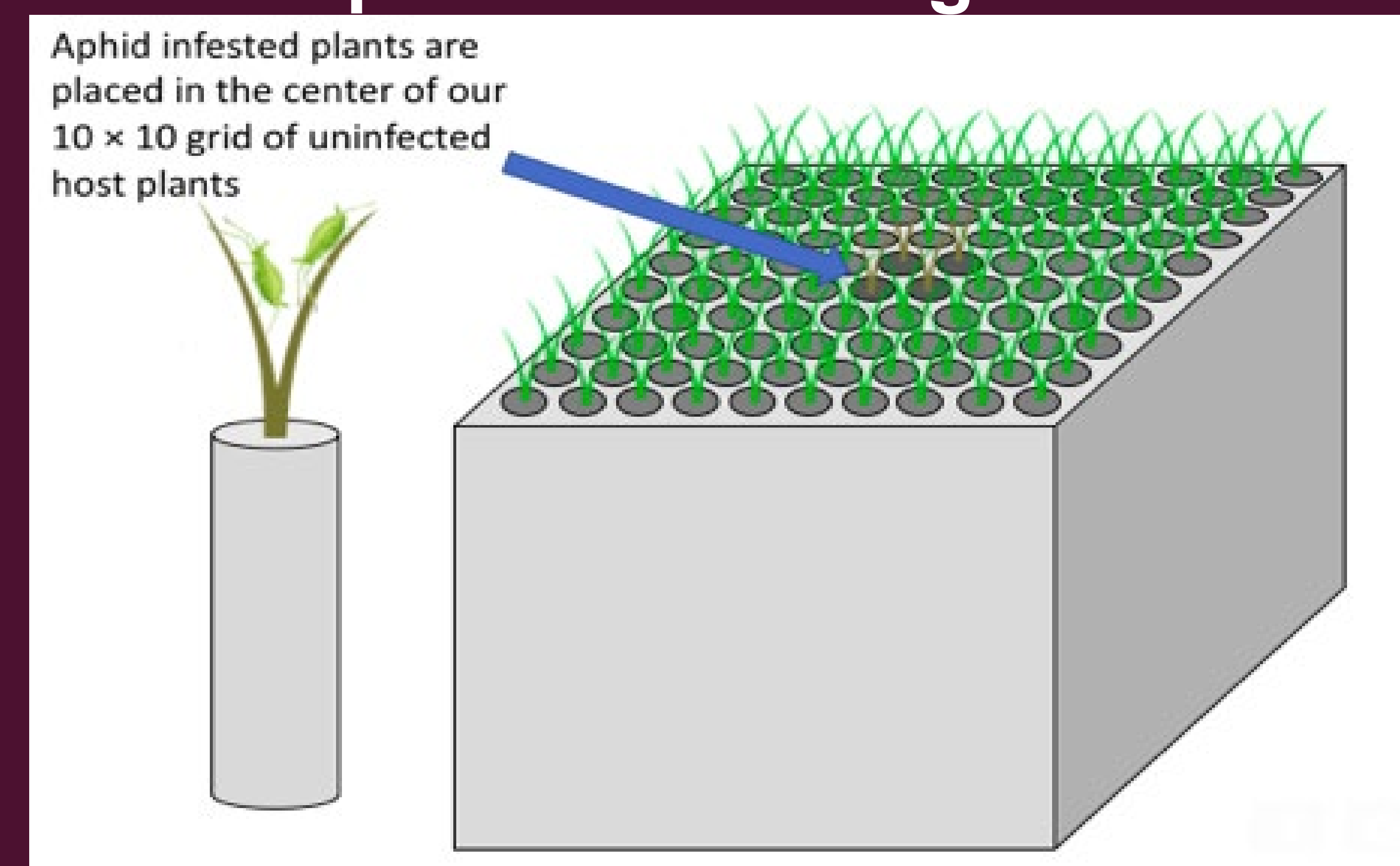


Fig. 2 An experimental plant neighborhood consisting of 100 *Avena Sativa* planted in 25 x 160 cm deep pots 10 x 10. Each neighborhood was placed in nylon insect rearing dorm. 2 levels of fertilization (0.2% & 10% of half-strength Hoagland's solution, Lacroix et. al 2014, 2017). Aphids with or without (B/CYDV) were added to plant neighborhoods, with a no aphid control (x 6 replicates). We sampled 4 randomly selected plants bi-weekly and used malt extract agar to isolate and grow fungal endophytes from leaf tissue.

Aphids increase fungal richness

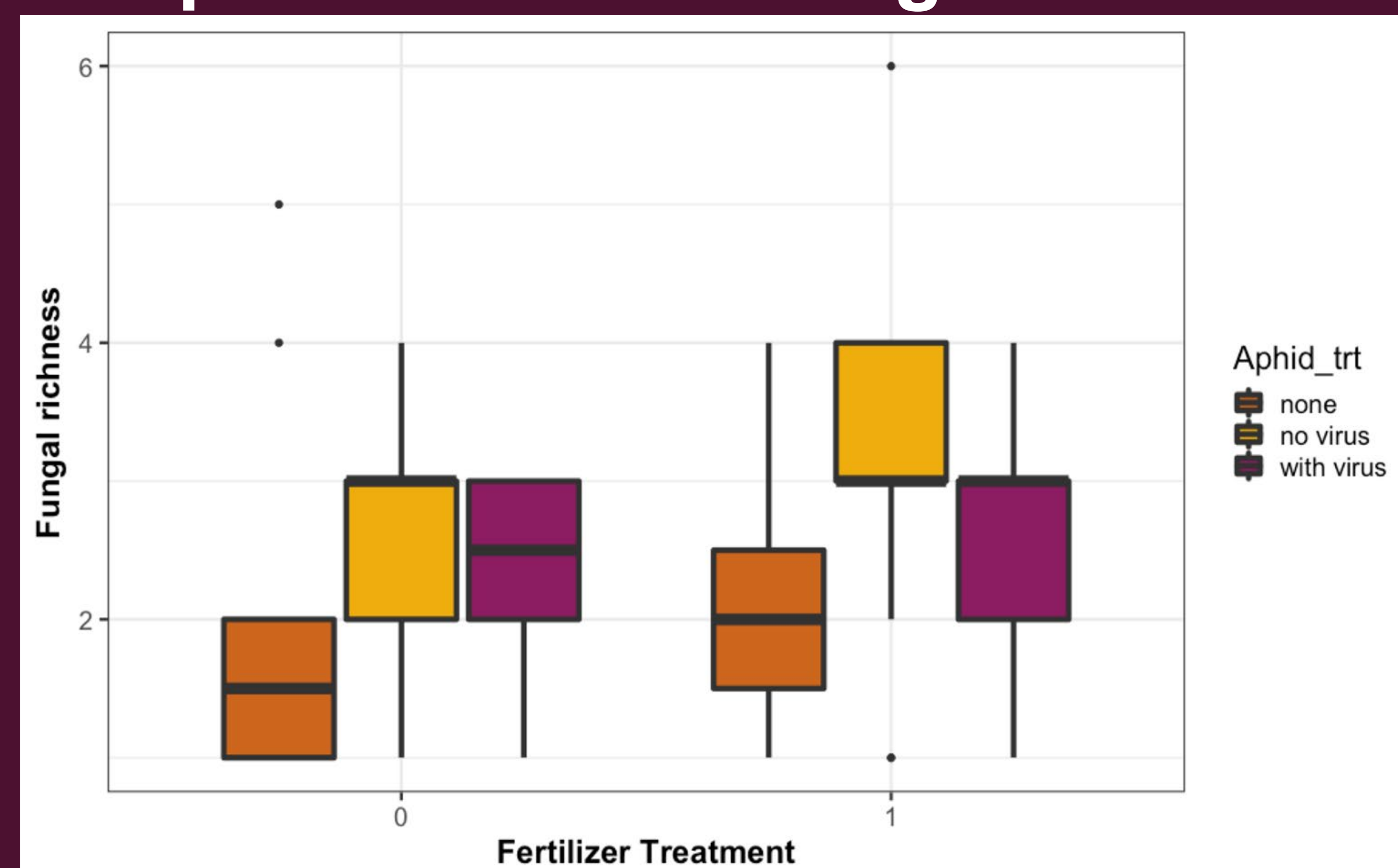


Fig. 3 Aphid presence increased fungal endophyte richness in each leaf ($F_{(2,59)} = 6.51, P=0.003$), however we found no effect of viral status (Tukey's diff = -0.502, $p = 0.14$), fertilization ($F_{(1,59)} = 1.91, P=0.17$) or location ($F_{(3,59)} = 1.09, P=0.36$) in each plant neighborhood.

Aphids increase fungal abundance

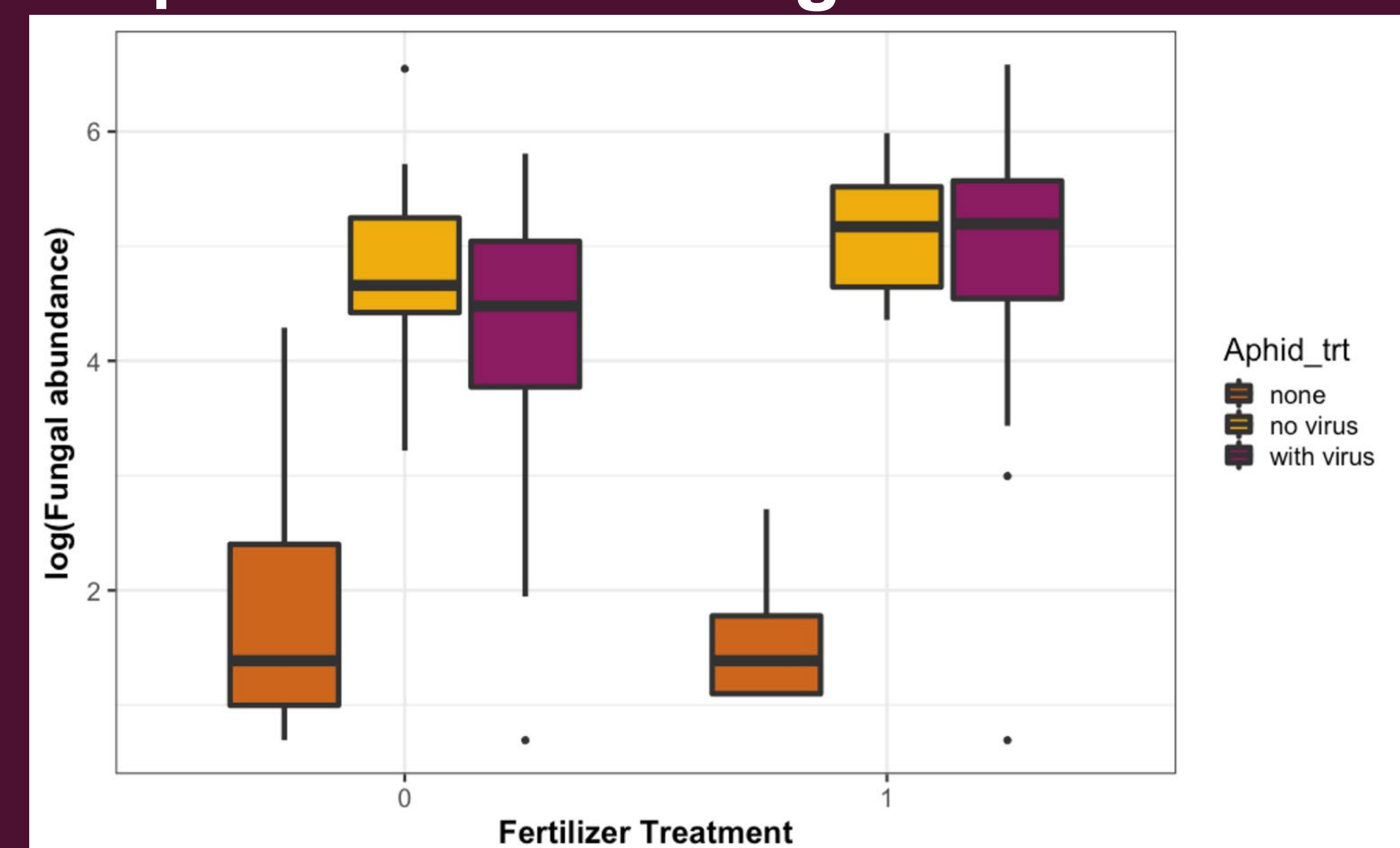


Fig. 4 Aphid presence increased fungal endophyte abundance five-fold $F_{(2,59)} = 73.9, P=0.0001$ regardless of viral status presence (Tukey's diff = -0.447, $p = 0.242$). Surprisingly, fertilization had no effect on fungal abundance ($F_{(1,59)} = 1.49, P=0.2270$).