# Virus, Chloroplast, and Insect Vector Interaction: Can We Use Yellowing to Control Disease?

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## ABSTRACT

Reports had indicated that yellowing virus infection might be accompanied with chloroplast alteration, as shown by leaves colour and photosynthetic change (Schop, 2024). It is then suspected that the virus interact with and influence chloroplast, and this virus-chloroplast interaction could also influence insect vector (Mauck, 2012). However, the biology of this tripartite virus-chloroplast-insect vector interaction surrounding yellowing symptoms still shrouded in mystery. In this project, we investigate how yellowing virus infection influence the structure and function of chloroplast and how this interaction then influence the transmission of virus by insect vector. Our preliminary results, working with beet yellow virus (BYV), sugar beet, and green-peach aphid model system, revealed that the virus first systemic leaves detection using RT-PCR preceded the leaves yellowing appearance (7-8 and 13 days post inoculation, respectively), meaning that the virus was already in the plant even before symptom. Transmission electron microscopy analysis also suggested that BYV infection potentially influenced chloroplast structural change in plant, which might explain how yellowing appeared. We hypothesized that the virus modulate yellowing to attract insect vector to feed the plant and then transmitting the virus to other plant as a result. Yellowing phenomenon thus might be potential to be exploited to control insect vector behaviour and with that, also controlling the disease transmission. Our preliminary results will be the timepoints of reference in which we test our hypothesis with. In Indonesian context, this project could be a fundamental science research model which try to understand how to control pest and disease without the use of chemical, as a part of the steps to achieve sustainable agriculture. The results could be extrapolated to Indonesian specific agricultural plants as chloroplast present in all plants and aphid as an insect vector is cosmopolite all over the world.

**Keywords**: *yellowing, beet yellow virus, chloroplast, aphid, sugar beet, transmission electron microscopy*

## References

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