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Grande salle + visio

INVESTIGATING THE MYSTERIES OF GALL FORMATION: A STUDY OF GALL-FORMING WEEVIL AND ITS SYMBIOTIC BACTERIA

par

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- Some insects induce abnormally enlarged tissues called as “galls” in plants. The galls function as shelters avoiding from natural enemies and environmental stressors. They also serve as feeding sites for the gall-induced insects. Therefore, the gall is conceivable as an “extended phenotype” of insects. The molecular mechanisms of gall formation in insects remain to be elucidated. A major reason for the inability to identify the genes involved in gall formation is that most insect galls are produced on woody plants and therefore cannot be experimentally validated in the laboratory. To overcome the problems, we have developed a new model insect, *Smicronyx madaranus*, to study the mechanisms underlying gall formation.
- Smicronyx madaranus* utilizes the parasitic plant *Cuscuta campestris* as a host plant. *C. campestris* depends on host plants for its nutrients, and usually shows low chlorophyll content and photosynthetic activity. We demonstrated that *S. madaranus*-induced galls had significantly increased CO₂ absorbance. Chloroplasts and starch accumulated in gall tissues at locations inhabited by the weevil larvae. These results suggest that the gall-inducing weevils enhance the photosynthetic activity in *C. campestris*, and modify the plant tissue to a nutrient-rich shelter for them. Through various manipulations, we have obtained evidence suggesting that adult weevils induce the gall, while larvae facilitate their growth. In addition, we found the symbiotic bacterium *Sodalis* in all individuals. *Sodalis* was stably transmitted to the offspring via the ovary. When the *Sodalis* was eliminated by antibiotic treatment, the timing of elytra tanning, feeding initiation, and gall formation were significantly delayed. The results suggest that the *Sodalis* symbiont plays crucial roles for *S. madaranus*. We are currently performing RNA-seq analysis on both plants and insects to uncover the molecular mechanisms controlling insect gall formation. Genome analysis of *Sodalis* and *Smicronyx* weevil are also underway. We also have confirmed that RNAi technique is effective for gene functional analysis in *S. madaranus*. It is expected that *S. madaranus* will be very useful research subject to understand the molecular mechanisms of gall induction and symbiosis.
- Murakami R *et al.*, Tsuchida T (2021) A new galling insect model enhances photosynthetic activity in an obligate holoparasitic plant. *Sci Rep*, **11**: 13013.

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