Carbon and nitrogen interactions between *Phtheirospermum* /*Orobanche minor* and host *T. pratense*

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<Introduction>

Parasitic plants are reliant on their hosts' nutrient supply. They can be characterized into different categories in the terms of their physiological properties.

Phtheirospermum is a xylem feeding facultative hemiparasite, which can perform photosynthesis by itself and is primarily parasitic for N and water from the host's xylem. *Orobanche minor* is a phloem feeding obligate holoparasite, which cannot perform photosynthesis, thus, it is mainly parasitic for C from the host phloem.

Previous studies mainly focused on studying the compared the influence of *Phtheirospermum* and *Orobanche* on a single host, *Trifolium pratense* (red clover), to investigate the carbon and nitrogen interactions between parasites and their host. We hypothesized that the photosynthetic performance of the *Phtheirospermum* infected host would be lower than the control, due to N deficiency caused by infection, which inhibits the synthesis of chlorophyll and photosynthetic proteins. On the other hand, for the *Orobanche minor* infected host, we hypothesized that the photosynthetic capacity would be elevated due to the C deficiency of the host. (1)

<Materials and Method>

Seeds of *T.pratense* (host) were germinated and *O. minor* seeds were inoculated onto the roots of the host, while *Phtheirospermum* seedlings were placed near the host.

Plants were grown in a growth chamber, with a 16 h light at 25℃: 8 h dark photoperiod at 15℃ with a relative humidity of 75%. Hoagland solution was supplied to each group. On 45, 60, 75 days, the chlorophyll fluorescence (ΦPSII and Electron transport rate) of the host was investigated. After 11 weeks' growth, the hosts and parasites were harvested and separated into roots and shoots. Representative leaves of infected and uninfected *T. pratense* were ground to measure the N, chlorophyll, Rubisco content and all plant parts were dried and weighed.

<Results and Discussion>

The shoot mass and root mass of *O. minor* infected hosts was significantly lower than controls, while, the only the shoot mass of *Phtheirospermum* infected hosts was significantly lower compared with control. This result indicated the growth of parasitized host was suppressed.

By 75 days, the ΦPSII and ETR of each groups were same, which differed from the our hypothesis. Further, we had a novel finding of temporal changes of the photosynthetic performance in parasitized hosts. For *Phtheirospermum* infected host, the ETR was lower than control on 45days, however it had recovered to control levels by 60 days. Similarly, for *O. minor* infected host, the ETR was lower than control on 45 and 60days, but it recovered to the control level on 75 days. This result may indicated that the infected hosts were physiologically stressed at the early stages of infection, but recovered to normal physiological conditions after the parasites had been growing for a period of time.

There was no significant differences in the N, chlorophyll, or Rubisco content between parasites infected hosts and control plants.

In conclusion, under N sufficient condition, there was no significant differences in the N, chlorophyll, and Rubisco content between infected hosts and uninfected plant. However, the infection of parasites suppressed the host photosynthesis at the early stage and inhibited the host's growth.

<Refrences>

1. J. M. HIBBERD *et al.* (1999) Solute fluxes from tobacco to the parasitic angiosperm *Orobanche cernua* and the influence of infection on host carbon and nitrogen relations. Plant, Cell and Environment 22, 937-947

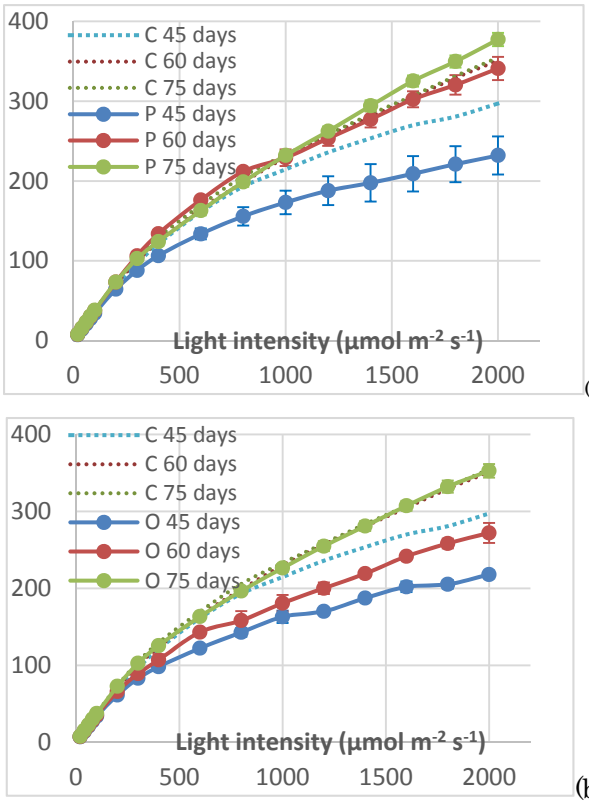

Fig. Temporal changes of ETR of infected hosts (solid lines) and control (dotted lines). a. Infection by *Phtheirospermum*, and b. Infection by *O. minor*.