

## research highlights

### PARASITIC PLANTS

## Injecting hormone into host

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Many crop species suffer from parasitic infection, as parasitic plants extract nutrition from the host plants. Parasite haustoria penetrate the host and bridge substance transfer between the parasite and host. A recent study, from Thomas Spallek, RIKEN Center for Sustainable Resource Science, Yokohama, Japan; Charles Melnyk, Swedish University of Agricultural Sciences, Uppsala, Sweden; and their colleagues, revealed that the plant hormone cytokinin was transferred from the hemiparasitic plant *Phtheirospermum japonicum* to one of its host plants, *Arabidopsis thaliana*, through haustoria. The interaction altered host root morphology and fitness.

*Phtheirospermum* is able to live using its own photosynthesis, but it can infect rice, maize and *Arabidopsis* for better nutrient conditions. In this study, xylem bridges were stained and characterized in



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haustoria. Spallek *et al.* observed evident root hypertrophy above the haustoria attachment sites. Using confocal analysis of

cytokinin reporter lines during infection, the researchers clearly showed that cytokinin was increased in both haustoria and host roots. Interestingly, hypertrophy was not induced by infection in *Arabidopsis* cytokinin signalling mutants (*ahk2,3* and *ahk3,4*), whereas it remained in cytokinin biosynthesis mutants (*ipt3,5,7* and *ipt1,3,5,7*). Overexpressing a cytokinin-degrading enzyme (CKX3) disrupted the formation of host root hypertrophy. Taken all together, along with the additional quantification of different cytokinin species, this provides support for the conclusion that the increase of cytokinin in host roots is independent of host cytokinin biosynthesis — in other words, cytokinin is transferred from parasite to host.

For the first time, the source of elevated cytokinin during parasitic infection has been defined, and the study also provides interesting insights of how cytokinin signalling and the induced root hypertrophy affects the performance of host plant.

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