It is generally correct to think of plants as the hearty autotrophs, gamely harnessing photons to make food and existing perennially (or annually) at the bottom of the food chain. However, thousands of plant species have lost the ability to feed themselves and have become adapted, instead, to live as parasites of other plants. Not surprisingly, these parasitic plants, especially witchweed root parasites such as *Striga* and *Orobanche*, have become major agricultural problems, causing substantial agricultural losses in regions where resources such as water are limited. Parasitic plants grow penetrating structures called haustoria, which connect to the vasculature of the host, allowing them to take water and nutrients from the host plant.

Removing a parasite is a not so simple matter of finding a treatment that will kill the parasite, but not the host. When both host and parasite are plants, the matter becomes increasingly complicated (reviewed in Rispail et al., 2007). Agronomic practices such as crop rotation and selective herbicides have proved to be of limited usefulness. Moreover, genetic resistance for resistance to parasitic plants has been difficult to find and has only proven successful in a few instances, although transgenic and marker-assisted selection strategies may provide more success. These complications show that novel strategies will be required to control these damaging parasites.

Macromolecules can be transferred from host to parasite; for example, RNA interference (RNAi) has been proposed, and explored with limited success, as one potential mechanism to control plant parasites (reviewed in Yoder et al., 2009). **Alakonya et al. (pages 3153–3166)** use the broad host-range parasitic plant dodder (*Cuscuta pentagona*) and the host plant tobacco (*Nicotiana tabacum*) to test an RNAi strategy. For the RNAi target, their examination of gene expression found that KNOTTED-like homeobox (*KNOX*) transcription factors are upregulated during early haustorial development, and they focus specifically on the KNOX factor *SHOOT MERISTEMLESS-like* (*STM*). KNOX factors affect cell differentiation in the shoot apical meristem and induce cytokinin biosynthesis, which is required for haustorium formation. The authors next express an RNAi construct targeting dodder *STM* in the tobacco host plants. To avoid affecting the host, they express the *STM* RNAi construct under the control of an *Arabidopsis thaliana* vasculature-specific promoter, targeting the RNAi to tissues that interact with the parasite. The authors detect *STM*-specific small RNAs in both the transgenic tobacco host and in the dodder grown on that host. They also find that, when growing on *STM*-RNAi tobacco, dodder shows strong downregulation of *STM*, poor establishment, limited growth (see figure), early onset of flowering, and reduced seed set. Therefore, with *STM* as a starting point, the authors show that novel strategies such as RNAi have strong potential for the control of parasitic plants.