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BIOTECHNOLOGY

Whitefly doom

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The kerfuffle around genetically modified organisms is not stopping scientists from developing better crops. Cotton, an economically important plant, faces many threats. The herbivorous cotton bollworm (*Helicoverpa armigera*) can be contained with transgenic *Bacillus thuringiensis* plants, but sap-sucking whiteflies (*Bemisia tabaci*) must be killed using chemical pesticides. A team of researchers, led by Pradhyumna Kumar Singh and mostly from Lucknow, India, has now addressed this problem.

Whiteflies have a broad range of hosts, but ferns are immune to the species. The authors screened fern extracts for whitefly toxicity and found that the edible fern *Tectaria macrodonta* was an efficient killer of the insect. The responsible protein, which demonstrated chitinase properties, was purified and cloned. Overexpression of the protein in cotton induced strong resistance during field trials by interrupting whitefly development cycles, without any cost in yield. Other insects, pathogenic or beneficial, were not affected.

More research is needed before this strategy can be commercially applied to cotton or other crops, but there is much to like about this study. Locally driven public research can be at the forefront of plant biotechnology, and transgenesis remains an important tool not to be dismissed. Finally, this interspecies transfer of one particular trait highlights the importance of biodiversity and conservation — even for plants that may not appear valuable today. *GT*

CROP EVOLUTION

After allopolyploidization

Nat. Genet. http://doi.org/bqr3 (2016)

The allopolyploid crop *Brassica juncea*, varieties of which are grown both for their leaves and for seed oil, was derived from the hybridization between diploid ancestors, *B. rapa* and *B. nigra*. Jinghua Yang, at Zhejiang University, China, and colleagues have assembled the genome of *B. juncea,* providing insights into the evolutionary processes behind the origination and trait differentiation of this important species.

Combining shotgun and single-molecule sequencing techniques, the researchers obtained a well-assembled genome of *B. juncea,* anchored to pseudochromosomes. The genome of *B. nigra* was also assembled using shotgun reads. The A genomes of the allopolyploids *B. juncea* and *B. napus* appear to be of different geographic origins. However, the A subgenomes of all *B. juncea* varieties have a single ancestor, shown by phylogenetic and principal component analyses based on resequencing data of multiple *B. juncea*, *B. napus* and *B. rapa* accessions.

Scans for selective sweeps identified 794 genes selected between vegetable- and oil-use *B. juncea* varieties. The unexpected high proportion (36%) of the selected genes displaying homoeolog expression dominance implies its role in trait improvement. For example, homoeologue expression dominance is associated with the selection of glucosinolate and lipid metabolism genes of the vegetable and oilseed *B. juncea* varieties, respectively. *JL*

CHEMICAL BIOLOGY

Parasite killer

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The plant hormone strigolactone was given its name as, when exuded from roots, it induces germination of seeds from parasitic *Striga* spp. Several species of *Striga*, commonly known as witchweeds, are parasitic, and are important pathogens of cereal crops in Africa and elsewhere. These species attach to roots and take up the circulating nutrients, reducing early growth of the crops. A team led by Peter McCourt from Toronto, Canada, has identified a promising chemical that interferes with strigolactone perception mechanisms and blocks the germination of the parasite.

As strigolactones are also involved in plant development, the researchers developed a high-throughput chemical screen in transgenic *Arabidopsis* seedlings with artificially elongated hypocotyls. Strigolactone reduces growth and thus an antagonist should restore hypocotyl elongation. A secondary germination-based screen on wild-type *Arabidopsis* and other assays confirmed the antagonistic effect. The most promising molecule, renamed soporidine, binds to strigolactone receptors in *Arabidopsis* and *Striga*, but does not affect the growth of monocot grasses.

Striga plants produce an impressive number of tiny seeds that can stay dormant in the soil and contaminate fields for years. It is a significant problem in Africa, as the affected crops include tropical and subtropical cereals. Soporidine has the ability to block *Striga* germination without affecting grass hosts and so could be used in agriculture to coat seeds and, ultimately, protect yields. *GT*

CLIMATE CHANGE

Not so complex responses

J. Ecol. http://doi.org/bqr5 (2016)

Increased temperatures and reduced rainfall are two of the main short-term effects predicted for anthropogenic climate change. Both can cause stress for growing trees, although temperature rises could also enhance plant growth. The two together may have effects greater than either alone. In experiments on a semi-arid woodland in New Mexico, Charlotte Grossiord, of the Los Alamos National Laboratory, and colleagues have shown that the situation may be far simpler, with physiological changes dominated by responses to water scarcity.

The researchers manipulated the temperature and rainfall of piñon pines (*Pinus edulis*) growing at the Los Alamos Survival-Mortality experiment. Over 3 years from 2012, the mature trees (around 50 years old) were enclosed in open-topped, transparent chambers that increased temperatures by around 4.8°C, or covered by clear, polymer troughs that reduced rainfall by 45%, or both.

The restriction of rainfall induced a number of water-saving measures in the trees, including reductions in photosynthesis, stomatal conductance, growth rate and needle length. However, trees subjected to higher temperatures showed neither adverse nor advantageous changes, whether coupled with water stress or not. Under ideal conditions, a similar rise in temperature would be predicted to increase plant growth, reducing the effects of drought. However, as this study reminds us, in natural environments it is the most limited resource that calls the tune. *CS*

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