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PLANT DEFENCE

Rubber bullets

Phytochemistry http://doi.org/2bh (2015)

COURTESY OF MERET HUBER

Latex is not only produced by rubber trees. More than one in ten land plants produce this mixture of sap and complex secondary metabolites, which they store in specialized lactifer cells and release on wounding. One prolific producer of latex is the common dandelion (*Taraxacum officinale* agg.). Matthias Erb of the University of Bern, Switzerland in conjunction with colleagues at the Max Plank Institute for Chemical Ecology at Jena, Germany have identified and quantified the major secondary metabolites in the latex of dandelions and tested its defensive potential against herbivory.

Using a combination of chromatographic and spectroscopic techniques the researchers found three classes of compound in dandelion latex: phenolic inositol esters, triterpene acetates and a sesquiterpene lactone. The concentration of these compounds varied between different plant organs, between different plant genotypes and with the age of the plant. But the basic composition of the latex remained similar suggesting that the mixture is important for survival. Indeed, larvae of the cucumber beetle, *Diabrotica balteata*, showed a strong avoidance of maize roots painted with dandelion latex extracts.

Various dandelion species and hybrids are actively being investigated as alternative, and more sustainable, sources of natural rubber. However, as this study shows, the chemistry of latex has much more to offer than just bands, boots and balls. *CS*

CROP PHENOLOGY

Winter wheat escapes heat

Environ. Res. Lett. **10,** 024012 (2015)

Global warming is expected to reduce crop yields in many regions over the coming century, increasing the risk of hunger. Concurrent shifts in crop phenology could counter some of the negative effects of warming on yields, suggests a German-based study of winter wheat.

Ehsan Eyshi Rezaei, of the University of Bonn, Germany, and colleagues examined the effect of temperature change on the first day of heading of winter wheat in Germany, using phenological and climate data collected between 1951 and 2009. Although spring temperatures remained fairly stable during the first half of the measurement period, they rose significantly between 1976 and 2009. This period of warming coincided with a marked advancement in the first day of heading, which moved forward by 14 days over this period. As a result of this acceleration in crop development, heat stress around the time of flowering — which occurs just after heading — increased only slightly over the same period.

The researchers note that although earlier heading may protect winter wheat from heat stress during a key developmental stage, warming could still compromise yields, for instance by reducing the length of the grain-filling period. *AA*

CROP ENGINEERING

Hijacking hormone receptors

Nature http://doi.org/2bj (2015)

When faced with a scarcity of water, plants adopt a series of measures to preserve water and increase their tolerance to stress, such as closing their stomata. These various responses are controlled through abscisic acid (ABA). By engineering an ABA receptor to respond to the chemical mandipropamid, Sang-Youl Park of the University of California, Riverside, and colleagues have demonstrated an approach to manipulating these natural responses to better serve the needs of agriculture.

The researchers first tested a library of mutants of the ABA receptor PYRABACTIN RESISTANCE 1 (PYR1) for sensitivity to a panel of common agrochemicals. They found that a mutant, PYR1^{MANDI}, containing changes in six amino acid residues lining the receptor's ABA binding pocket was selectively activated by nanomolar concentrations of the fungicide mandipropamid.

Mandipropamid treatment of transgenic *Arabidopsis* plants expressing PYR1^{MANDI} induced a systemic response mimicking that produced by ABA including inhibition of seed-germination, retardation of root-growth, changes in transpiration rate and genome-wide transcriptional reprogramming. Moreover, mandipropamid application increased the survival of the plants under water shortage.

Tomato plants expressing PYR1^{MANDI} also showed reduced transpiration rates when treated with mandipropamid suggesting that engineered ABA receptors could prove a promising route to producing drought tolerant crops. *JL*

AUXIN SIGNALLING

ABP1 springs a surprise

Proc. Natl Acad. Sci. USA **112,** 2275–2280 (2015)

Decades of research by multiple groups have accumulated evidence that the plant hormone auxin is perceived by a pair of coexisting receptors: ABP1, a weakly-secreted unusual cell surface protein that controls rapid non-transcriptional events, and TIR1, a nuclear F-box involved in the ubiquitin-mediated degradation of transcriptional repressors. Recent work led by Yunde Zhao and Mark Estelle challenges this model and questions the importance of ABP1 in auxin signalling.

Due to the embryo lethality of one early-described null mutant, previous research on ABP1 has been performed using less ideal approaches. This new work uses the latest CRISPR technology to generate a precise genomic deletion in the *ABP1* gene, and in addition the authors obtained a new insertion line. Both are confirmed to be null mutants. Unexpectedly, both are viable, show none of the described auxin-related developmental phenotypes, are not auxin resistant and do not have altered hormonal responses at the molecular level.

Although the most obvious conclusion is that ABP1 is dispensable for auxin signalling, the reasons for this stunning discrepancy with previous work are not fully understood yet. Secondary mutations, off-target and compensation effects are suspected. Nevertheless, in the light of these new results, there is an urgent need to re-examine the function of ABP1 in plant growth and development. *GT*

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