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Molecular basis of maize differential resistance to herbicides

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Abstract

Herbicides, commonly known as weedkillers, are compounds used to destroy or inhibit the growth of plants, especially weeds. The most popular weedkillers, widely used in the maize fields, are nonselective, which means that they affect not only weed populations but influence all plants that are growing in the sprayed area. Organisms constantly exposed to environmental stimuli establish mechanisms of protection and adaptation and because of sedentary lifestyle they require efficient short-term strategies. Therefore to guarantee their survival under adverse conditions plants have developed exquisite adjustments to stresses at all levels (anatomical, morphological, cellular, biochemical and molecular).

Years ago it has been observed that some maize lines show higher sensitivity to herbicide spraying than others but molecules determining such heightened resistance remain unknown to this day. Therefore our goal is to identify molecular basis of plant's increased/decreased resistance to herbicides and identify a molecular marker that can be used as an indicator of plant's resistance to herbicides. First, we chose two maize lines that differ significantly in susceptibility to herbicide RoundUp, then analyzed gene expression (microarrays) and alternative splicing events (NGS) and identified hundreds of genes with changed expression profiles between tested lines. We also detected differences in small RNA populations and identified several new microRNA candidates (NGS). Since it was recently shown that abiotic stresses cause long-term regulation of gene expression, mostly conferred by epigenetic gene regulatory mechanisms we decided to track changes in epigenome. Using MSAP we identified more than a hundred sequences that show different methylation profiles.

Biography

Agata Tyczewska completed her PhD from Institute of Bioorganic Chemistry PAS in Poznań, Poland in 2008 where she was working on the identification of human Dicer inhibitors. She then joined Matzke Lab at Gregor Mendel Institute of Plant Molecular Biology in Vienna, Austria where she spend nearly two years working as a postdoc on RNA-directed DNA methylation. After her return to Poznań in 2011 she became interested in herbicide resistance in maize varieties. She received a patent from Polish Patent Office, is a co-author of several patent applications and published 14 papers (experimental and review) in reputed journals.