Potato improvement by genome editing

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Potato (*S.tuberosum*) is the third most important crop in the world after wheat and rice in terms of human consumption. It is considered as a global security food producing more food per unit than any other major crop. Short days and moderate temperatures promote tuber formation ensuring proper timing of vegetative propagation of the plant. Day length regulates important aspects in plant development such as flowering or tuber formation. In potato a FLOWEING LOCUS T (FT) paralog named SP6A (SELF-PRUNING6A) gene, that respond to different environmental conditions, mediates the tuberization. The day length is sensed by the leaves and SP6A will induce tuberization under short day conditions. Under elevated temperatures, SP6A expression is supressed by a specific-miRNA. This leads to low tuberization efficiency at elevated temperatures.

The climate change is a big challenge in these days for agriculture. Very hot summers have a negative impact on tuberization. DNA-free genome editing *via* CRISPR (clustered, regularly interspaced, short palindromic repeat) /Cas9 (CRISPR associated protein) is widely used to induce site-directed mutagenesis for crop improvement. A mutation will be introduced in the SP6A-specific miRNA with DNA-free genome editing using potato protoplast and RNPs (ribonucleoproteins). We expect that it will affect tuberization at elevated temperatures and allow to ensure tuber yield under conditions of global climate changes. The first step in this study was to choose the best gRNA for genome editing. Thus the *in vitro* efficiency of the gRNAs was tested. Further on, efficient gRNAs will be used for potato protoplast transfection with RNPs.

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