

Breeding Late-Blight resistant potatoes for organic farming

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Late blight in potato, caused by fungus-like oomycete *Phytophthora infestans*, is one of the most disastrous diseases worldwide. Due to constraints in the use of fertilizers and pesticides, organic farming is faced with an even higher challenge as compared to conventional farming. Pre-breeding for quantitative, race non-specific late-blight resistance may serve an option for enabling sustainable potato growing in organic farming.

To take advantage of this potential a program focused on breeding of potato varieties for organic farming in Germany was initiated by a network of organic farmers, potato breeders and research institutes. The project aims at combining low susceptibility to late blight, resistance to other diseases, and quality traits in pre-breeding materials.

To achieve this goal, a total of 158 varieties and breeding clones were evaluated for their susceptibility against late blight on foliage and tubers. Four experiments with different test methods, i.e. a field trial, a detached-leaf assay, a tuber-slice assay, and a whole-tuber test were carried out over three years. Infestation of potato tops with late blight in the field was assessed via Delta-rAUDPC values which had been corrected for maturity. Maturity and quality scores of these clones were determined in an additional field trial under fungicide application.

Maturity is an essential trait in the context of assessing late-blight resistance. Most of the tested JKI breeding clones showed very low Delta-rAUDPC values, which illustrates the enhancement achieved in breeding for late-blight resistance within this material. A large part of these clones are early maturing, thus exemplifying that the correlation of late-blight resistance and late maturity can be broken up. As expected, infestation of the tubers was only loosely correlated with the infestation of the foliage as assessed in the detached-leaf assay or in the field. Some pre-breeding clones exhibited low infestation of the tubers in tuber-slice and whole-tuber tests. Correlations of Delta-rAUDPC values and results of the laboratory assays were in a medium range, which indicate a non-substitutability of the field experiment in predicting quantitative late blight resistance.

The project is expected to provide information on the potential of late-blight resistant potato breeding clones in contributing to sustainable potato growing via reduced use of copper-based fungicides in organic farming systems.

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