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Germplasm Diversity for Resource Protection in Crop Production

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Abstract

Huge problems in tomato greenhouse production in the tropics are caused by high temperatures. Greenhouses are used to protect plants from destruction due to heavy rainfalls, storms, and insect infestations. For worthwhile tomato production it is absolutely necessary to decrease the greenhouse inside temperature. But the use of more or increasingly powerful cooling systems might be as well uneconomical as resource encumbering. Genetic diversity of heat tolerance of the tomato (*Solanum lycopersicum* L.) has already been described in the literature.

Two strategies were used to evaluate and combine these potentials of resource protection: Reducing the stress factor and finding genotypes adapted to the stressor. The experiments were conducted during different seasons at the experimental facilities of the project „Protected cultivation- an approach to sustainable vegetable production", situated on the campus of the Asian Institute of Technology (AIT), Klong Luang, Pathum Thani, Central Thailand, and on the campus of the Leibniz University in Hannover, Germany. For the first strategy, we assessed the response of miscellaneously heat tolerant genotypes to different microclimatic conditions aroused by different greenhouse cover materials and ground mulches. We gauged the plant's response to UV absorbing greenhouse cover films and different coloured mulch foils and evaluated the influence of UV and NIR radiation. We evaluated several traits, associated with heat tolerance. For the second strategy the most heat tolerant genotype and a heat sensitive variety were selected and used as parents for building up a segregating F2 population. We evaluated the same traits under high temperature treatment as in the prior experiments. At present we're using AFLPs to build linkage groups. We will be able to map some of the genes responsible for heat tolerance and to create primers as useful tools for plant breeders. Basing upon these results it becomes possible to breed new varieties with better adaptation to heat stress, and reduce the energy consumption for cooling systems.

Keywords: Genetic diversity, heat stress, resource protection, *Solanum lycopersicum*

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