Overexpression of *Ricinus communis* Malate Synthase Gene in *Arabidopsis thaliana* Enhances Seed-Thermotolerance During Germination at High Temperatures

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Introduction: *Ricinus communis* seeds germinate to a high percentage and faster at 35°C than at lower temperatures, but with compromised seedling establishment. High temperature during seed germination leads to down-regulation of important metabolic processes which are crucial for successful seedling establishment. Overexpression of malate synthase (*MLS*) resulted in higher starch levels in *Nicotiana benthamiana* leaves, which highlights the importance of this gene in energy-generating pathways for seedling establishment. **Objectives:** The objectives were to overexpress *Ricinus communis* malate synthase (*RcMLS*) gene in *Arabidopsis thaliana* and to evaluate the responses of the transformed seeds to high temperatures during germination. **Material and Methods:** *RcMLS* was cloned into *Agrobacterium tumefaciens* using the Gateway cloning-system. Subsequently, the transformed bacteria were used to (stably) transform *Arabidopsis thaliana* by a floral dip procedure. Seeds of *A. thaliana* overexpression lines and *A. thaliana* wild type (Col-0) were used to phenotype seed germination at different temperatures (22°C, 31°C, 33°C, 34°C, and 36°C). **Results and Discussion:** Col-0 seeds germinated nearly 100% at 22°C, 31°C and 33°C. At 34°C total germination lowered to 92%, whereas at 35°C total germination lowered to 36%. At 36°C or above none of the seeds germinated, not even after relocation to 22°C for a week. Therefore, 35°C was selected as the threshold temperature for further germination experiments. Total germination of Arabidopsis seeds overexpressing *RcMLS* was 65%, when seeds were germinated at 35°C. This is significantly higher than the total germination of the Col-0 seeds at the same temperature. **Conclusions**: Overexpression of *RcMLS* enhanced thermotolerance in Arabidopsis seeds during germination at 35°C. *RcMLS* might be a key responsive gene in lipid mobilization and gluconeogenesis to sustain successful seedling growth at high temperatures.

Key words: functional characterization, high-temperature stress, temperature-responsive genes

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