

## **Arabidopsis plants adapt to different water regimes: An integrated analysis of growth, development and gene expression**

### **ABSTRACT**

Water deficit is thought to be one of the major environmental constraints affecting growth and development of plants. It is a common stress impairing production of plants in the world. This hypothesis was tested in *Arabidopsis thaliana* in terms of investigating the growth, development and water relations of wild-type (Col-0) and *vte4* mutant plants under different water regimes. These water treatments, including 100% of field capacity (control), 75% of field capacity (mild stress) and 50% of field capacity (severe stress) were imposed on the plants. Each water treatment was replicated three times in a complete randomized design with factorial arrangement. Wild type and mutant *A.thaliana* plants were subjected to the abiotic stress (water stress) for up to 20 days to determine the parameters of growth, development and water relations. Interestingly, under identical water deficit scenario the wild type *A.thaliana* (Col-0) demonstrated the higher increase in morphological parameters in comparison with *vte4* mutant. Specific leaf area, rosette dry weight and rosette dry weight at bolting obtained the highest values of 50.33 mm<sup>2</sup>/mg, 14.56 mg and 206.5 mg, respectively compared to the mutant when plants were provided with 100% field capacity. Considering plant type effect, the highest scores of 41.55 mm<sup>2</sup>/mg, 10.33 mg and 127.66 mg were recorded for the wild type plants respectively for the same traits. The root mass fraction escalated to 0.26 g/g in wild type *A.thaliana* after 20 days of onset of water deficit under severe stress (50% field capacity) while under the same condition the water potential decreased as low as -1.25 MPa. These results together showed that different water treatments significantly differed in morphological parameters and the lack of  $\gamma$ -tocopherol methyltransferase ( $\gamma$ -TMT) in *vte4* affected the plant's defense mechanism against the water stress.

**Keyword:** *Arabidopsis thaliana*; Water stress; Wild type;  $\gamma$ -TMT; Leaf specific area; Rosette dry weight; Water potential