

Daily regulation of some C₄ and Calvin cycle enzymes in some *dicotyledon* species of *Chenopodiaceae* family

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Aim of the study: The changes in activities of some C₄ and Calvin cycle enzymes in relation to ambient temperature have been studied in the plant materials, harvested during intensive vegetation period of the *Salsola dendroides* and the *Suaeda altissima* species of the *Chenopodiaceae* family.

Materials and Methods: Leaves and other photosynthetic organs of matured plants grown under natural conditions in Absheron peninsula were used as the study material. Sampling was performed at 3 different times throughout the day: 08:00, 13:00, and 20:00 h. Light intensity, temperature and humidity at the mentioned sampling times were measured to be 47; 1850 and 25 $\mu\text{mol m}^{-2} \text{s}^{-1}$, 22 \pm 1; 38 \pm 2 and 27 \pm 2 °C, and 62; 32 and 41%, respectively. The activities of the photosynthetic enzymes were measured using the methods previously described in (Pyankov et al. 2000; Alfonso and Brüggemann, 2012) with minor changes. The activity of enzymes was followed at 25 °C as the decrease of absorbance at 340 nm. Protein was measured by the method of Bradford (1976), using bovine serum albumin as the standard. All assays of the presented study were performed in triplicate for each sample.

Results: The regulation of some C₃ and C₄ enzymes in the *S. dendroides* and the *S. altissima* species of *Chenopodiaceae* family have been studied during the intensive vegetation period. Activities of PEPC and cytosolic aspartate aminotransferase (AsAT) were shown to decrease in both species in the afternoon and evening. The activity of alanine aminotransferase (AlAT) was high in the *S. dendroides* species in the morning and evening and decreased in the *S. altissima* species by evening. NADP-ME activity was found to decrease in both plants during the day, whereas NAD-ME activity was high in the evening. The study of the activities of the Calvin cycle redox regulated enzymes showed temperature related increases in NADP-glyceraldehyde 3-phosphate dehydrogenase (NADP-GAPDH) activity in both plants, in FBSase activity in the *S. altissima* species and in NADP-MDH activity in the *S. dendroides* species in the afternoon. High temperature, solar intensity, and also salinity, characteristic for the territory where the research was performed, create extreme conditions for the vegetation. Nevertheless, high diversity of *Chenopodiaceae* is observed in such a territory. Tolerance of these species against the mentioned factors, especially high temperature and drought opens wide opportunities for comparative analysis of adaptive properties of these plants.

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Key words: C₄ photosynthesis, Calvin cycle enzymes, *Chenopodiaceae*, temperature