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Sorghum bicolor Plays a Significant Role in Food Security

Ulviyye MUSTAFAYEVA, Novruz QULIYEV
Institute of Molecular Biology and Biotechnology, National Academy of Sciences, 2 Matbuat ave., AZ1073 Baku, Azerbaijan
ulviyye_mustafayeva@mail.ru

Aim of the study: *Sorghum* is a genus of flowering plants in the grass family Poaceae. *Sorghum bicolor* is the cultivation and commercial exploitation of species of grasses within the genus *Sorghum*. These plants are used for grain, fibre and fodder. The plants are cultivated in warmer climates worldwide. The researh, is aimed at increasing biomass.

Materials And Methods: The leaves were homogenized in quartz sand with a mortar and pestle. 50 mM TRIS-HCl (pH 8.0), buffer containing 0.01%BSA, 0.5% Triton, 14mM β-ME, 1 мM EDTA and 0.5% PVP was used for the homogenization. 2 ml of the buffer solution was added to 0.5g leaves at $+40^0$C. To determine NADP-MDH activity the enzyme extract was initially activated by DTT for 15 min. The obtained homogenate was centrifuged for 5 min at 10,000g and 100 мM Tris-HCl (pH 8.0) buffer containing 10 mg/ml BSA, 0.5 M EDTA, 20 mM $MgCl_2$, 0.2 мM NADP·H, 1 mM oxaloacetate and 20µl enzymatic preparation was used for the determination of the enzyme activity.

Results: Theexperimentsstarted on the 40th day of the growth of*S. bicolor* plants. The leaves of *S. bicolor* plants, kept in the dark, illuminated for 15 minutes, and illuminated for 1 hour were used in the experiments. NADP-malate dehydrogenase activity was measured in both activated and inactive enzyme extracts. No activity was detected in the leaves kept in the dark, which is consistent with the results of the research carried out by Scheibe et al. Thioredoxins caused redox oxidation of NADP-MDH in illuminated leaves. It is assumed that chlroplasts have only one redox activated NADP-MDH in leaves exposed to light and therefore, malate pump functions only in illuminated leaves. A high NADP-MDH activity was observed in samples illuminated for 15 minutes. The NADP-MDH activity was found to be 6 times higher in activated samples compared with inactive ones. In C4 plants high concentrations of $NADP^+$ inhibit NADP-MDH activity. This effect was not observed in C3 plants. The obtained result is of great physiological importance. Thus, recovery potential of chloroplasts in C4 plants depends on the NADP/NADPH ratio - cofactor of NADP-MDH, which fulfills CO_2 fixation in mesophyll cells. The results of the research suggest that expression of the gene encoding the enzyme in *S. bicolor* leaves is light-regulated.

Key words: C_4 photosynthesis, *Sorghum*, *Poaceae*, temperature