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FUNCTIONAL STATE OF THE PHOTOSYNTHETIC APPARATUS OF THE WHEAT FLAG LEAF *Triticum aestivum* L. UNDER DIFFERENT WATER-SUPPLY CONDITIONS

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During grain formation, the wheat flag leaf is one of the main sources of photoassimilates that drive grain filling. Under limited water-supply, its photosynthetic activity depends not only on soil moisture but also on photosynthetically active radiation, leaf blade temperature, and the ability of the leaf to maintain CO_2 assimilation throughout the diurnal cycle. Therefore, the dynamics of the real CO_2 assimilation rate in the flag leaf can characterize the functional state of the photosynthetic apparatus under water deficit. The hypothesis of the study was that reducing soil moisture to 50% of field capacity would alter not only the mean daytime level of real CO_2 assimilation but also its diurnal pattern, with the main differences between water-supply treatments appearing during daytime hours at maximum leaf temperatures and during morning recovery of photosynthetic activity.

The study was conducted on wheat plants of cv. Moldova 614 grown in vegetation pots. The control treatment was maintained at 70% of field capacity, while moderate water deficit was simulated by reducing soil moisture to 50% of field capacity. Measurements were performed at the milk stage of grain development on flag leaves. The real CO_2 assimilation rate, photosynthetically active radiation, and leaf temperature were recorded throughout the diurnal cycle.

The data showed that flag leaves at 70% of field capacity maintained a higher real CO_2 assimilation rate than plants at 50% of field capacity. During the daytime, values in the control treatment ranged from 3.5 to 4.1 μmol CO_2 m^{-2} s^{-1}, whereas under limited water supply they were more often within 3.0 - 3.6 μmol CO_2 m^{-2} s^{-1}. In both treatments, assimilation activity decreased in the afternoon and declined to near-zero values overnight, with a more pronounced afternoon decrease at 50% of

field capacity. Morning recovery also depended on water supply: in the control treatment, maximum values reached 4.5 - 4.8 μmol CO_2 m^{-2} s^{-1}, whereas under water deficit they remained lower, at 3.3 - 3.6 μmol CO_2 m^{-2} s^{-1}.

Comparison of real CO_2 assimilation with leaf temperature showed that, as leaf temperature increased to 35–37°C, the differences between treatments became more pronounced. Since stomatal conductance and leaf water potential were not directly measured, the data do not allow a clear distinction between stomatal and non-stomatal causes of the decline in assimilation. Nevertheless, leaf temperature should be considered an important accompanying parameter when interpreting the photosynthetic response to water deficit.

The results demonstrate that moderate water deficit in cv. Moldova 614 suppresses real CO_2 assimilation in the flag leaf unevenly throughout the diurnal cycle, with the strongest reduction during daytime hours at elevated leaf temperature and during morning recovery. This indicates the usefulness of diurnal photosynthesis dynamics, rather than only individual absolute values, for evaluating the functional state of wheat plants under water deficit during grain formation.

Keywords: wheat, flag leaf, water supply, real CO_2 assimilation, leaf temperature.

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