CHANGES OF PHOTOSYNTHESIS RATE AND CHLOROPHYLL FLUORESCENCE PARAMETERS OF MELATONIN-TREATED WHEAT SEEDLINGS UNDER DROUGHT STRESS

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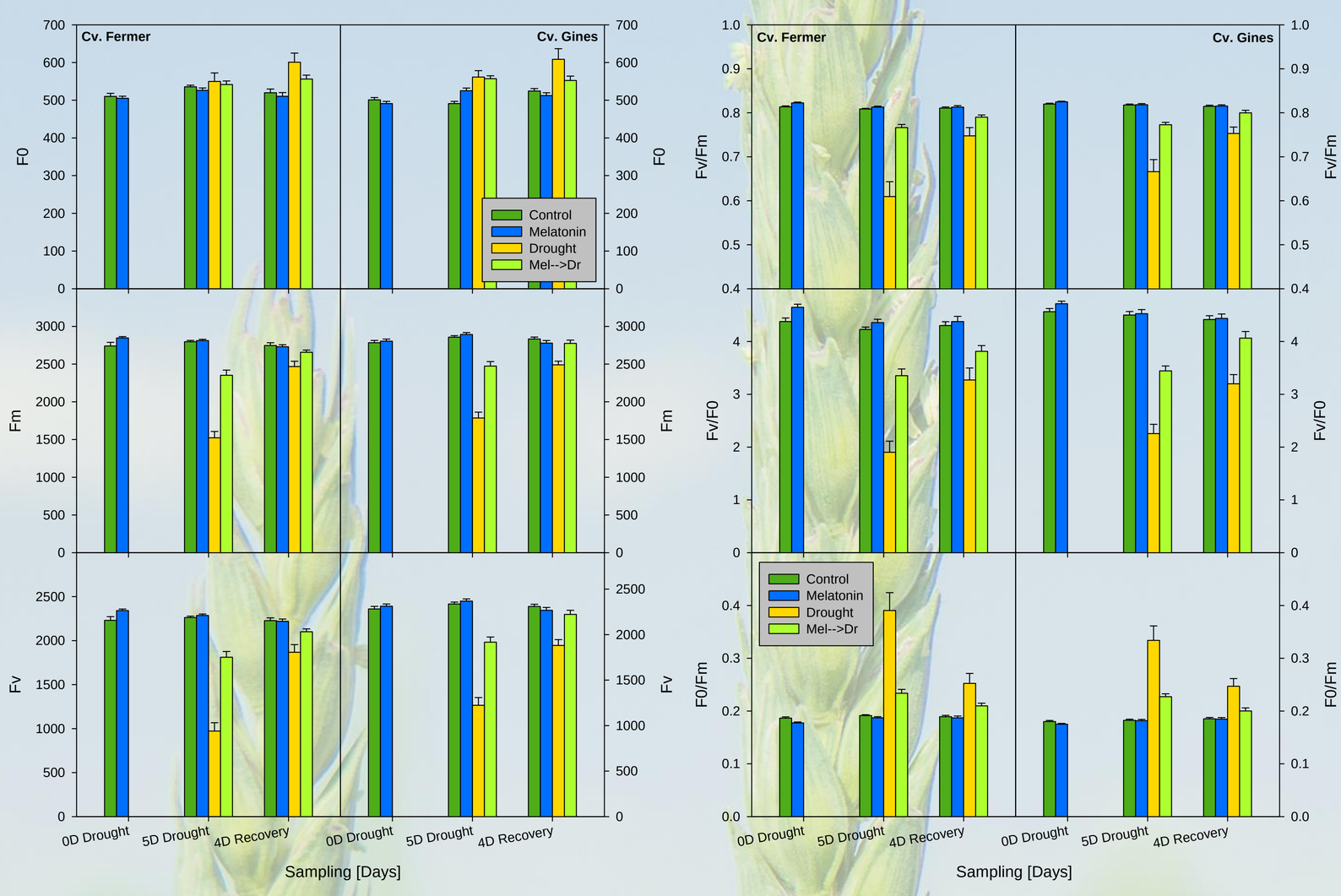
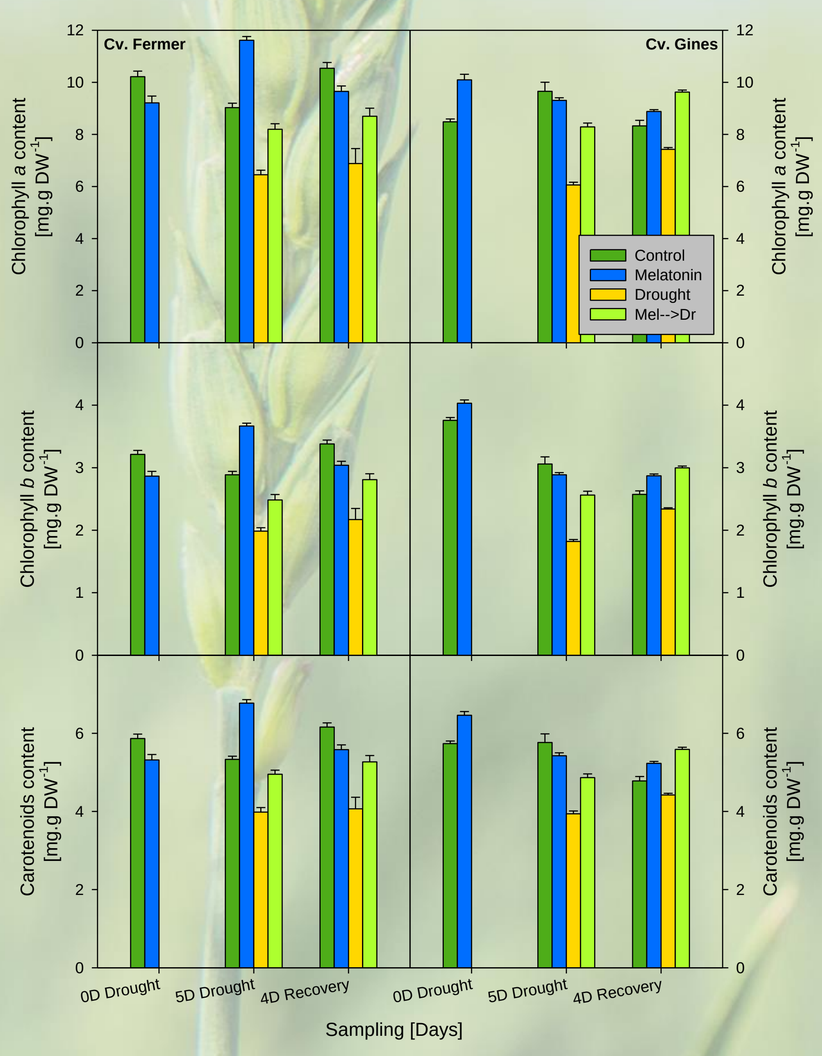
Soil drought is among the majors environmental factors which disturb photosynthetic process of plants and considerably affect crop productivity worldwide. Melatonin is a natural product of plant metabolism with growth-regulating properties. It is non-toxic and is safe to the environment. Recently, extensive research is carried out about the possibilities for exogenous application of melatonin as a biostimulant that could beneficially mitigate the stress negative consequences in plants. Non-invasive and sensitive methods for assessing the efficiency of the photosynthetic machinery and evaluating the physiological status of plants are the fluorescence of chlorophyll "a“ and leaf gas exchange parameters. Principally, F_V/F_M and F_V/F_0 relations are parameters which reflect the impact of various environmental stress factors on the photosynthetic apparatus. Therefore we measured the leaf pigments content, photosynthesis rate, stomatal conductance and transpiration, and chlorophyll fluorescence in order to evaluate the effects of melatonin in two Bulgarian wheat cultivars subjected to drought.



Chlorophyll fluorescence parameters of wheat plants treated with melatonin and subjected to drought stress.

Methodology

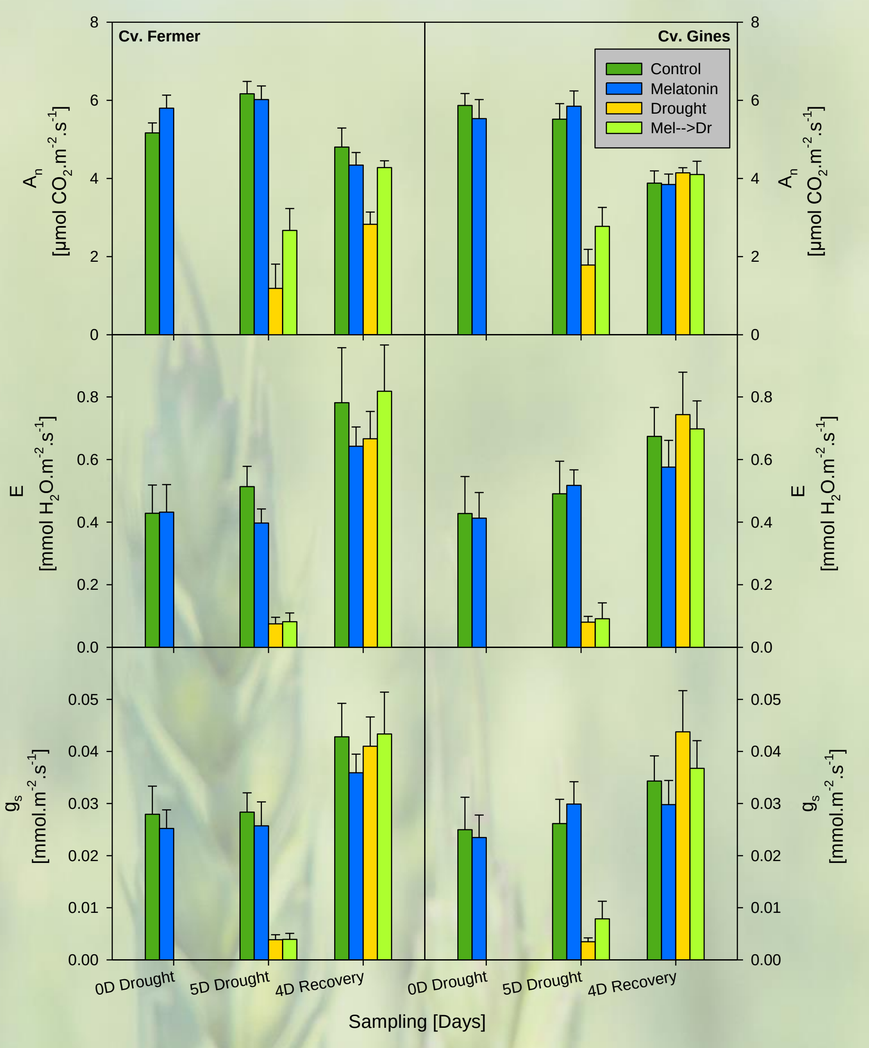
Soil grown 17-day-old wheat plants (*Triticum aestivum* L., cv. Fermer and cv. Gines) were root supplemented with 75µmol melatonin and 24h later were subjected for 5 days to drought. After the end of the stress period the normal regime of irrigation was restored and plants were left for recovery. The data were recorded in the beginning and at the end of the stress period and after 4 days of recovery. Chlorophyll fluorescence was recorded by Plant Efficiency Analyzer (Hansatech Instruments, UK). Leaf gas exchange parameters were measured with infrared gas analyzer system Li6400 (LI-COR Biosciences Inc., USA). Chlorophyll and carotenoids were measured according to Arnon (1949). The data presented are mean values with standard error.



Leaf pigment content in wheat plants treated with melatonin and subjected to drought stress.

Results

- Melatonin alone did not cause considerable alterations in the measured parameters.
- We found a significant decrease in leaf gas exchange parameters: net photosynthesis rate (A_n), transpiration rate (E), stomatal conductance (g_s); chlorophyll fluorescence parameters: maximal (Fm), variable (Fv) fluorescence, Fv/Fm and Fv/F0 ratios and leaf pigment content during drought.
- When the normal irrigation was restored, the content of leaf pigments, the photosynthesis and fluorescence parameters tended to increase.



Leaf gas exchange parameters of wheat plants treated with melatonin and subjected to drought stress.

Conclusion: The data indicated that the application of melatonin beneficially influenced the efficiency of the photosynthetic apparatus under drought stress.

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