

# ALTERATIONS IN THE HORMONAL LEVELS OF TWO BULGARIAN WHEAT CULTIVARS CAUSED BY DROUGHT – INTERACTION WITH MELATONIN

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## Introduction

Drought stress affects crop production due to its negative impact on plant physiology, which is manifested at multiple levels, including alterations in the hormonal balance. Indole acetic acid (IAA) and abscisic acid (ABA) are key phytohormones which regulate plant growth and reactions to stress. Melatonin is a biosubstance, which appears to be ubiquitous in plants and possesses multiple regulatory functions. Exogenous melatonin was found to benefit plant physiological state, especially under stress conditions.

Melatonin and auxins share a common precursor from the shikimate pathway and melatonin possess auxin-like properties. On the other hand, melatonin acts in an opposite way to abscisic acid, especially under drought stress conditions by counteracting the ABA-induced closure of stomata.

The aim of the current study is to investigate the alterations in the content of IAA and ABA in wheat plants subjected to drought and treated with melatonin. It was of special interest to investigate if there are discernible differences in the hormonal levels between susceptible or tolerant to drought wheat varieties.

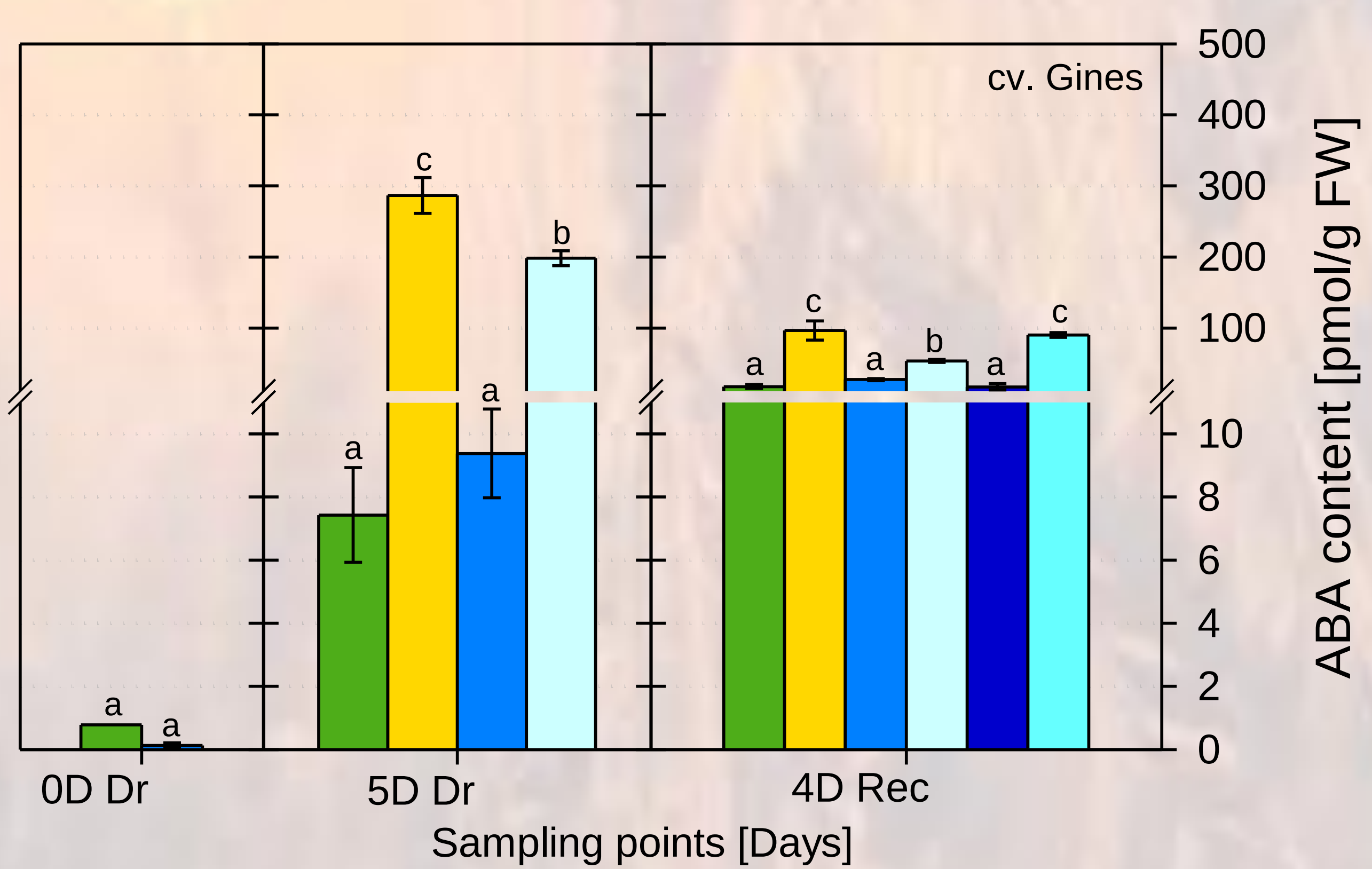
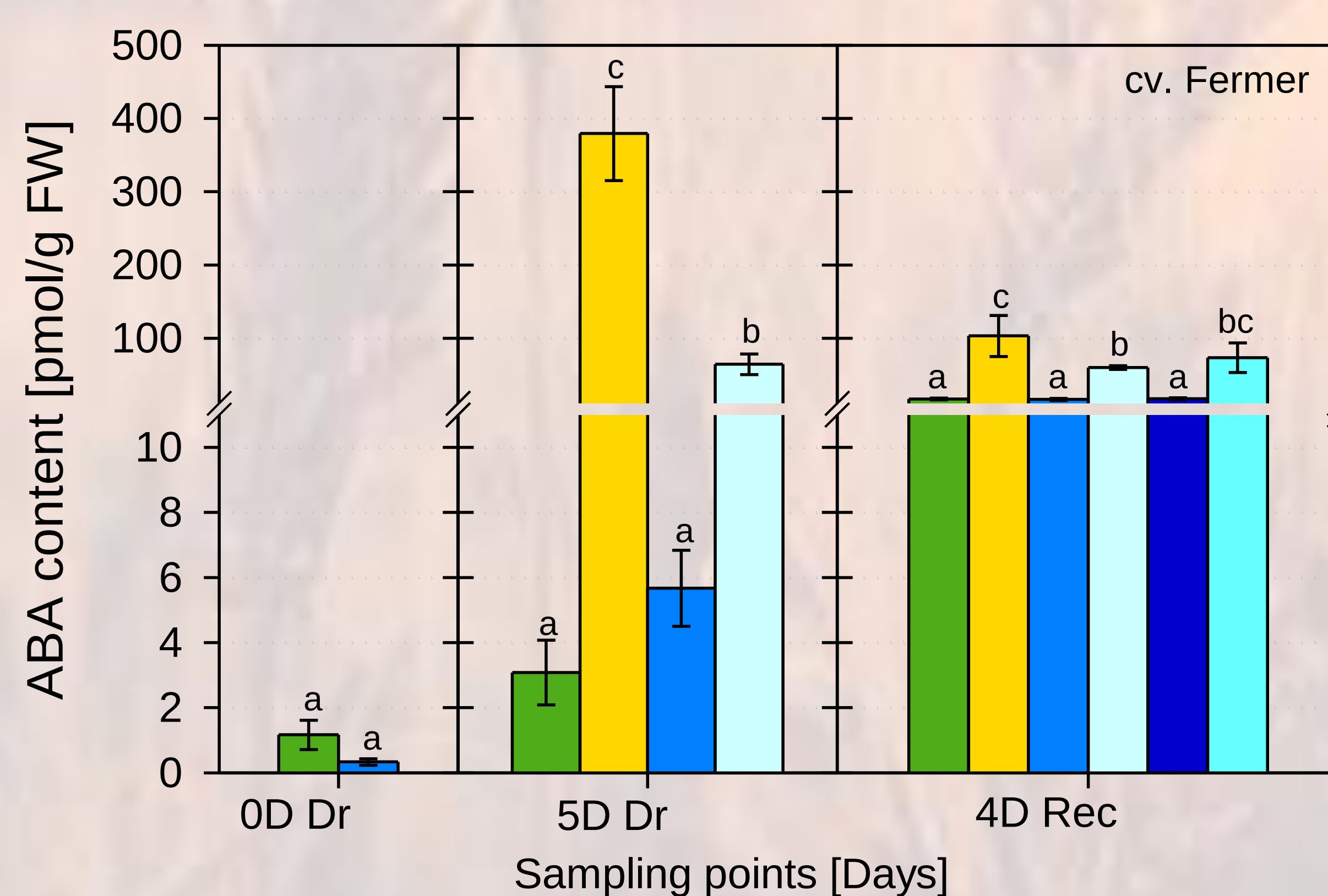
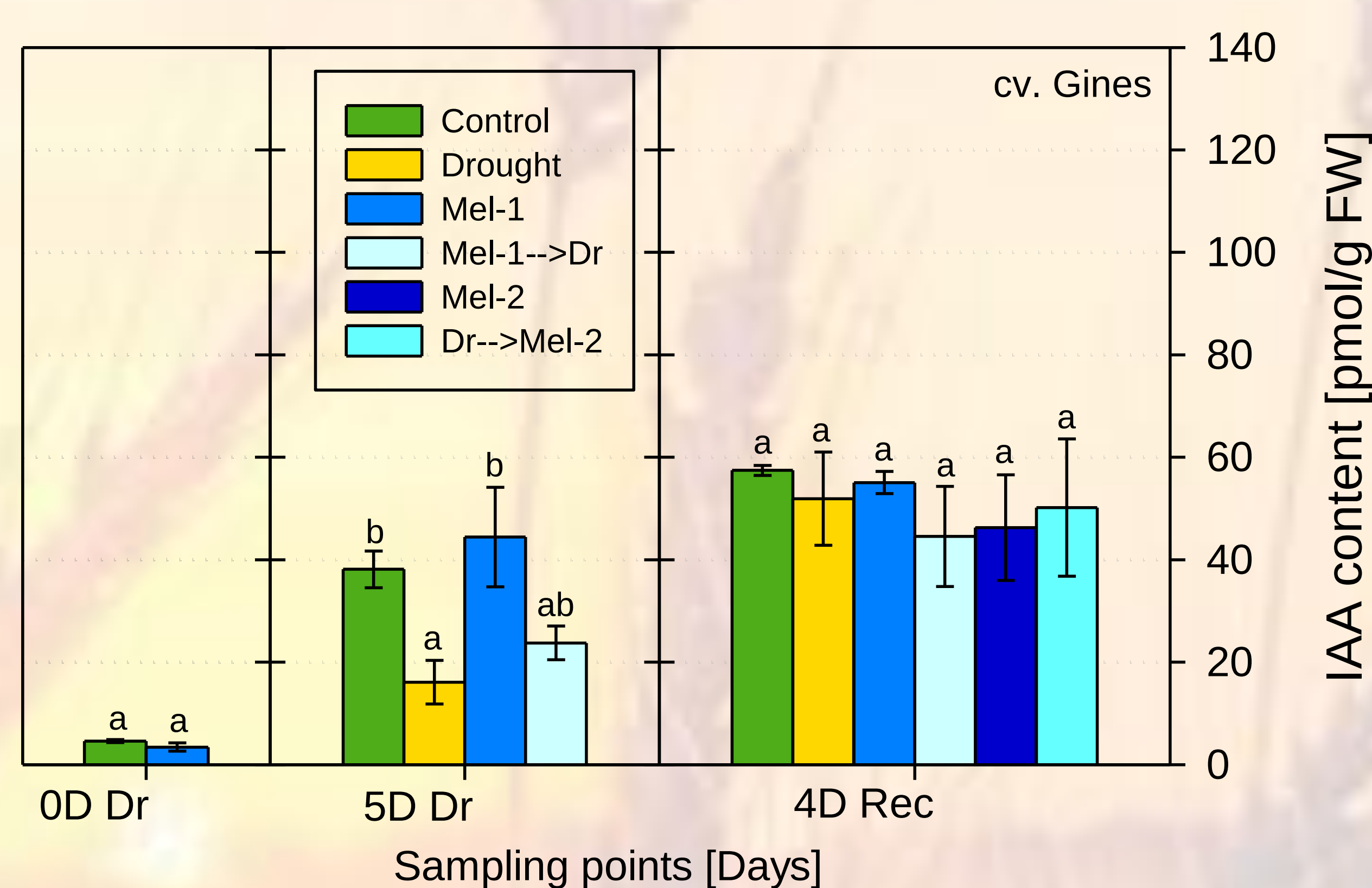
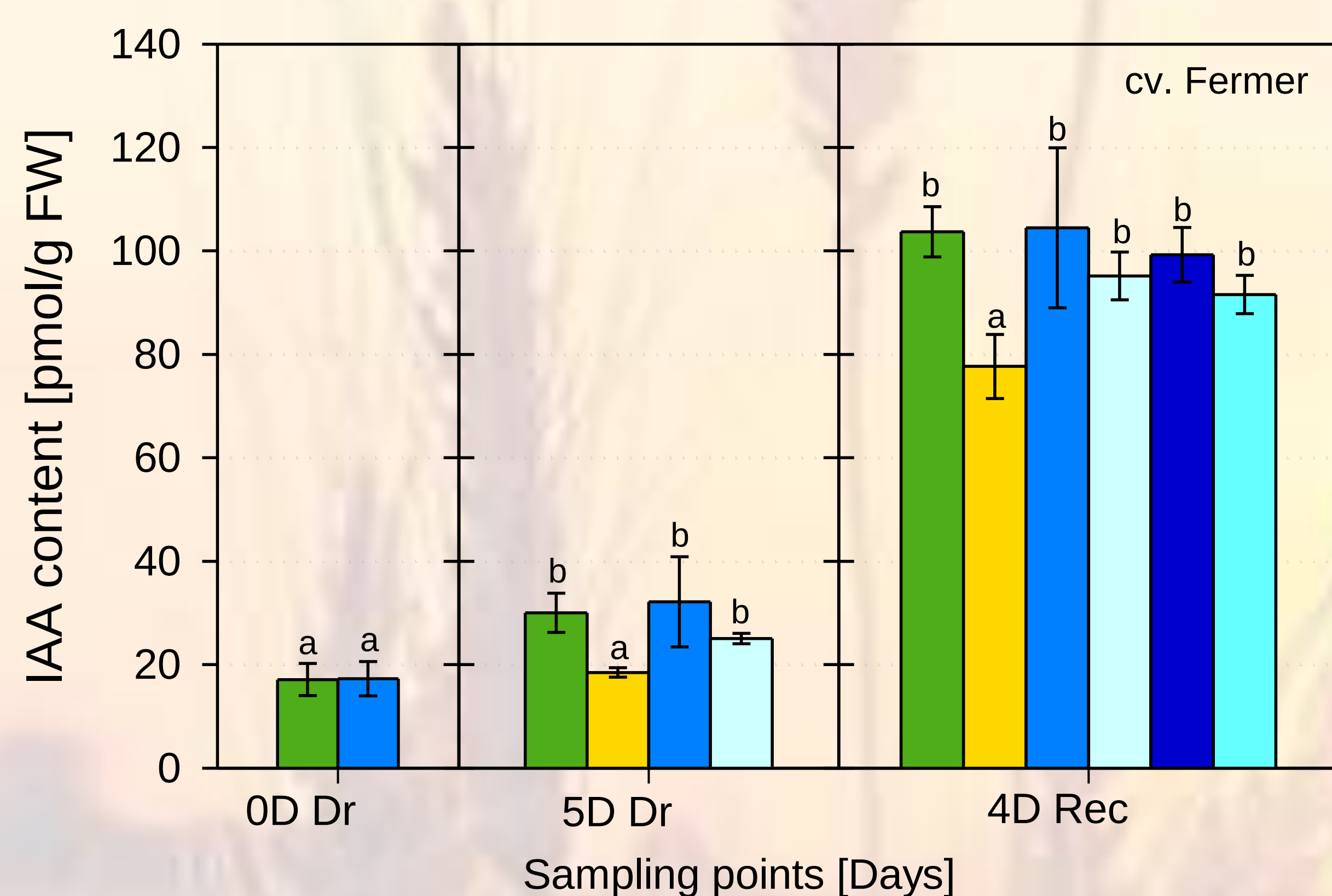
## Materials and Methods

A five-day drought stress was applied to young winter wheat (*Triticum aestivum* L.) plants of the Bulgarian cultivars Fermer and Gines which are previously characterized to possess different tolerance to drought. After the drought period, the normal water supply was restored. Twenty-four hours before and after drought, plants were root supplemented with 75µM melatonin solution.

The levels of phytohormones indol-3-yl acetic acid and abscisic acid were measured in wheat leaves immediately after drought (5D), and on the fourth day (4D-R) of recovery.

The content of IAA and ABA was measured at 405 nm with a UV-Vis spectrophotometer (Thermo Fisher Inc., Waltham, MA, USA) with SkanIt Software 2.2 (Thermo Fisher Inc.) using respective ELISA immunoassay kit (OChemIm Ltd., Olomouc, Czech Republic) according to the manufacturer's protocol.

The data presented are mean values ± Standard Error. The data were statistically evaluated by One-Way ANOVA with Duncan's post-hoc test and significant differences between treatments are indicated by different letters.



## Results

- ❖ Generally, the constitutive level of IAA was lower in the drought tolerant variety “Gines” than in “Fermer”. No differences between varieties were found in relation to ABA.
- ❖ Drought stress decreased the content of IAA in both varieties. During the recovery period IAA level tended to increase. In the susceptible variety “Fermer” IAA remained below the control, while in the tolerant cultivar “Gines” it neared the control.
- ❖ ABA was highly increased after 5 days of drought. This effect was better expressed in the susceptible cultivar “Fermer”. After restoring the normal irrigation regime ABA levels were decreased but remained slightly higher than the controls in both cultivars.
- ❖ Melatonin by itself did not cause statistically significant alterations, but substantially adjusted the drought-induced deviations in both hormones.