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Proceedings

Editor: Ivan Spasojević

Technical support: Dragana Robajac

Cover design: Zoran Beloševac

Publisher: Faculty of Chemistry, Serbian Biochemical Society

Printed by: Colorgrafx, Belgrade

Serbian Biochemical Society

Tenth Conference

with international participation

24.09.2021. Kragujevac, Serbia

“Biochemical Insights into Molecular Mechanisms”

Heat-induced accumulation of proline and yield components in different cereal varieties

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Growth, development, and yield of cereals are influenced by high temperature. Recent studies have shown that an important factor in plant adaptation to high temperature can be the proline accumulation. Proline is an amino acid involved in a series of metabolic processes in plants, such as protein stabilizer, antioxidant and osmolite. The aim of this research was to determine the effect of high temperature on the content of proline and yield elements, in different cereal varieties during two vegetative seasons, to compare it with the content of proline in moderate temperature conditions and to isolate varieties more resistant to conditions of heat stress. For research, plant material of 10 genetically divergent cereal varieties was used. The results during the first experimental year showed that under moderate air temperature conditions proline content was 0.66 $\mu\text{mol/g}$ fresh plant (fp), and in the second experimental year 0.77 $\mu\text{mol/g}$ fp. Under conditions of heat stress proline accumulation increased during both years. In the first year, the average content of proline was 2.17 $\mu\text{mol/g}$ fp, and in the second experimental year the average content was 2.51 $\mu\text{mol/g}$ fp. The obtained results showed that heat stress led to increased proline accumulation in analyzed cereal varieties. Compared with other cereal varieties, wheat varieties Zvezdana and Pobeda were characterized by higher contents of proline and yield in conditions of heat stress. Statistical analysis and correlation of the results of proline accumulation and yield elements showed that more resistant varieties to heat stress conditions have higher proline accumulation and higher yields.

Acknowledgements

This research was supported by the Ministry of Education, Science and Technological Development of the Republic of Serbia (Agreement No. 451-03-9/2021-14/200122).