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DROUGHT-INDUCED ADJUSTMENT OF PRIMARY METABOLITES IN MAIZE HYBRIDS

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Primary metabolites are directly implicated in plant growth processes, photosynthesis, and respiration, allowing plants to acclimatize and recover from drought stress. Accordingly, this study aimed to determine alterations in content of sugars, total protein, seventeen amino acids and thirty two fatty acids in seeds of maize genotypes differing in drought tolerance in terms of improved plant productivity e.g. increased grain yield obtained under severe water deficit. The experiment was conducted under irrigation and rain-fed conditions. Long-term water deficit stress directly affected plant metabolism, resulting in profound changes in biosynthesis and transport of evaluated primary metabolites. Water deficit caused the inhibition of sugar metabolism (i.e. declined level of sucrose, glucose, fructose, maltose and lactose), bein more pronounced in seeds of drought-sensitive genotypes. Slight decrease in palmitic, linoleic and α-linoleic fatty acids were evidenced in drougth susceptible and medium drought-tolerant maize genotypes. However, significant increase was observed for oleic and especially stearic fatty acid content. In response to water deficit, medium drought-tolerant and tolerant genotypes exhibited amino acids content increase, especialy for methionine, lysine, isoleucine and leucine, with preserved incorporation of amino acids into protein chain. This was confirmed with highly significant positive correlations between total protein and amino acids content ($p \leq 0.01$). The increased protein content in drought tolerant genotypes is linked to altered C-partitioning, which changes the C/N ratio, to favor more N-assimilation, which was confirmed with highly significant negative correlations between sugars and protein content ($p \leq 0.01$), i.e. sugars and amino acids content ($p \leq 0.01$), respectively. Identification of sensitive sites (i.e. biochemical pathways for seed reserves) related to seed-filling processes in stressed plants under long-term water deficit, would provide useful cues in developing strategies to improve grain yield and its quality.

Keywords: *amino acids, fatty acids, sugars, water deficit, Zea mays L.*