EVALUATION OF CHANGES IN STARCH MOBILIZATION DURING CORN GERMINATION UNDER THE INFLUENCE OF NON-OPTIMAL TEMPERATURES

Elena LUTCAN*, Olga PROCA, Ala BOROVSKAIA, Natalia MASCENCO
Institute of Genetics, Physiology and Plant Protection, Moldova State University, Chisinau, Republic of Moldova
*Corresponding author: elena.lutcan@sti.usm.md; lutcanelena322@gmail.com
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Background: Starch, a complex carbohydrate, is a reserve substance and one of the primary sources for corn seed germination. Breaking down into simple sugars (glucose) during the early growth stage of corn seeds, the starch supports both root and seedling biomass accumulation, participating in the synthesis of cells structural components and providing energy for plant respiration and growth. Thus, the proportion of starch mobilized from the corn seeds determines their metabolic efficiency, and changes in starch mobilization indicate modification to the physiological processes of corn germination and growth in response to external abiotic factors.
The aim of this study was to investigate the effect of two abiotic factors - temperature and treatment with the natural bioregulator JS, dry extract obtained from *Juniperus sabina* and diluted to a concentration of 0.0001%, on starch mobilization during corn seed germination and its relationship with plant biomass and metabolic efficiency.
Materials and methods: Corn seeds were germinated in six variants: two under optimal conditions - control seeds and seeds pretreated with JS; two under cold test - control and pretreated seeds with JS, which were germinated at 10°C for 7 days, followed by 4 days under optimal conditions; and two under heat test - the seeds exposed at 50°C for 30 minutes, then germinated under optimal conditions - control and seeds pretreated with JS. Starch content in intact and post-germinated seeds was determined using the Ewers-Grossfeld polarimetric method. Seeds of the maternal inbred line of the Porumbeni 455 MRf were used as study object.
Results: The grains of the maternal line contain 63.35±1.79% starch under optimal germination conditions for control seeds, 51.8% of the initial starch content was mobilized from endosperm and used for root and seedlings growth, as well as for energetic support of physiological processes. At non-optimal temperatures, the starch utilization for germination of control seeds changed significantly: at low temperatures, its consumption decreased by 9.5%, while at high temperatures it increased by 45.3% compared to the control seeds germinated under optimal conditions. The metabolic efficiency of these seeds changed similarly. This fact confirms that the studied hybrid is more resistant to high temperatures than to low ones. Pretreatment of corn seeds with the JS solution increased the consumption of starch used for seed germination under non-optimal conditions by 2.4-11.5%, which indicates the synergistic effect of two abiotic factors. A direct correlation between the amount of mobilized starch and plant biomass (0.6069), as well as between mobilized starch and metabolic efficiency (0.6192) was established. Similar results were obtained when studying changes in metabolic efficiency after treating corn seeds of the P427 hybrid with JS solutions of varying concentrations (0.1...0.0001%).
Conclusions: Thus, an assessment of changes in plant biomass, metabolic efficiency and mobilization of reserve substances, especially starch, showed that the maternal inbred line of the Porumbeni 455MRf corn hybrid has significant resistance to elevated temperature.
Keywords: corn seed, germination, starch, bioregulator JS, non-optimal temperature
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