SIMULATING WATER DEFICIT IN CULTIVATED FLAX (*LINUM USITATISSIMUM L.*)

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Background: The reintroduction into cultivation of resilient, native, or historically cultivated species such as flax (*Linum usitatissimum* L.) represents an opportunity for sustainable agriculture, as these species demonstrate a higher capacity to adapt to water scarcity and unfavorable soil conditions, compared to agricultural systems based on intensive monocultures.
Aim of the study: To evaluate the germination behavior of local flax forms (*Linum usitatissimum* L.) under water stress induced by PEG 6000, in order to identify genotypes with enhanced drought tolerance.
Materials and methods: Two local flax (*Linum usitatissimum* L.) accessions from the Gene Bank's *ex situ* collection were used as study material: *DRS-09* (Sofia vlg., Drochia dist.) and *CSG-22* (Grigorievca vlg., Causeni dist.). To investigate plant responses to water stress, a polyethylene glycol 6000 (PEG 6000) solution was applied at five concentrations (0% – control, 10, 15, 20 and 25%) as a standard method for simulating drought conditions under controlled laboratory environments. The samples were exposed to a temperature of 20±1° for 6 days.
Results: The results showed a clear variation in germination capacity and seedling growth depending on the intensity of osmotic stress induced by PEG 6000. Under non-stress conditions (0% PEG), the genotypes exhibited high germination rates, 90% for *DRS-09* and 88% for *CSG-22*. At 10% PEG, a slight stimulation of germination was observed, with both genotypes reaching values of up to 94%. As the concentration increased to 15% and 20% PEG, germination remained relatively stable, ranging between 88-92% and 86-88%, respectively, while at 25% PEG germination was completely inhibited (0%). In the absence of osmotic stress, the *DRS-09* genotype exhibited superior vigor, with an average seedling length of 15.67±0.60 cm compared to 9.96±0.57 cm for *CSG-22*. PEG application resulted in a progressive reduction in growth, which became more pronounced with increasing stress intensity. At 10% PEG, seedling length was 11.40±0.65 cm (*DRS-09*) and 9.02±0.53 cm (*CSG-22*), followed by marked decreases at 15% PEG (6.82±0.40 cm and 4.26±0.26 cm). At 20% PEG, growth was severely inhibited, reaching values of 1.75±0.07 cm and 1.67±0.09 cm and at 25% PEG, complete suppression of germination and growth was observed. Overall, the results indicate increased sensitivity to severe stress and differential tolerance among genotypes under moderate stress conditions.
Conclusions: The *DRS-09* genotype showed higher overall tolerance to PEG-induced water deficit and represents the most promising material for further study. A PEG concentration of up to 20% is recommended for future screening of flax genotypes, as it effectively differentiates stress responses.
Keywords: *Linum usitatissimum* L., local forms, water deficit, PEG 6000.
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