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EFFECT OF OSMOTIC STRESS ON GROWTH AND BIOMASS ACCUMULATION IN FLAX SEEDLINGS (*Linum usitatissimum* L.)

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Drought is a major abiotic stress factor that affects plant growth and development, causing significant yield losses. Identifying drought-tolerant genotypes capable of maintaining stable yields under water-limited conditions is essential for sustainable agriculture. Due to their distinct genetic backgrounds, botanical varieties of flax (*Linum usitatissimum* L.) exhibit considerable variability in drought tolerance and water-stress response.

Two local flax accessions, G01 (Sofia Village, Drochia District) and G02 (Grigorievca Village, Causeni District), were evaluated for their response to osmotic stress. Drought conditions were simulated by inducing osmotic stress with a 15% (w/v) PEG 6000 solution, corresponding to an osmotic potential of Ψ_s = -0.325 MPa. Seeds were incubated for 7 days in darkness at a constant temperature of 20±1°C, and the effects of osmotic stress were assessed based on morphological and gravimetric parameters of the seedlings.

Osmotic stress (Ψ_s = -0.325 MPa) limited water uptake during germination, resulting in reduced tissue hydration and inhibited seedling growth. Consequently, fresh weight decreased from 1.08 g to 0.48 g in G01 (-56.0%) and from 1.12 g to 0.42 g in G02 (-62.8%). Water content also decreased, from 94.5% to 86.4% in G01 and from 93.6% to 84.9% in G02. Concomitantly, the ratio of dry mass to fresh mass (DM/FM) increased from 5.5% to 13.6% in G01 and from 6.4% to 15.1% in G02, indicating reduced tissue hydration under osmotic stress. Moreover, dry biomass showed a differential response between genotypes: G01 exhibited a 9.1% increase compared with the control, whereas G02 showed an 11.8% decrease, suggesting greater stability of dry matter content in G01 under osmotic stress conditions.

Morphological assessment of embryonic organs further revealed a differential response between genotypes. The hypocotyl was the most affected organ, exhibiting

a decrease of more than 62% in fresh weight, accompanied by pronounced inhibition of axial growth. Hypocotyl length decreased from 6.5 cm to 1.7 cm in G01 and from 3.5 cm to 1.2 cm in G02 under osmotic stress conditions. Similarly, radicle elongation was significantly restricted, decreasing from 11.2 cm to 6.2 cm in G01 and from 8.2 cm to 4.5 cm in G02, accompanied by reduced fresh biomass.

In conclusion, exposure to 15% PEG 6000 (Ψ_s = -0.325 MPa) significantly inhibited early seedling development in flax, resulting in marked reductions in water content, fresh biomass, and embryonic organ elongation. Compared with G02, genotype G01 demonstrated a greater capacity to maintain dry biomass content and growth under osmotic stress, suggesting higher tolerance to water deficit. This differential response may be associated with the distinct ecological origins of the genotypes, with G01 originating from northern Moldova and G02 from the south-eastern region, where contrasting environmental conditions may have contributed to their adaptive responses to water stress.

Keywords: *Linum usitatissimum*, flax, osmotic stress, PEG 6000.

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