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EVALUATION OF CHICKPEA RESILIENCE TO COLD STRESS AT GERMINATION AND SEEDLING STAGES

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In this communication presented summarizing results of research on evaluation of 16 chickpea genotypes to cold stress at germination and seedling stages. The research was prompted by agro climatic instability, specifically unpredictable low temperature observed during April over three consecutive years. Investigation was carried out in 2026 and comprised 6 foreign, 8 local accessions as well as 2 cultivars *Ichel* and *Botna*, latter as check being tolerant to cold. Genotypes MDI 02433, MDI 02461and cv. *Botna* are *desi*, others – *kabuli,* which were characterized by wide range of seeds size: 11.5g (MDI 02461) – 41.1g (REZ2-9a) per 100 seeds.

The primary objective was: to screen genotypes for low-temperature resilience during the seedling emergence phase under field conditions and seeds germination under controlled ones. Before start the experiments all genotypes were tested for germination, everyone had 100%. The field experiment consisted of early sowing (on 1st March, a month earlier than accepted time), in randomized block design (20 cm/5cm distance between/in rows) with 3 replications (40×3 seeds per genotype). For evaluation the speed of seedling emergence index (SSEI), was used Maguire's formula: sum of the number of newly emergence seedling divided by the number of days since planting (on the 25th, 28th, 31th and 33th days) and final emergence rates, both expressed in percentage. Under controlled conditions (20 ×3 seeds per genotype, germinated in pots with sand), genotypes were exposed to three distinct thermal regimes - stress (7 ℃), suboptimal (10 ℃), and optimal (13 ℃) - for an 8-day period. Stress indices at germination stage I and II were calculated as ratio of radicles' length (mean) under stress condition to suboptimal and optimal, respectively.

Values of speed seedling emergence index ranged from 2.7 (MDI 02403) to 3.7 (OR1-2b), while final emergence rates varied between 73.7% (MDI 02403) - 100% (MDI02433, OR1-2b). Radicle lengths (mean) constituted 18.3 mm (15.1-24.8 mm) at 7 ℃, 70.2 mm (57.5-79.5 mm) at 10 ℃, and 106.7 mm (82.5-117.7 mm) at 13 ℃.

Stress indices at germination stage I and II ranged from 0.213 (REZ2-9a) to 0.321 (MDI 02443) and 0.134 (MDI02403) – 0.216 (MDI 02443), respectively. Based on the integrated experimental datasets, Ward's hierarchical clustering analysis segregated the germplasm into three distinct cohorts: Cluster 1 comprised 5 cold-tolerant genotypes: cv. *Botna*, MDI 02431, OR1-2b, MDI 02443 and MDI 02433; Cluster 2 included 8 moderately tolerant accessions: cv. *Ichel*, CS1-18b, CS2-16, MDI 02488, MDI 02437, MDI 02405, MDI 02461 and MDI02422; and Cluster 3 consisted of 3 moderately sensitive accessions: MDI02403, MDI 02447 and REZ2-9a. Correlation analysis revealed a highly significant positive correlation (R = 0.963) between SSEI and final emergence rate, alongside moderate positive correlations between *SSEI* and stress indices I (0.738) and II (0.725), respectively. Low negative correlation was determined between *SSEI* and *weight of 100 seeds* (R= (-0.117) and also between *stress indices* I, II and *weight of 100 seeds* (R= (- 0.257) and (R= (-0.186), respectively.

Conclusions: as a result of conducted research genotypes: cv. *Botna*, MDI 02431, OR1-2b, MDI 02443, and MDI 02433 were identified as tolerant to cold, while genotypes: cv. Ichel, CS1-18b, CS2-16, MDI 02488, MDI 02437, MDI 02405, MDI 02461 and MDI02422 as moderate tolerant.

Keywords: chickpea, early sowing, seedling emergence index, emergence rate, stress index

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