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EFFECTS OF HIGH TEMPERATURE ON GROWTH CHARACTERISTICS OF ADVANCED TOMATO BREEDING LINES

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In the current context of climate change, vegetable producers require genetic resources capable of withstanding heat and drought stress, while consumers particularly value local tomato varieties for their superior taste and diverse uses. The aim of this research was to study the variability of heat stress tolerance in new tomato lines, to identify the most valuable genotypes, and to incorporate them into breeding programs.

Ten promising tomato lines were used as research material. Of these, five lines were developed at the Institute of Genetics, Physiology and Plant Protection (IGPPP) (L 108, L 109, L 110, L 111, and L 112), and five at the Vegetable Research and Development Station, Bacău, Romania (L 97, L 100, L 201, L 270, and L 273). The heat stress tolerance of the tomato samples was evaluated based on the growth capacity of the embryonic radicle, hypocotyl, and intact seedling over a period of 7 days after exposure, on the fourth day, to a temperature of 43°C for 6 hours. Seedlings grown at 25°C served as the control. The evaluation of the response of tomato lines to different temperature levels with respect to growth traits during early ontogeny demonstrated that radicle length under optimal conditions ranged from 28.7 to 61.8 mm, while at 43°C it varied between 17.5 and 31.6 mm. The degree of growth inhibition in the studied genotypes ranged from -8.4% to -59.5% compared with the optimal conditions. A strong inhibitory effect was observed in lines L 111 (-59.5%) and L 273 (-50.7%). The Romanian lines L 97 and L 201 exhibited the highest level of heat tolerance, with tolerance values of 80.6% and 91.6%, respectively. In these lines, radicle length decreased by only 19.4% and 8.4%, respectively, compared with the optimal temperature treatment. Regarding hypocotyl length, growth inhibition at 43°C was significant in five lines: L109, L 110, L 111, L 149, and L 273, with reduc-

tions of 43.1%, 44.0%, 43.3%, 49.4%, and 45.3%, respectively. In contrast, stimulation of hypocotyl growth was observed in line L201, where growth increased by 36.7% compared with the control. In the remaining lines, growth inhibition ranged from 13.0% to 33.3%. With respect to seedling length, a reduction compared with the control was recorded in most genotypes, varying from 23.9% to 54.8%. At the same time, exposure to 43°C stimulated seedling growth in line L 201, resulting in a 10.3% increase relative to the control. Cluster analysis (k-means method) demonstrated that inter-cluster variance was considerably higher than intra-cluster variance for the studied traits, indicating pronounced differences among the investigated genotypes. By classifying the genotypes based on the three growth traits, it was found that the genotype groups, separated into three clusters, differed in both the level and variability of the studied characteristics. Thus, under heat stress conditions, Cluster 1 comprised three genotypes (L 97, L 112, and L 273) characterized by the lowest values of the assessed traits. Cluster 2 included genotypes with intermediate values (L 100, L 110, L 111, and L 270). Cluster 3 consisted of genotypes L 108, L109, and L 201, which exhibited the highest values for growth traits during early tomato ontogeny and, therefore, are of particular interest for breeding programs as potential genetic sources of heat stress tolerance.

Keywords: tomato, temperature, breeding lines.

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