**Computer image analysis of seed characteristics wheat genotypes under rain-fed and well-watered conditions**

**Ehsan Rabieyan1, Mohammad Reza Bihamta1, Mohsen Esmaeilzadeh Moghaddam2, Valiollah Mohammadi1, Hadi Alipour3**

1Department of Agronomy and Plant Breeding, Faculty of Agriculture, University of Tehran, Karaj, Iran

2Seed and Plant Improvement Institute, Agricultural Research Education and Extension Organization (AREEO), Karaj, Iran

3Department of Plant Production and Genetics, Faculty of Agriculture, Urmia University, Iran

[**mrghanad@ut.ac.ir**](mailto:mrghanad@ut.ac.ir)

**Abstract**

Morphometric seed analysis represents a potential tool for the inter- and intra-specific exploration of discrepancies in morphology with ecological, phylogenetic, and taxonomic objectives. Seed morphometric traits are regarded as fundamental parameters which assist in understanding seed response to water regime, providing important data for research on crop breeding in the areas that suffered water stress. Imaging-based screening presents an opportunity for more exact/rapid analysis of seed morphometric traits. Therefore, this study was aimed at evaluating the phenotypic diversity of traits related to wheat seeds with imaging, a total of 298 wheat genotypes (208 native landraces and 90 cultivars) were followed in the form of alpha lattice design with two replications during two cropping years (2018-19 and 2019-20) under drought (rain-fed) and normal (well-watered) conditions. After physiological maturity, seeds were harvested and 50 seeds were randomly selected from each plot to measure seed-related traits. The resultant images were analyzed and processed through the software Python 3.7 to calculate a total of 35 morphometric variables of wheat seeds. From our observations, the criteria Frete and MaxR exhibited that grain length is less affected by drought. In the rain-fed environment, seed weight had the highest correlation with seed volume (r= 0.76\*\*) and area (r= 0.76\*\*). The correlation between 1000-grain weight with Aspect ratio (r=-0.22\*) and Roundness (r=-0.21\*) was also non-significant, negative. The results revealed that volume, area, perim, and thickness traits had the greatest effect on seed weight under both normal and stress conditions. In addition to, 625263, 626358, 626958, 622264, 623908, 623980, Koohdasht, Nicknejad, Zare, Sharyar, and Azar2 genotypes presented lower grain weight loss (less than 10%) under stress compared to normal. Therefore, these genotypes had higher stability than other genotypes. ​Overall, our findings permitted the formation of a morphometric seed database for the conservation and characterization of wheat germplasm.

**Keywords:** Drought, Genetic variability, Wheat