Cell length instead of cell number becomes the predominant factor contributing to hypocotyl length genotypic differences under abiotic stress in Medicago truncatula

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Résumé en anglais	Hypocotyl elongation in the dark is a crucial process to ensure seedling emergence. It relies both on the cell number and cell length. The contribution of these two factors to the maximal hypocotyl length and the impact of environmental conditions on this contribution are not known. This is surprising considering the agronomic and economical importance of seedling emergence in crop establishment. Using 14 genotypes from a nested core collection representing Medicago truncatula (barrel medic) natural variation, we investigated how epidermal cell number and cell length contribute to hypocotyl length under optimal, low temperature (8°C) and water deficit (−0.50 MPa) conditions. Both cell number and length vary according to genotypes and contribute to maximal hypocotyl length differences between genotypes. This contribution, however, depends on growth conditions. Cell number is the major contributor under optimal conditions (60%) whereas cell length becomes the major determinant under stress. Maximal hypocotyl length is correlated with hypocotyl elongation rate under both stresses but not under optimal condition, revealing contrasted genotypes for cell elongation capacity under stress. To identify the genetic regulators determining cell number and cell length, quantitative trait loci (QTLs) were detected using a recombinant inbred lines population exhibiting segregation in maximal hypocotyl length. Two QTLs controlling cell number and three QTLs controlling cell length at low temperature were detected. One QTL for cell number and two for cell length were found to be associated with hypocotyl length under low temperature. This study provides new information to improve seedling emergence under abiotic stress.

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