

**CHLOROPLAST OMICS OF ENDIVE ("CICHORIUM ENDIVIA" L.):  
CHARACTERISING GENOME STRUCTURAL VARIANTS AND TRANSCRIPTOME  
RESPONSE TO RAINFALL-INDUCED WATERLOG STRESS.**

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Surveys on chloroplast (cp) genome diversity have been useful for phylogeny and marker-based DNA barcoding applicable to molecular breeding and registration/legal protection of cultivars. Moreover, chloroplast functions in stress response have emerged by transcriptomic investigations. Smooth- and curly-leafed endives (*C. endivia* var. *latifolia* and var. *crispa*) are of nutritive and economic importance in the market segments of primary and minimally processed produce, and fall into breeding programs of public and private seed companies. So far, the endive cp genome sequence has not been released yet, hence we assembled and annotated that of the smooth-leafed cultivar 'Confiance' as reference, which was 152809 base pairs long, organized into the angiosperm-typical quadripartite structure harboring the inverted repeats IRA and IRB separated by the large- and short- single copy regions. The annotation included 137 genes, 91 coding regions, 37 tRNAs and 9 rRNAs. Starting from the notion that cp DNA is nearly fully transcribed, cp diversity of seven cultivars/genotypes was addressed by using RNA-seq reads that covered over 70% of the reference cp genome. DNA and RNA sequence diversity within 'Confiance' included variants in 40 genes and supported heteroplasmy and RNA editing phenomena. In addition, ca. 250 variants among the cultivars included few genotype-specific polymorphisms and were effective to separate them in phylogenetic trees. The cp transcriptome expression was assayed in smooth and curly cultivars that underwent short-term waterlog before harvest (due to rainfall excess) versus those grown in normal regime. Overall, a eighteen gene set, which included those encoding photosystem I and II proteins, was commonly down-regulated in all stressed genotypes, supporting events of photosynthesis

impairment as observed also by the general drop of sugar levels.