Relationship between chlorophyll fluorescence parameters and quality of the fresh and stored lettuce (*Lactuca sativa* L.)

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Abstract

Quality of lettuce relates to growing conditions, cultivar and storage conditions. There is a need to introduce in the plant production a forecast system for abiotic stresses to enable recognizing early changes of the plant quality before visual changes occur, based on non-destructive measurement methods. The objective of this study was to evaluate the relationship between photochemical processes dynamics and quality parameters of the lettuce. The results will be useful to assess the quality and storage ability of the lettuce and to determine chlorophyll fluorescence parameters, which could well characterize early changes of quality during plant production and storage. Two cultivars of lettuce were investigated 'Omega' F1 - butterhead lettuce type, and 'Aficion' F1 - 'Batavia' type, which were grown in three hydroponic systems: in mineral wool slabs, coconut fibre, and NFT (nutrient film technique). The harvested plants were tested after 3 d and after 6 d of storage. The results of this study showed that lettuce of 'Aficion' F1 and 'Omega' F1 cvs. differ significantly in yield, quality and different ChlF parameters. 'Aficion' F1 of 'Batavia' type was characterized by higher dry mass, soluble solids, Chl a, Chl b and carotenoid contents than the 'Omega' F1 plants. Only 'Omega' cultivar showed reaction to the growing medium used. The influence of storage period on both cultivars was similar. Storage for 3 d period particularly affected decreasing of SPAD index, and the chlorophyll fluorescence parameters such as PI total, Area, Fo, Fm, Fv, Reo / CSo and increasing of ABS/RC, k_P /ABS × k_F and k_N /ABS × k_F. In general, 'Aficion' plants photosynthetic apparatus was significantly less modified during the storage. The level of degradation of the plant tissues during storage has a different effect on structure and reactions in photosynthetic light phase parameters in leaves. The analysis of the photoinduced chlorophyll fluorescence rise allows to monitor the damage dynamics in thylakoid membranes and connect them with the quality parameters of plant tissue.