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S1/P36: GAS EXCHANGE MEASUREMENTS AND CHLOROPHYLL A FLUORESCENCE IN YOUNG PINEAPPLE PLANTS UNDER LONG DAY AND SHORT DAY PHOTOPERIODS

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Pineapple (Ananas comosus) is a constitutive CAM (Crassulacean Acid Metabolism) plant and the most economically significant of the Bromeliaceae family. Vegetative growth in pineapple culture is the longest development stage and significant differences in plant physiology are described concerning geographical location and environmental factors specially temperature (Bartholomew et al., 2002). The aim of the present research was to determine the physiological response of young pineapple plant to long (16/8h light/dark, LDP) and short day (8/16h light/dark, SDP) photoperiods. Six-month old plants, propagated from crown segments of pineapple fruits were acclimatized for 4-6 weeks to both photoperiods (115-130 $\mu$mol.m$^{-2}$.s$^{-1}$ light intensity) at a night and day temperature of 21 and 36 $^\circ$C, respectively. The physiological assessments were performed by gas exchange measurements and PAM (Pulse Amplitude Modulation) fluorometry. Leaves were analysed in the start, middle and end of both light and dark periods. Electron transport rate (ETR), yield ($\Phi_{II}$) and quenching parameters ($qN$, NPQ, $qL$, $qP$), were used to calculate ETRmax, optimum irradiance for maximum photosynthesis, photosynthetic efficiency, and scale coefficients associated to fit curves for each parameter. Gas exchange measurements, performed for 24 h cycles, showed CO$_2$ assimilation during the dark period assuring that the plants had CAM. Total CO$_2$ assimilation was estimated to be up to 4 times higher in SDP than in LDP plants and dependent on the thermoperiod. For instance, maintaining light period temperatures into the dark inhibit stomatal opening decreasing significantly CO$_2$ assimilation. Light curves were characterized by photoinhibition in both photoperiods being more pronounced in LDP plants. ETRmax and optimum irradiance were approximately twice higher for SDP compared to LDP plants. Maximum non-photochemical quenching (NPQmax) increased greatly during dark period resulting in a high-energy dispersion through heat emission when photosynthesis does not occur. Photosynthetic efficiency, yield and quenching scale coefficients for $qP$, $qN$ and $qL$ showed a circadian variation in both photoperiods. These results generate a set of equations (Ritchie 2008) of great importance since they can be used to estimate favourable circumstances for high photosynthesis in field conditions and predict the best lights regimes to induce fast vegetative growth under greenhouse conditions as practiced in the Azores (Portugal). Nevertheless, SDP seems to be more favourable to induce fast vegetative growth of pineapple plants.

Bartholomew et al. (2002). The pineapple: botany, production and uses. New York, USA, CAB International


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