Fluorescence excitation kinetic forfurther studies of plant photosynthetic activity measured by the FluoroMeterModul (FMM) instrument based on an embedded computer

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Here we present a chlorophyll fluorometer module (FMM) system which adapts the intensity to the individual leaf sample by adjusting the quantum flux density of the excitation light so that the fluorescence signal is kept constant. This is achieved by the feedback power adjustment of the fluorescence exciting laser diode. Thus, the intensity of the excitation light is adapted to the actual need of a particular sample for quantum conversion without applying exaggeratedly high quantum flux density. The resulting laser power curves presenting the variation of excitation light of the FMM which maintains the fluorescence response constant during the transient over five minutes between the dark- adapted to the light-adapted state of photosynthesis.

Examples are shown for measuring upper and lower leaf sides, a single leaf with different pre-darkening periods, as well as yellow, light green and dark green leaves of *Ficus benjamina*. The variations of excitation kinetics are studied in detail using the example of primary leaves of etiolated barley seedlings (*Hordeum vulgare* L. cv. Barke) during different states of greening in the light. The greening process is characterized by the gradual accumulation of chlorophyll and the development of photosynthetic activity accomplished after 48 hours illumination.

The novel excitation kinetics during the induction of chlorophyll fluorescence can be used to study the yield and regulation of photosynthesis and its related non-photochemical processes for an individual leaf sample. It allows not only to sense the present state of pre-darkening or pre-irradiation but also the light environment the leaf has experienced during its growth and development. Thus, the individual physiological capacity and plasticity of each leaf sample can be analysed. The information gained by this novel technique can be of high importance for basic and applied ecophysiological research which makes this new methodology both innovative and informative.

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