

Effect of High Irradiance on an Ethnobotanically Important Plant (*Luffa acutangula* Roxb.)

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ABSTRACT

Luffa acutangula Roxb was examined for the effects of photoinhibition. Our results show that this species is not immune to high irradiance.

Key Words: High irradiance, variable fluorescence, Fv/Fm.ss.

INTRODUCTION

Luffa actuangula Roxb. is cultivated throughout India. It is grown mainly for its fruits, fruit- juice, seeds, root and leaves. The heated juice of *L. acutangula* is used in the treatment of the adrenal variety of diabetes.

Photoinhibition

Photoinhibition is the light-induced reduction in the function of photosystem II (PS II) with an associated decline in quantum efficiency. Photoinhibition may result from direct photodamage to reaction centers or an increase in photo protective mechanisms that deflect excess energy away from PS II. Controlled dissipation of the excess energy prevents damage to the photosynthetic apparatus

When dark-adapted leaves are suddenly subjected to high irradiance, the initial fluorescence, F_0 , is the quantity of fluorescence produced when all PS II reactioncentres are open. With the absorption of quanta, reaction centres start to close and the maximum fluorescence, F_m , is measured under saturating irradiance when all of the reaction centres are closed. Variable fluorescence F_v is the difference between F_0 and F_m . The ratio of F_v and F_m is the intrinsic efficiency of PS II, and obtains an average maximum value of 0.80 – 0.83 for a wide variety of plants growing under optimal conditions (Demmig and Bjorkman 1987). Plant physiologists use measures of fluorescence as an indicator of chlorophyll stress specifically in relation to photosystem II. Greater fluorescence results when photosystem II (PS II) reaction centers are closed or damaged and can no longer accept additional electrons, thus interrupting electron transport. The relationship between chlorophyll and carotenoid may be used as potential indicator of photo-oxidative damages caused by strong irradiation.

MATERIALS AND METHODS

Dark-adapted Fv/Fm measurements were taken with the help of Opti-Sciences modulated flourometer OS- 30P (Opti Sciences, Hudson). The fully expanded leaves of *Luffa actuangula* were exposed to high

irradiance for 30 mins. Prior to that chlorophyll fluorescence was measured. After the high irradiance and after 30 minutes of recovery time, the chlorophyll fluorescence was again measured.

RESULTS AND DISCUSSION

Table 1 shows the results of chlorophyll fluorescence of *Luffa actuangula*. The Fv/Fm value was high (0.914) before high irradiance. After the HI Fv/Fm value was decreased, it showed a slight increase after recovery. Before the HI Fo value was low, but it increased after HI and it decreased after recovery. Variable fluorescence was high before HI and it decreases both after HI and after recovery. Our results are in line with that found by others.

Table 1: Chlorophyll fluorescence value of *Luffa actuangula*

Treatments	Fo	Fm	Fv/Fm	Fv
Before HI	23.7±1.61	280.4±5.8	0.914±0.004	256.50±5.02
After HI	68.33±4.7	282±18.07	0.757±0.01	213.54±15.5
After Recovery	61.67±3.5	267.16±17.8	0.768±0.01	205.35±16.8

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