

Ergosterol Regulated Functioning of Rubisco in Tomato

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Abstract : Ergosterol, is an important fungal metabolite on phylloplane which is not synthesised by plants. However, the functional requirement of ergosterol to the plants is still an enigma. Being ubiquitously present in all plants except algae needs an insight into its physiological implication. The present study aimed at understanding if and how ergosterol influences the physiology of chloroplast particularly the activity of RuBisCo and carbonic anhydrase. The concept of the study was based on one of our earlier observation of enhanced Hills reaction in plants treated with fungal metabolites which contained ergosterol. The fungal metabolite treated plants had a significantly high concentration of photosynthetic pigments. Eight-week-old tomato plants raised under aseptic conditions at 25 + 10 C, 75 % relative humidity and 12 hour L/D photoperiod. Metabolites of *Aspergillus niger* and *Fusarium oxysporum* were sprayed on plants either singly or in a 1: 1 combination. A separate group of plants was also treated with 0.5, 1.0, 3.0, 5.0, 7.0 mg ergosterol / ml of n- heptane. Control plants were treated with sterile distilled water only. Plants were sampled at 24, 48, 72 and 96 hours of treatment. RuBisCo and carbonic anhydrase was estimated from sampled leaves. RuBisCo was separated on 1D SDS-PAGE and subjected to MALDI - TOF- TOF - MS analysis. The presence of ergosterol in fungal metabolites was confirmed. Fungal metabolites significantly enhanced the concentration and activity of RuBisCo and carbonic anhydrase. The Vmax activity of the enzymes was significantly high in metabolite treated plants. 1:1 mix of metabolite was more effective than when applied individually. Insilico analysis revealed, RuBisCo subunits had a binding site for ergosterol and in its presence affinity of Co₂ to the enzyme increased by several folds. Invivo activity of RuBisCo was significantly elicited by ergosterol. Results of the present study indicate that ergosterol from phylloplane microfungi probably regulates the binding of Co₂ to RuBisCo along with activity of carbonic anhydrase thereby modulating the physiology of chloroplast.

Keywords : carbonic anhydrase, ergosterol, phylloplane, RuBisCo

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