

p*-hydroxybenzoic acid inhibited photosynthetic efficiency, yield and non-photochemical fluorescence quenching in *Lactuca sativa

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ABSTRACT

The *p*-hydroxybenzoic acid (BA) is a widespread phenolic compound often cited as allelochemical [1], released into soil by root exudates of *Avena fatua* [2], leaf leachates, and decomposed plant tissues of *Triticum aestivum* L. [3]. Because of the herbicidal potential of BA on crops [4] and weed species [5], commercially available BA was tested on photosynthetic efficiency, yield and non-photochemical fluorescence quenching in *Lactuca sativa* in a glass house study. The stock solution (3mM) of BA was made in Methanol: Water (20:80). Methanol was evaporated in a rotary vaporizer and stock solution was adjusted to concentration of 1.5 mM. Lettuce (*Lactuca sativa* L. cv. Great Lakes California) seeds were grown in perlite culture in plastic pots, irrigated with 500 ml 1:1 Hoagland solution/pot, twice in a week in controlled glass house, having temperature: 18/8 °C (day/night) and 12/12 h (light/darkness) photoperiod and 80 % relative humidity. One-month-old seedlings were treated with 1.5 mM concentration of BA and chlorophyll fluorescence measurements were performed with portable, pulse-modulated instrument fluorescence monitoring system (FMS) (Hansatech, Norfolk, England) by the method of Weiss and Reigosa [6]. Total protein was quantified by using the Spectrophotometric Bradford [7] assays using commercial bovine serum albumin as standard. Allelochemical BA reduced quantum efficiency (F_v/F_m) in lettuce seedlings on all days but the effect was stronger on the fifth and sixth day. Effective

quantum yield (Φ PSII) of photosystem II was significantly decreased by BA during third, fourth, fifth and sixth day. The photochemical fluorescence quenching (qP) was significantly decreased after treatment with BA and its values was 5-folds less in treated plants as compared to control. The allelochemicals HBA also significantly reduced NPQ values as compared to control during first, second, third, and fourth day. Leaf protein contents of *L. sativa* were significantly reduced by highest concentration of BA (1.5 mM). Some other allelochemicals like BOA [8] were also reported to inhibit Fv/Fm ratios. These results indicate that Fv/Fm, quantum yield of PSII electron transport, and qP can be used indirectly to elucidate allelopathic influence of BA on lettuce plants.

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