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Husna Siddiqui, Khan Bilal Mukhtar Ahmed, Shamsul Hayat

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Comparative effect of 28-Homobrassinolide and 24-Epibrassinolide on the performance of different components influencing the photosynthetic machinery in *Brassica juncea* L.

Husna Siddiqui*, Khan Bilal Mukhtar Ahmed *, Shamsul Hayat*

Plant Physiology Section, Department of Botany, Aligarh Muslim University, Aligarh 202002, India*

Abstract

BRs are polyhydroxylated sterol derivatives, classified as of phytohormones. Plants of *Brassica juncea* var. Varuna were grown in pots and an aqueous solution (10^{-8}M) of two brassinosteroid isomers 28-homobrassinolide (HBL) and 24-epibrassinolide (EBL) of same concentration (10^{-8}M) was applied to their leaves. The treatment up-regulated the photosynthetic machinery directly by enhancing water splitting activity, photochemical quenching, non-photochemical quenching, maximum PSII efficiency, actual PSII efficiency, electron transport rate, stomatal movement, stomatal conductance, internal CO_2 concentration, transpiration rate, net photosynthetic rate and carbohydrate synthesis. Moreover, the level of biochemical enzymes (carbonic anhydrase and nitrate reductase), reactive oxygen species (superoxide and hydrogen peroxide) generation, antioxidant enzyme activity and mineral status (C, N, Mg, P, S, K), which indirectly influence the rate of photosynthesis, also improved in the treated plants. Out of the two BR analogues tested, EBL excelled in its effects over HBL.

Keywords: PSII efficiency, electron transport rate, stomatal conductance, net photosynthetic rate, reactive oxygen species, elemental composition

Introduction

BRs are polyhydroxylated sterol derivatives sharing structural similarity with animal and insect steroid hormones. BRs are present in each plant part and do not undergo long-distance transport. They are known to regulate photosynthesis under normal as well as in abnormal conditions (Siddiqui et al. 2018). The application of BRs enhances the rate of photosynthesis by improving various related attributes e.g. chlorophyll content in *Vigna radiata* (Bhatia and Kaur 1997), *Brassica juncea* (Hayat et al. 2001; Braun and Wild 1984), *Oryza sativa* (Wang 1997), *Cicer arietinum* (Fariduddin et al. 2000, Ali et al. 2005). Leaf-applied 28-HBL enhanced the net photosynthetic rate in *Triticum aestivum* (Yusuf et al. 2011), *Cucumis sativus* (Xia et al. 2009), *Vigna radiata* (Ali et al. 2008). Seeds soaked in EBL solution also enhanced the photosynthetic rate in resulting plant; (Fariduddin et al. 2003; 2004). A rise in CO_2 assimilation rate was observed in wheat and mustard (Braun and Wild, 1984), *Oryza sativa* (Fujii et al. 1991) and *Vicia faba* (Pinol and Simon 2009) on treatment with BRs.