ABSTRACTS

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INTERACTIVE EFFECT OF ELEVATED CARBON DIOXIDE AND NITROGEN SOURCES ON WHEAT PLANTS

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Elevated carbon dioxide (e-CO2) levels from ambient (a-CO2) enhances plant biomass and yield due to increased carboxylase activity of Rubisco. However, this response might vary with nitrogen (N) form due to split up of energy at e-CO2 among CO2 and nitrate assimilation. This study was designed to investigate the shifts in energy under e-CO2 and thus plant growth performance as affected by N form. Wheat plants were grown in nutrient solution prepared with NH4+, NO3-, NH4+ and NO3- or urea under a-CO2 and e-CO2. Changes in photosynthetic parameters, biomass and concentrations of N, soluble carbohydrates and free amino acids in shoots and roots were determined. Plants supplied with NH4NO3 performed better in terms of biomass and biological enhancement ratio by e-CO2. e-CO2 significantly enhanced CO2 assimilation (A) but at highly variable rates depending on the N source. Under e-CO2, A was in the order of NO3- > NH4NO3 > NH4+ > urea. Compared to other N sources, plants supplied with NH4NO3 had lower intercellular CO2 along with higher photoassimilate translocation to roots and low accumulation of free amino acids, indicating better exploitation of the e-CO2. We conclude that photosynthesis, protein and carbohydrate metabolism are differentially influenced by e-CO2 depending on the N-source. Management of N fertilization towards a balanced supply of NO3- and NH4+ to plants is the key for harnessing e-CO2, while minimizing its adverse effects on the quality of the grains.

Key Words: amino acids; carbohydrate metabolism; elevated CO2; nitrogen form; Triticum aestivum