

Interactive effect of N form and HCO_3^- on chemical and eco-physiological characteristics of snap bean in hydroponic system

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Abstract

Due to alkalinity of most soil and water resources in Iran and consequently bicarbonate-induced high pH of plants' growing medium and different effects of ammonium and nitrate on pH of plant growing medium, research about deleterious effects of factors like alkalinity and interactive effect of nitrogen with bicarbonate on chemical and ecophysiological characteristics of plants seems to be necessary. Thus, an experiment was carried out on snap bean as a factorial trial with completely randomized design and two factors of sodium bicarbonate (0, 1, 5 and 15 mM) and nitrogen form (ammonium and nitrate). The results of this experiment showed that bicarbonate decreased SPAD index and plant pigments in leaves. Proline concentration in ammonium treated plants increased with bicarbonate linearly; whereas in nitrate treatment and at 1 mM bicarbonate, it decreased slightly but increased again markedly with elevating of bicarbonate content. In ammonium treatment, the photosynthesis rate, mesophyll efficiency and water use efficiency decreased with bicarbonate, whereas in nitrate treatment, they increased with low and medium concentrations of bicarbonate. It is concluded that in ammonium treatment, bicarbonate decreased photosynthesis efficiency and water utilization in snap bean at all concentrations, whereas, in nitrate-fed plants, bicarbonate at low concentration (1 mM) was suitable, probably due to providing some CO_2 or carbon skeleton for nitrogen assimilation in plants.

Keywords: Nitrate, Ammonium, Photosynthesis, Alkalinity, Legume.

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