

Combined effect of deficit irrigation and potassium fertilizer on physiological response, plant water status and yield of soybean in calcareous soil.

Abstract

A 2-year field experiment (2013 and 2014) was conducted in calcareous soil (CaCO₃ 19.2%), on soybean grown under three irrigation regimes 100%, 85% and 70% of crop evapotranspiration combined with three potassium (K₂O) levels (90, 120 and 150 kg ha⁻¹). The objective was to investigate the complementary properties of potassium fertilizer in improving soybean physiological response under water deficit. Plant water status (relative water content RWC, chlorophyll fluorescence F_v/F_0 and F_v/F_m), had been significantly affected by irrigation or/and potassium application. Potassium improved growth characteristics (i.e. shoot length, number, leaf area and dry weight of leaves) as well as physiochemical attributes (total soluble sugars, free proline and contents of N, P, K, Ca and Na). Yield and yield water use efficiency (Y-WUE) were significantly affected by irrigation and potassium treatments. Results indicated that potassium application of 150 and 120 kg ha⁻¹ significantly increased seed yield by 29.6% and 13.89%, respectively, compared with 90 kg ha⁻¹ as average for two seasons. It was concluded that application of higher levels of potassium fertilizer in arid environment improves plant water status as well as growth and yield of soybean under water stress.