Amelioration of water stress by potassium fertilizer in two oilseed species

H.R. Fanaei\textsuperscript{a,*}, M. Galavi\textsuperscript{a}, M. Kafi\textsuperscript{b}, A. Ghanbari Bonjar\textsuperscript{a}

\textsuperscript{a}Department of Agronomy and Plant Breeding, Faculty of Agriculture, University of Zabol, Zabol, Iran.
\textsuperscript{b}Department of Agronomy and Plant Breeding, Faculty of Agriculture, Ferdowsi University of Mashhad, Mashhad, Iran.

\*Corresponding author; Email: fanay52@yahoo.com.

Received 11 Sep 2008; Accepted after revision 27 March 2009; Published online 28 April 2009

Abstract

The effects of potassium fertilizer (K\textsubscript{2}SO\textsubscript{4}) levels K\textsubscript{0} (0), K\textsubscript{1} (150) and K\textsubscript{2} (250 kg/ha) in two species of \textit{Brassica napus} (Hyola 401 Hybrid) and \textit{Brassica juncea} (landrace cultivar), under three irrigation regimes, control (irrigation after 50\%), moderate stress, (irrigation after 70\%), and severe stress (irrigation after 90\% soil water depletion) were studied in a factorial experiment laid out in a randomized complete block design with three replications. Grain yield and physiological indices, including relative water content (RWC), stomatal conductance (g), chlorophyll content (SPAD values); leaf temperature (T\textsubscript{L}), and the difference between canopy temperature and air temperature (T\textsubscript{c}-T\textsubscript{a}) were measured at two stages (50\% flowering and 100\% silique formation). Both species maintained, higher RWC, SPAD values and g, in non stress condition, but decreasing soil water supply caused a lower RWC, SPAD values, g, \(\Delta T\) and increased T\textsubscript{L}. Potassium application also improved above mentioned physiological traits. Grain yield was positively associated with RWC, g and SPAD values but showed a negative association with T\textsubscript{L} and \(\Delta T\) in both stages. Results showed that with increasing stress severity grain yield reduced significantly, but potassium application conferred great increase on rapeseed yield. Overall, grain yield showed significant association with RWC, g and SPAD values but showed a negative association with T\textsubscript{L} and \(\Delta T\) in both stages. It is concluded that potassium application, could ameliorate negative effects of water stress on grain yield and physiological properties and consequently improved them. For selecting drought tolerant cultivars, due to easier measurement of g, SPAD values and T\textsubscript{L}, they could be recommended for screening large numbers of rapeseed cultivars in a short time at critical stages of crop growth.

Keywords: Grain yield; Leaf stomatal conductance; Rapeseed; Relative Water Content; Chlorophyll content; Water Stress.

Introduction

Canola (\textit{Brassica napus} L.) contains about 40 - 44 \% oil and is one of the major oilseed crops that grown profitably in rotation with wheat (Carmody, 2001). Because of high water