

Abstract

Intermittent irrigation is a method to increase water productivity of rice production systems (*Oryza sativa* L.). In this study, the effects of this type of irrigation combined with two periods of midseason drainage on growth parameters of two rice cultivars were investigated in subsurface drained paddy fields of Sari Agricultural Sciences and Natural Resources University as split plot in a randomized complete block design with three replications during two rice growing seasons (2014-2015). Main factor consists of drainage systems in the study field including three conventional subsurface drainage systems with drain depth of 0.9 m and drain spacing of 30 m ($D_{0.9}L_{30}$), drain depth of 0.65 m and drain spacing of 30 m ($D_{0.65}L_{30}$), and drain depth of 0.65 m and drain spacing of 15 m ($D_{0.65}L_{15}$); a bi-level subsurface drainage system with drain spacing of 15 m and drain depths of 0.65 and 0.9 m as alternate depths (Bilevel), and a surface drainage treatment as control (Control). Sub-factors were Hashemi and Daylamani Tarom rice cultivars which were planted in the study area. Midseason drainage was conducted in two periods: 26- 35 and 43- 47 days after transplanting in 2014 and 28- 32 and 39- 43 days after transplanting in 2015. During the growing seasons, sampling was done to determine leaf area index (LAI), total dry matter weight (TDW), crop growth rate (CGR), relative growth rate (RGR), leaf area ratio (LAR), net assimilation rate (NAR), leaf dry weight, stem dry weight and panicle dry weight. After harvest, various quality characteristics were determined. Minor differences in water management during the growing seasons, resulted in different responses of the cultivars to the midseason drainage. In 2014, for Hashemi cultivar, significant differences were found between LAI, NAR and RGR of the subsurface drainage treatments and the Control. However, significant differences were observed between LAI, RGR and LAR of the subsurface drainage treatments and the Control for Daylamani cultivar in 2015. During the study period, maximum LAIs of Hashemei and Daylamani cultivars were respectively, 7.5 (Bilevel) and 7.1 ($D_{0.9}L_{30}$) and maximum TDWs of these cultivars were 1187.5 and 1164 g m⁻², respectively. Subsurface drainage had no significant effect on the moisture content of grain, brown rice, hard shell, safe rice and broken rice of both cultivars. For both cultivars, the protein content of the Control was higher than that of the subsurface drainage treatments. In the subsurface drainage treatments, white rice and conversion efficiency of both cultivars were significantly higher than those in the Control. The maximum conversion efficiency was 67.23 % related to $D_{0.9}L_{30}$. Based on the results, conducting two periods of midseason drainage through subsurface drainage would improve rice growth and quality characteristics if proper drainage time is selected.

Keywords: Intermittent irrigation, Midseason drainage, Subsurface drainage, Leaf area index, Paddy field, Dry matter, Protein, Conversion efficiency.