

## Abstract

Nitrogen is one of the essential nutrients in completing the plant growth process. The optimum level of nitrogen application, in accordance with the plant's needs, can guarantee the sustainability of economic agriculture in a region. However, fertilization beyond the need will cause numerous environmental problems; especially in saving irrigation strategies such as Partial Root-zone Drying (PRD), in which the water requirement of the plant is less. Additionally, the use of unconventional water resources will provide a change in the level of nitrogen absorbed by plants, thus it will be more important to survey in these conditions. Therefore, in this study, the suitable levels of nitrogen fertilizer under different irrigation management were investigated on plant growth characteristics, yield and yield components of sunflower and water productivity in the field conditions. Cultivation of sunflower has been done under Furrow irrigation in two seasons 2017 and 2018 at the Zabol University Research Institute of Agriculture (Baqiyatallah Azam Research Institute). The experiment was conducted by mixing two types of water quality (fresh and saline water), two types of irrigation strategies (Full irrigation and partial root-zone drying) and three levels of fertilizer (100, 200 and 300 kg N ha<sup>-1</sup>) with 12 treatments and three replicates. Experimental treatments included, (FI.F100),(FI.F200),(FI.F300),(PRD.F100),(PRD.F200),(PRD.F300),(PRD.S.F300),(PRD.S.F300),(PRD.S.F300),(PRD.S100),(PRD.S100)and (PRD.S100). The overall results of this study indicated that most of the physiological traits of sunflowers were reduced by 100 kg N ha<sup>-1</sup>nitrogen level and PRDs. During the first and second crop growth seasons, the highest yield was observed in the combination with full irrigation with freshwater and the high level of nitrogen (i.e. 300 kg N ha<sup>-1</sup>) with 522 and 4526.6 kg/ha, respectively. The PRD.S200 and PRD.S100 treatments had the lowest yield in both years, respectively. Maximum biological yield was observed in the high level of nitrogen (i.e. 300 kg N ha<sup>-1</sup>) with 2926 and 15116 kg/ha, respectively. The PRD.S100 treatment had the lowest biological yield in both years. The highest harvest index was observed in both FI.F200 and PRD.S.F300 treatments, respectively. In addition, PRD.F300 and FI.F300 treatments had the lowest harvest index at first and second years, respectively. The highest 1000-seed weight was observed in full irrigation with fresh water and the high level of nitrogen with 53.28 and 62.08 g / m<sup>2</sup>, respectively.

**Keywords:** Hyper arid climate, saline water, Sunflower, partial root-zone drying, Nitrogen fertilizer severity, Usual deficit irrigation



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