Rapeseed Growth and Yield under Water Stress Conditions

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Abstract: The study was a factorial experiment in a completely randomized blocks design with three irrigation treatments which was conducted on rapeseed plant in a farm in Dawlat Abad village located in the city of Khash, in the year 2012. The experimental treatments were consisted of two irrigation factors at three levels, every 5, every 10 and every 15 days during the growing period, and rapeseed cultivars at four levels, including R.g.s003 and Hyola 401. The results showed that the number of seeds per bag in the R.G.S003 with full irrigation was maximum, but not statistically different from the other cultivars. The results showed that with increasing water stress from complete irrigation toward the severe stress (every 15 days) the measuring parameters have decreased.
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1. Introduction

Agriculture is one of the most important sectors in Iran's economy and this sector is very important in terms of employment, land use and water consumption. More than 17 million hectares of the country's lands are under the agricultural production cultivation and about 94 percent of the available water is consumed by the agriculture (Safi et al., 2011: Zhang et al., 2006). In fact, one of the problems facing the agricultural sector is the sustainable use of land, water and labor resources to increase production and agricultural development that requires appropriate planning and policy (Ghalavand, 2006: Van Ittersum et al., 2003).

Policy of the Ministry of Agriculture in connection with the increasing production of rapeseed in the country is its cultivation in marginal areas which have salinity and low water problems. Accordingly, the plant under these conditions, at different stages of its development is facing with environmental stresses. Therefore, being aware of the occurrence time and the duration of the plant development causes the development stages which are more sensitive to the environmental stresses and more influential in the seed yield would be recognized and limiting factors of production, such as water, would be prepared for the plant in this stage. This will ultimately increase the product yield and therefore, the study of the plant vital changes including stages of vegetative and reproductive growth than phenological time would be important (Malakoti and sepehr, 2003 Todorovic et al., 2009).

Iran, due to its unique geographical position, is located in dry and low moisture areas and desert areas are covered more than 75 percent of its vast surface (Sarmadnia, 1993). This fact, along with climate variability increases the diversity and species richness throughout the country, so that the number of plant species in Iran is mentioned between 7500 - 8000.

Water is one of the most important factors in the production of various products. So that, water Shortage can seriously damage plants growth and development as well as their active ingredient (Omidbeygi, 2005). Irregular rainfall patterns in arid areas of the world expose plants to different intensities of drought stress. Often, high temperature and poor nutritional status make the effects of drought more complicate. Water not only ecologically but also physiologically is important for the plant, because water involves in most of plant internal processes and almost all metabolic activities of plant cells including the construction of the active ingredients in medicinal plants depend on the presence of water (Letchamo et al., 1994).

Therefore, one of the most important goals in plant breeding programs is the study of plants tolerance to drought (Yadav & Bhathagar, 2001). Long-term stress of water affects all plant metabolic processes and thereby reduces crop production in the plant. Kang et al (2002) in their experiments showed that seed yield reactions and water use efficiency of wheat were significantly different compared to irrigation regimes which this difference was due to the amount of soil moisture and irrigation schedules.

2. Materials and Methods

This experiment was conducted in crop year - 2012 in Dawlat Abad village located in the city of Khash. The experiment was carried out as factorial in a completely randomized blocks design with three

replications. The experimental treatments were consisted of two irrigation factors at three levels, every 5, every 10 and every 15 days during the growing period, and Rapeseed cultivars at four levels, including R.g.s003 and Hyola 401. Number of seeds per each bush was counted.

For data analysis, SAS software and mean comparison with Duncan test at the probability level of 5% were used.

3. Results

The seed number yield

Mean comparison of interaction of the different levels of irrigation treatments and rapeseed cultivars on the seed number per bag and kernel weight according to Table 1 showed that the maximum yield was observed in the R.G.S003 cultivar and full irrigation. The results showed that the highest number of seeds per bag was in the R.G.S003 cultivar in full irrigation. But the lowest number of seeds per bag was observed in irrigation of every 15 days (severe stress).

Pazaki (2010) carried out his study about rapeseed yield under water stress conditions and optimum irrigation and came to the conclusion that the maximum kernel weight was under the optimum irrigation state and the minimum kernel weight was under water stress conditions and the number of seeds per bag is also the same.

The loss of root weight of native grass species (Selahvarzi et al., 2009) and grass (Huang and Fu, 2001) under conditions of soil moisture deficit (Selahvarzi et al., 2009) have been reported.

Motaghi et al (2009) were conducted their experiments under two conditions of extreme water stress (no irrigation from pollination stage to later) and without stress on the three genotypes. The results of the experiments showed that kernel weight decreased in susceptible genotypes but not true for drought tolerant genotypes. Mendham and Salisbury (1995) reported that supplemental irrigation or prolonging flowering stage in rapeseed increased the number of bags and seeds in the bag. So that, the researchers concluded that the reason of this was higher leaf surface during this stage of development (Li et al., 2006).

Table 1: Comparison of mean components at different levels of water deficit stress in rapeseed, Cultivars on Number of seeds per sac.

Seed weight	Number of seeds per sac	treatment	
3/4 a	35 a	R.G.S003 cultivar	Full irrigation (every 7 days irrigation)
3/3 a	33 a	Hyola 401 cultivar	
3/0 ab	29 b	R.G.S003 cultivar	Moderate stress (every 14 days irrigation)
3/0 ab	28 b	Hyola 401 cultivar	
2/7 bc	23 d	R.G.S003 cultivar	Severe stress (every 21 days irrigation)
2/7 bc	22 d	Hyola 401 cultivar	

4. Conclusion

The results of the farm experiments showed that the maximum yield of rapeseed seed in the study area was obtained from the cultivation of RGS003 and Hyola 401 cultivars with the crop irrigation of every 5 days.

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