The Effect of Irrigation Interval and Different Levels of Chemical Fertilizer on Yield of Alfalfa

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Abstract: Different environmental conditions are one of the most important issues related to the growing of plants. In the meantime, water stress is considered one of the greatest problems facing the plant productions in arid and semi-arid areas including Iran. This experimental study was conducted to evaluate the effect of irrigation interval and chemical fertilizer on yield and uptake percent of elements of alfalfa in a farm located in Khash in the year 1395. The experiment was conducted as split plots in completely randomized blocks design with three replications. The main plot was assigned to irrigation interval with four levels I1 (six days), I2 (seven days), I3 (ten days) and I4 (twelve days) and subsidiary plot was allocated to the amount of chemical fertilizer with four levels of F1 (control-zero), F2 (N100 -P70-K40), F3 (N150-P100-K70) and F4 (N200-P150-K100). The results showed that increasing the irrigation intervals decreased morphological characteristics such as wet and dry weight of root and aerial parts of plant; that this reduction can be caused by insufficient water available to the roots, stomata closure and reducing photosynthesis which ultimately reduces the functions of the mentioned traits.
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Key words: Irrigation, Alfalfa, Fertilizer, dry weight.

1. Introduction

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

2.1 Geographical location of the experiment site and soil properties of the area

This study was conducted in the city of Khash in Iran. Physical and chemical properties of the experiment area soil are given in Table 1.

Table 1: Physical and chemical properties of the experiment area soil

Soil texture	Sand (%)	Silt (%)	Clay (%(	Electrical conduction (dS/m)	Acidity	depth (cm)
Sandy loam	41	27	32	1.8	7.6	0-30

2.2 Implementation

The experiment was conducted as split plots in completely randomized blocks design with three replications. The main plot was assigned to irrigation interval with four levels I1 (six days), I2 (seven days), I3 (ten days) and I4 (twelve days) and subsidiary plot

was allocated to the amount of chemical fertilizer with four levels of F1 (control-zero), F2 (N100 -P70-K40), F3 (N150-P100-K70) and F4 (N200-P150-K100). Digital scale was used to measure the weight of the plant.

2.3 Data analysis

For all the obtained data, analysis of variance was performed by using SAS statistical software and tables and charts were drawn by using Word and Excel software. The comparison of interactions Mean was done with Duncan test at 5% level by using MSTATC software.

3. Results

Wet and dry weight of aerial organ

Analysis of variance results showed that the irrigation intervals have a significant effect on wet and dry weight of aerial organ of medicinal plant of bitter melon (Table 1). Also, the effect of chemical fertilizer and the interaction of irrigation interval × chemical fertilizer on properties of wet and dry weight of aerial organ of alfalfa were significant at 1% level. The mean comparison results showed that with increasing irrigation intervals, wet and dry weight of aerial organ reduced; so that, the irrigation interval with six days interval had the highest wet and dry weight of aerial organ. Also, study results of Ardakani (2007), Safikhani (2007) and Fatima et al (2000) on three plants of Dracocephalum and Lemongrass states that with increasing irrigation intervals, because of reducing the rate of photosynthesis, growth and thereby aerial organ yield decreased.

Wet and dry weight of root

The comparison results showed that the effects of irrigation interval and chemical fertilizer was significant at 1% level in terms of properties of wet and dry weight of root (Table 1). Also, the interaction of irrigation interval × chemical fertilizer was significant at 1% level in terms of properties of wet and dry weight of root (Table 1). The comparison results showed that with increasing irrigation intervals, wet and dry weight of root reduced. 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.

Table 1: Variance analysis of morphological characteristics

Mean Square of morphological characteristics and active ingredient				degrees of freedom	sources of changes
dry weight of root	wet weight of root	dry weight of aerial organ	wet weight of aerial organ		
^{ns}005/0	^{ns}00003/0	^{ns}001/0	^{ns}15/0	3	block
**116/0	**002/0	**100/0	**56/10	3	irrigation interval
**005/0	**00005/0	**002/0	**57/0	9	main mistake
**118/0	**001/0	**008/0	**01/0	3	chemical fertilizer
*004/0	*000003/0	**001/0	**13/0	9	irrigation interval × chemical fertilizer
002/0	000001/0	004/0	27/0	36	subsidiary mistake
34/1	888/0	86/2	70/2	variation coefficient	

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