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The Impact of Dryness Stress and Changes in the Source and Destination on the Performance and the Elements of Performance in Sunflower

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ABSTRACT

In order to study the effects of dryness stress and changes in the source and destination on the performance and the elements of performance in sunflower, a test was carried out in split plot form in the template of full random blocks experiments in three intervals. The test was performed at the research farm of Islamic Azad University, Varamin-Pishva Branch in Ghaleh-e-sin of Varamin in summer 2013. The main factor included four irrigation levels (dryness stress) based on the morphologic a1: desirable (full irrigation once per eight days), a2: No irrigation from budding to flowering, a3: no irrigation from flowering to the beginning of seed filling, a4: no irrigation from seed filing to physiological maturity of seeds; and the sub-factors of changes in source and replacement reservoirs consisted of) b1: control without manipulation, b2: omission of 33% of the leave, and, b3: omission of 66% of leaves. Based on the results, different levels of irrigation had highly significant effects (P<0.01) on characteristics such as number of seeds per receptacle, the 1000-seed weight and the seed performance. In addition, characteristics such as the diameter of receptacle were easily affected with five percent significance in statistical level. Furthermore; characteristics such as receptacle diameter; too, were affected by different levels of leave deletion (omitting leave) with five percent significance in statistical level. The results showed that the non-irrigation treatment from the flowering initiation stage to the seeds filling would decrease the seed performance for approximately 52.40 percent, compared to full irrigation treatment.

Keywords: Sunflower, performance of elements, source, replacement reservoir

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INTRODUCTION

One of the climatic factors that affect the distribution and spread of plants across the world and the factor that might cause several morphological, physiological and biochemical changes in plant is water deficit. Some studies have shown that the water deficit stress causes decrease in growth of different parts of the plant, including roots and shoots; as well as reduction in leave area, height, dry weight, hydathole and stoma, lowered photosynthesis and precipitation, destruction of enzymes, proteins and changes in proteins synthesis, accumulation of Aminoacids and chlorophyll lowering [5,6].

Sufficient water provisions is one of the most important farm administration in achieving desirable conditions of plants society growth and suitable performance in order to save the plant from humidity tension. In this connection, [3] stated that the amount of access to soil moisture is the most important factor in determining the crops performance in semi-dry areas. [2] believe that the moisture deficit in the budding to the end of flowering has the highest negative impacts on the performance of sunflower hybrids.

[8] in studying the role of seeds in determining the performance of corn, soya and sunflower claimed that the number of seeds is the most important part of crops and oil seeds performance. Of course, this factor is intensively depends on the effective philological factors (genotype, environmental factors and managerial factors) during flowering and seeds filling. The studies of [9] showed that the number of seeds is the most important part of sunflower performance and should be considered for the purpose of increasing the performance. [1] in studying the effects of irrigation in the sunflower reproduction stage observed that the soft pasty and hard stages of seeds was the critical points in the sensitivity of the plant towards humidity stress and non-irrigation in this stage caused 25 percent decrease in the seeds performance. Another test showed that the leave omission stress (herbivorous) intensifies the impacts of dryness and salinity by lowered production and increase in changeability; and, this damage is not reversible easily [7] . In this connection, Sadras reported that insects reduce hydathole resistance, photosynthesis speed and plant perspiration rate [4].

MATERIALS AND METHODS

The test was performed in the 1000 m2 area research farm of Islamic Azad University, Varamin- Pishva branch in Ghaleh-e-sin of Varamin in the farming year of 2013. The main factors consisted the four levels of dryness stress: morphologic a1: desirable (full irrigation once per eight days), a2: No irrigation from budding to flowering, a3: no irrigation from flowering to the beginning of seed filling, a4: no irrigation from seed filing to physiological maturity of seeds; and the sub-factors of changes in source and replacement reservoirs consisted of) b1: control without manipulation, b2: omission of 33% of the leave, and, b3: omission of 66% of leaves. The variety which was used was Williams Sunflower. The test was repeated in three frequencies. The test was performed in split plot in the template of full random block plan. In this test, irrigation was performed for all treatments similar to the control group to the full establishment of the plant and after that, the stress treatment was performed in each stage. Prior to cultivation and in the preparation of land, the soil sample was taken for determining the type of consumable fertilizer and based on the results of sampling, fertilizer recommendations were made. The fertilizer needed by the land was provided by Soil and Water Institute (varamin) . The land's need to phosphor and potassium was added to it prior to cultivation. The area needed in this plan was 705 square meters, allocating 15 square meters per patch- as shown in the plot map in details. The number of rows per patch was 5, the length of each cultivation line was 5 meters, the distance between cultivation liens was 60cm and the distance between bushes on the line was 5 centimeters. Lines 1 and 5 as well as half a meter of each part were taken as margin, line 2 was for sampling, line 3 as sample margin and line 4 was the performance plant. The performance elements were calculated based on one square meters bush from each patch and necessary farming cares were performed during growth.

RESULTS AND DISCUSSION

Based on the results of variance analysis, the seed performance was affected by different levels of irrigation and was one percent significant in statistical level; however, the simple impact of omitting the leave (leave deletion) and the counter effects of the two factors of irrigation and leave omission (leave deletion) showed no statistically significant differences on the seed performance (table 1). The different levels of irrigation had highly significant effects on seed performance as far as the highest performance of seed with the most seed performance with 4151.3 Kg. per hectare was for full irrigation treatment (control) that was in one statistical group with the treatment of no irrigation from seeds filling stage to physiologic group. The least seed performance; on the other hand, with average 2175.4 Kg per hectare was obtained from no irrigation treatment from flowering initiation stage to the beginning of seeds filling that statistically was in one class with the non-irrigation treatment from budding to flowering (table 2).

Among the counter effects of the two irrigation and leave omission (leave deletion) treatments, the highest performance of seed with average 4278.0 Kg per hectare was for full irrigation treatment and omitting 33 percent of leave and the lowest with 1970.4 Kg. per hectare was for non-irrigation treatment from flowering stage to seeds

filling along with deleting 33 percent of leave; however, statistically, all treatments of the country effect of the dual treatment showed no significant differences and were in one statistical group (table 3).

Number of seeds per receptacle

According to the results obtained from variance analysis table, it was observed that number of seeds per receptacles affected by different levels of irrigation and showed one percent significance in statistical level; however, the simple impact of different degrees of leave omission (leave deletion) and the counter effects of the irrigation and leave omission (deletion) did not show statistically significant differences on the number of seed per receptacle (table 1). The number of seeds per receptacles changed under the impact of different levels of irrigation as far as the highest number with 962.18 seeds in average was obtained by full irrigation and the least amount of seeds with average 766.33 seeds was obtained by non-irrigation treatment from initiation stage of flowering to the beginning of seeds filling (table 2). In this regards, the counter effects of irrigation and leave omission (leave deletion), the highest number of seeds in receptacle with an average 977.18 seeds was for full irrigation treatment (control) and non-omission of leave. The least amount of seeds; on the other hand, with average 755.30 seeds belonged to the treatment of no irrigation from flowering initiation to the beginning of seeds filling along with omitting 66 percent of leave (table 3).

Weight of 1000 seeds

Different levels of irrigation and omitting leave (leave deletion) affected the weight of one thousand seeds and made it statistically significant in one percent value; however, the dual treatments of irrigation and leave omission (leave deletion) had no statistically significant effects on the weight of thousand seeds (table 1). The characteristic of the weight of one thousand seeds was affected by different levels of irrigation as far as the highest amount with average 75.29 grams was obtained by full irrigation treatment (control group) and the least with average 53.68 gram was from the treatment of no irrigation from seeds filling stage to physiologic maturity of the seeds, that showed no statistically significant difference with the non-irrigation treatment from flowering to the beginning of seeds filling and placed in one group (table 2). Among different levels of leave omission (leave deletion), the most and least weight of one thousand seeds with average 64.33 and 61.30 grams were for the treatments of deleting no leave and deleting 66 percent of leave; respectively (table 3). With respect to the results of irrigation and leave omission (leave deletion) interactions, the highest amount of weight of one thousand seeds was obtained from full irrigation treatment and no deletion of leave with an average of 76.18 grams. The least weight of one thousand seeds with average 52.31 grams was obtained from the treatment of no irrigation from seeds filling stage to seeds physiologic maturity along with omitting 66 percent of the leave (table 3).

Receptacle diameter

The characteristic of receptacle diameter was affected by different levels of irrigation and leave omission (leave deletion) with five percent significance in statistical level; however, their counter impacts showed no statistically significant difference in receptacle diameter (table 1).

Among different levels of irrigation, the highest diameter was for full irrigation treatments (control) with average 14.80 centimeters and the least diameter of the receptacle was for the treatment of no irrigation from budding to flowering which was equal to 11.79 cm (table 2-4). The receptacle diameter was affected by different level of leave omission (leave deletion) as much as the highest diameter of receptacle with average 14.61 centimeter was obtained from the treatments of non-omission of leave and the least diameter of the receptacle with the average 12.83cm was found from the treatment of omitting 66 percent of the leave (table 2).

Results of comparing the average of the impacts of both irrigation and omission of leave (leave deletion) showed that the highest diameter of receptacle with average 15.80cm was for full irrigation treatment and no leave omission, and the least diameter of receptacles with average 11.30cm was for the treatments of no irrigation from budding to flowering along with omitting 33 percent of the leave (table 3).

Table 1 - Analysis of variance mean squares traits

Amount of changes (SOV)	Freedom degree (df)	Seeds performance	Weight of one thousand seeds	Number of seeds per receptacles	Diameter of receptacle
Replication	2	60847.34 $^{n.s}$	5.41 $^{n.s}$	1164.08 $^{n.s}$	0.37 $^{n.s}$
Irrigation (factor A)	2	7378440.17**	942.68**	79825.33**	15.58*
Error A	6	263869.44	1.64	629.48	2.34
Leaves omission (factor B)	2	13786.47 $^{n.s}$	28.58**	1811.88 $^{n.s}$	9.49**
AB (Dryness x leaves omission)	6	145298.88 $^{n.s}$	1.01 $^{n.s}$	36.64 $^{n.s}$	0.78 $^{n.s}$
Error AB	16	1368472.99	0.76	975.17	2.47
(CV%)	-	16.51	9.34	15.70	11.47

$^{ns, *\ and\ **}$ are insignificant, significant in levels five and one percent; respectively.

Table 2- Comparison between mean averages in characteristics subject of study

Amount of changes (SOV)	Seed performance (Kg/Hect)	Weight of one thousand seeds (g)	Number of seeds per receptacles	Diameter of receptacles (cm)
A 1	4151.3 a	75.29 a	962.18 a	14.80 a
A 2	2743.8 b	66.60 b	767.84 c	11.79 b
A 3	2175.4 b	55.02 c	766.43 c	14.17 a
A 4	3744.7 a	53.68 c	872.92 b	14.06 a
B 1	3171.2 a	62.30 b	839.03 a	13.67 ab
B 2	3201.3 a	61.30 c	832.05 a	12.83 b
B 3	3238.9 a	64.33 a	855.95 a	14.61 a

The mean averages that share minimum one letter do not have significant statistical differences in multi-range Duncan tests in 5 percent probability level.

Irrigation (A): A1- full irrigation (control), A2= No irrigation form budding to flowering, A3= no irrigation from flowering to the initiation of seed filling, A4- No irrigation from seed filling to physiological maturity of the seed
Leave omission (B): B1- omission of 33 percent of leave, B2- Omission of 66 percent of leave, B3- no omission of leave (control group)

Table 3- Comparison between the mean averages of counter effects of the characteristics subject of study

Treatment	Seed performance (Kg/Hect)	Weight of one thousand seeds (g)	Number of seeds per receptacles	Diameter of receptacles (cm)
A_1B_1	4278.0 a	75.26 ab	961.21 a	14.53 a-c
A_1B_2	4056.9 a	74.44 b	948.18 a	14.08 a-d
A_1B_3	4118.9 a	76.18 a	977.15 a	15.80 a
A_2B_1	2766.6 a	66.40 d	759.55 c	11.30 d
A_2B_2	2562.1 a	65.19 d	760.43 c	11.46 cd
A_2B_3	2902.6 a	68.20 c	783.56 c	12.62 b-d
A_3B_1	1970.4 a	54.24 fg	765.15 c	14.60 ab
A_3B_2	2519.6 a	53.28 gh	755.30 c	12.55 b-d
A_3B_3	2036.2 a	57.53 e	788.83 c	15.36 ab
A_4B_1	3670.0 a	53.31 gh	780.20 b	14.24 a-d
A_4B_2	3666.5 a	52.31 h	864.30 b	13.25 a-d
A_4B_3	3897.8 a	55.42 f	884.25 b	14.68 ab

The mean averages that share minimum one letter do not have significant statistical differences in multi-range Duncan tests in 5 percent probability level.

Irrigation (A): A1- full irrigation (control), A2= No irrigation form budding to flowering, A3= no irrigation from flowering to the initiation of seed filling, A4- No irrigation from seed filling to physiological maturity of the seed
Leave omission (B): B1- omission of 33 percent of leave, B2- Omission of 66 percent of leave, B3- no omission of leave (control group)

CONCLUSION

The results showed that treatment of water from flowering to early grain filling stage reduction of approximately 52.40 percent ratio of yield to irrigation was completed. The defoliation treatments in traits that affect the activities of the self is the source and sink.

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