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Effect of weed competition on growth characteristics of sunflower at different levels of nitrogen fertilizer

[1*]Afshar Azadbakht, [2]Reza Amraie, [3]Seideh Razieh Mirzapour and [4]Hadis Nasrollahi

[1]Department of Weed Science, Birjand University, Birjand, Iran
[2] Department of Agriculture Science, Payame Noor University, Koohdasht, Iran
[3]Medical University of Kermanshah, Respectively
[4]Department of agronomy, Khorramabad Branch, Islamic Azad University, Khorramabad, Iran.

ABSTRACT

In order to investigate the interaction between weed competition times and at different levels of nitrogen fertilizer on growth characteristics of sunflower a split plot experiment based on randomized complete block design was conducted with 24 treatments and 3 replications in research farm of college of agriculture of Birjand University in 2010. The main factor was 3 levels of nitrogen (0, 100 and 200 Kg/ha^{-1}). The sub factor was different weed competition periods containing of 3 levels of weed free, 3 levels of weed infested until phonological stages of two leaf (V2), four leaf (V4) and head visible stage(VR) of sunflower and with 2 levels (all season weed free and weed infested) treatments. The results showed that the power of weeds competition with sunflower with the application of nitrogen fertilizer increase until the level of 100 Kg/ha^{-1}of nitrogen fertilizer consumption, but increases more nitrogen is favor of sunflower. The main weeds were barnyard grass, bindweed, common mallow, red root pigweed, common lamb's quarters, and hoary cress. Application of nitrogen fertilizer also have a significant increase of biological yield, height and head diameter of sunflower, but the severity was of the increased under the influence of competing weeds.

Keywords: Competition, Nitrogen, Weeds, Sunflower

INTRODUCTION

Due to the fact that a large part of the required country vegetable oil from abroad was attained, the increase in the production of seeds of sunflower oil, including in the country is important, and can play an important role in the supply of oil that is needed for the country.

In spite of the sunflower crop (due to relatively high growth rate) have a well compete with weeds, but the biological and economic yield under the impact of weed competition can greatly reduced and weed control will be Special needs in the early period[1]. The results of the investigation show that the competing weeds and crop plants under the influence of the environmental conditions, especially the availability of soil nutrients [3,9,8]. So the nutrients resource management is a type of strategy in the management of weeds.

The Results of some studies suggest that the potential use of weeds in nutrients is more than crops [2]. Therefore, at the beginning of season growth and fertility of soil on top of the situation, by taking advantage of these features, more growth, and by creating a shortage in nutrients can reduce agricultural competitive of crop plant[11]. Long-term adaptation of plant to soil nutrients in the limits with the changes in the demand and use of elements, as well as derived on the morphology and distribution of roots in plant[4].

In most agriculture areas for increase, the growth of crop plant commonly used fertilizers. So the plants cardinal in this habitats, is the competition for food instead of draining the elements of long-term resources. Furthermore, the weeds competition with crops when the original soil sources are reduced probably increases [5]. Among the nutrients, nitrogen has a very important role in the ability of competing between the plants and the compete for absorption of nitrogen is the most widespread form of competition interspecies in crops and interspecies compete in the system of weed-crop farming[6]. This experiment investigated the interaction of different periods of weed competition and nitrogen fertilizer levels on plant height, biomass, dry weight, and diameter of the sunflower.

MATERIALS AND METHODS

This research performed in the spring of 2010 at the research farm of College of agriculture, University of birjand with latitude North 32º¸ 56´ and longitude 59º, 13´¸ Eastern with height of 1480 meters from sea level. Based on the results of soil tests, soil acidity, 7.8, soil salinity 3.9 dS/m, lime 16.5 percent and gravel 2.1 percent, the soil has a loamy texture and a dense mass of the building was missing. The testing was applied a split plot experiment based on randomized complete block design was conducted with 24 treatments and 3 replications. Operation of the sowing as a category (on bed farrow) on 15 May 2010 to a hill with handing method in any pit number 4 to 5 seeds were poured and performed the first irrigation. There was used to Pomar variety of sunflower seeds. Intervals of two plants on planting rows were 20 cm and the distance between the rows was 60 cm.

The width of the plots according to 5 line planting in plots was 3 m and 6 m in length. The main plots included three nitrogen fertilizer levels (zero, 100 and 200 Kg/ha^{-1} pure nitrogen) and subplots include different periods of weed interference based on sunflower growth stages. These periods includes three levels of weed-free[1](control) and three levels of weed infected[2] (interference) until two-leaf (V2), four-leaf (V4) and sunflower head visible(VR) stages[3],with two weed-free and weed infested treatments in all season duration[4]. In the testing used of the natural density of weed was so similar to the normal distribution with a more mixed weed a farm and have control of the weeds was done hand weeding. Barnyard grass, Common mallow, Common Amaranth, Common lamb's quarters, and Hoary cress were the main common observed weeds. In the first group treatments (WF), the plots, until the aforementioned stages was weeding and free of weed, then let the weeds grow and compete with the sunflower was given until the end of the season. In the second group treatments, weeds from the beginning of the season until the aforementioned stages of sunflower were interference, but weeding and crop plant until the end of the season, remained free of weed.

Some of the growth traits including the biological yield of sunflower, dry weight, height and head diameter of the ten random plants in each plot, a week before the final harvest was measured. To perform the analysis of variance and compare the average of statistical software SAS were used. Compare the average based on the protected LSD test with a significant level 5% Possibility. In addition, the Figures were drawed with Excel and Sigma plot software.

RESULTS AND DISCUSSION

Biological yield of sunflower

Biological yield of sunflower significantly affected by treatments of nitrogen and weed competition. By increasing the time of presence of weed on the farm, biological yield declined to interfere so that the treatments all-season weed and interference-stage head visibility, attained the lowest biological yield. The percent of reduction in biological yield of all season interference treatments for the levels of nitrogen n0, n1 and n2 equivalent to 58.98, 55.9 and 52.09% and for treatments interference until head visibility stage, and for the aforementioned levels of nitrogen treatments was 40.22, 45.31 and 42.72% (table 1).

How to the effect of disclosure by biological yield of competing weeds such as sunflower seed yield and competition was caused significant reduces it, this thread suggests that increasing of the biological yield, which caused the spread of good growth and proper canopy foliage of crop plant can be fitted to Increase the yield of the economic role of the movement. These results with the results of the Cavero et al, (1999) had stated that the weed reduces the biological yield has matched. With the increased levels of nitrogen application, increased biological yield of sunflower so that average sunflower biological yield in the level of n0 equivalent to 10287. 08 kg/ ha^{-1} and

[1] *-Weed Free (WF).*
[2] *- Weed infested (WI).*
[3] *-Weed-free treatment until the two-leaf(V2) stage, four-leaf(V4) and head visibility(VR) of sunflower, respectively, as shown in the WF2, WF4 and WFR and weed-infested treatments to the mentioned stage shown in the WI2, WI4 and WIR*
[4] *-The weed control (free) treatments in all season duration shown as WFH and the weed interference(infested) treatments in all season duration is shown as a WIH.*

there was increased in the levels of the n1 and n2, equivalent to 10887.92 and 12565.41 kg/ha^{-1} respectively (Figure 1).

Table1: The biological yield averages of different weed competition treatments of sunflower at different levels of nitrogen (n0, n1 and n2 was using to 0, 100 and 200 kg/ ha^{-1} pure nitrogen respectively).

WIH	WIR	WI4	WI2	WFH	WFR	WF4	WF2	competition treatments / nitrogen levels
6061.1 o	38833.3 jklm	10072.22 ijk	fgh 11743.44	14777.77 bcd	13926.6 de	8556.66 klmn	8334.44 lmn	n0
7133.3 no	8842.2 jklm	11970 fg	e d 13548.8	16176.6 b	12542.2 ef	8557.77 klmn	8332.22 lmn	n1
87948.8 mn	9825.5 ijkl	de 13798.8	cd 14507.7	18103.3 a	bc 15523.3	10288.88 hij	/6610526.66 ghi	n2

**The average member has at least one same letters was not statistically significant differences with together by LSD test at the level 5% Possibility.*

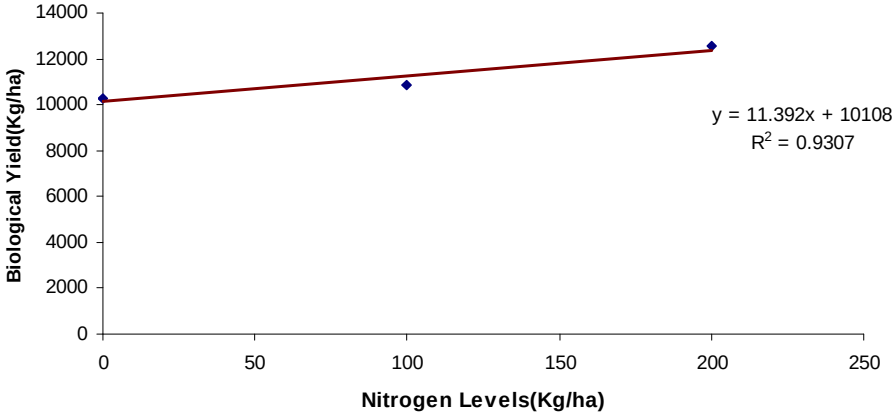

Figure 1: The average of biological yield at sunflower in different levels of nitrogen.

These results with the results of Kumara (2007) in connection with the increased yield of the sunflower with the increased levels of nitrogen found match. In addition, Kumara et al found that increased to levels of nitrogen with a negative impact on growth of weeds and also reduce the weeds competitiveness caused to increasing of yield in Sunflower.

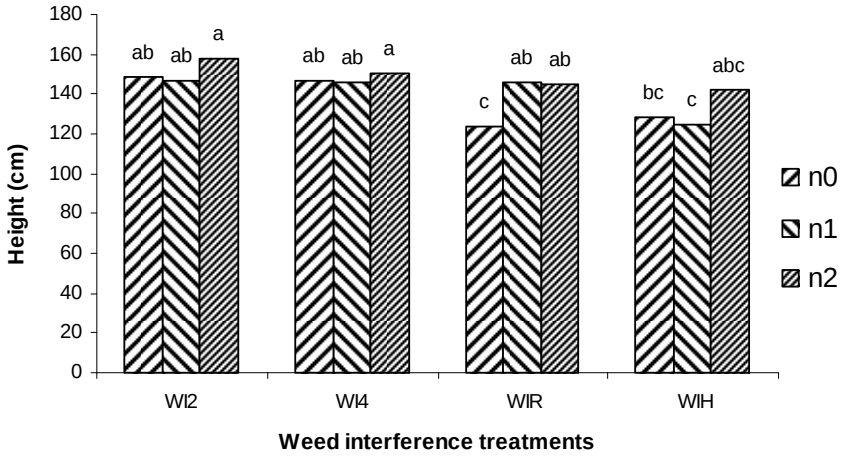

Figure 2: Comparison of averages sunflower height at the end of the growing season between the weed interference treatments at the nitrogen levels of n0, n1 and n2. Column with similar letters are not statistically significantly different at the level 5% Possibility. (n0, n1 and n2, respectively, using 0, 100 and 200 kg/ ha^{-1}pure nitrogen).

Height of the sunflower

In this study the significant differences resulting from the weeds interference with the weeds control was observed on the final height such that most of sunflower height observed in the all season control(free) treatments that sizes equivalent to 146.26, 152.1 and 158. 63cm respectively to arrange for fertilizer levels n0, n1 and n2 respectively and the minimum height in the all season interference treatments for the levels mentioned in 128. 56, 124.16 and 142.26cm respectively (Figures 2 and 3).

The percentage reduction of the height for interference all season treatments compared to all season treatments control for the level n0 was 12.1, and for the n1 and n2 nitrogen levels was 18.36 and 10.1% respectively.

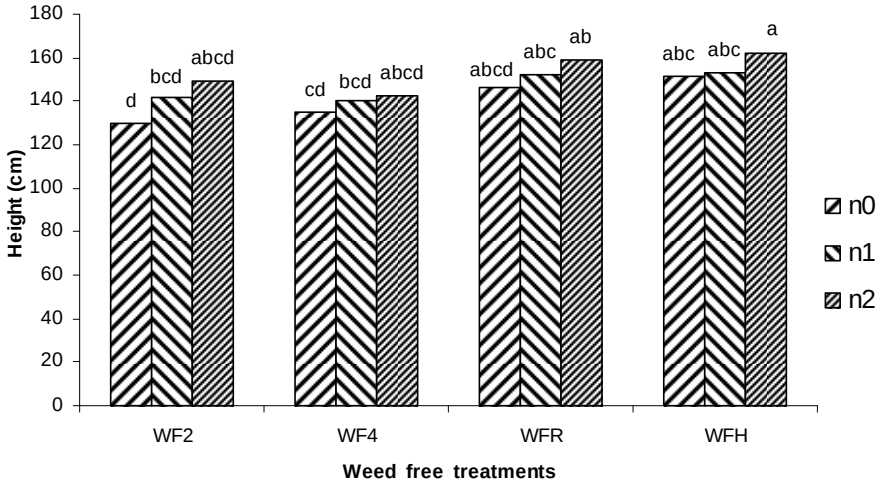

Figure 3: Comparison of averages sunflower height at the end of the growing season between the weed control(free) treatments at the nitrogen levels of n0, n1 and n2. Column with similar letters are not statistically significantly different at the level 5% Possibility. (n0, n1 and n2, respectively, using 0, 100 and 200 kg/ha^{-1}pure nitrogen).

Wanjari et al. (2000) knows the relationship between the height of a direct relationship with the yield so is one of the causes of the decrease stems in addition that reduces could be the availability of plant to light in competition with weeds taller than it, And so shoot, one of the major sources of stored carbohydrates and other materials stored in the plant that comes in time, especially in grain filling under conditions of stress can be play a secondary role as a main source of storage in plants. Therefore, any changes to this source have a direct effect on the seed yield.

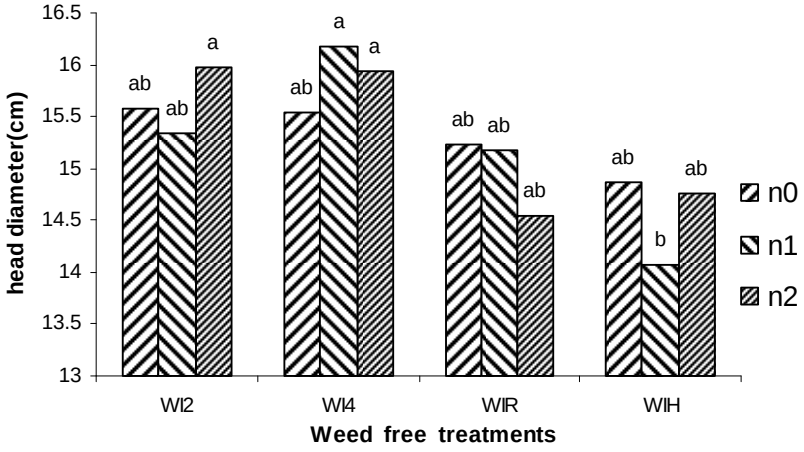

Figure 4: The influence of weed free(control) treatments on the nitrogen levels of n0, n1 and n2, on head dry diameter of sunflower. The columns contain the same letters was not statistically significant differences in the level of level 5% Possibility together. (n0, n1 and n2, respectively application 0, 100 and 200 kg/ha^{-1} of pure nitrogen).

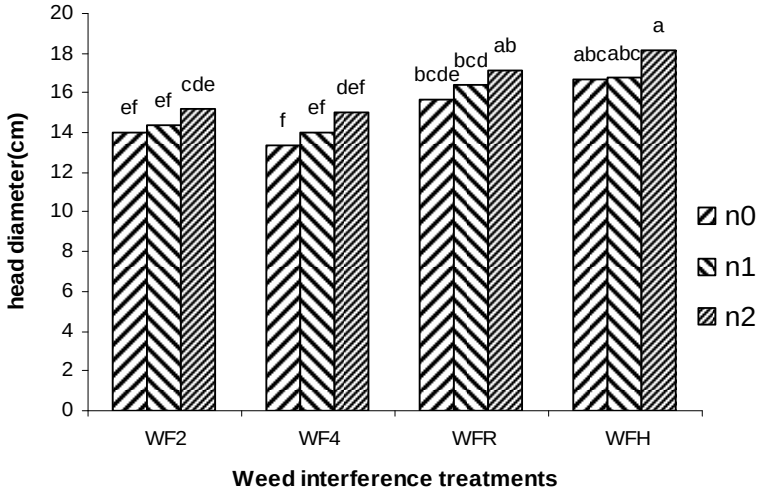

Figure 5:The influence of weed interference treatments on the nitrogen levels of n0, n1 and n2, on head diameter of sunflower. The columns contain the same letters was not statistically significant differences in the level of level 5% Possibility together. (n0, n1 and n2, respectively application 0, 100 and 200 kg/ha^{-1} of pure nitrogen).

Head diameter of sunflower

The influence of weed control and weed interference periods on the diameter was significant. There was decreased the head diameter With the increase in the duration of interference and with increase of weed free duration the diameter was added. But in the meantime, there was also exceptions, during the period of free, for all levels of nitrogen treatments to control up to two leaf (V2) has a head diameter greater than treatments-free up to four page (V4). The maximum head diameter observed in the all season control treatments (for levels of n0, n1, and n2 nitrogen equivalent to 16.7, 16.8, and 18.2cm respectively). The least diameter were to treatments free up to four leaf(V4) and full season interference page (figures4 and 5) rather to the all season control treatments with 19.7, 16.48 and 17.58% reduction respectively for the mentioned levels were about the applicated of nitrogen.

Reduce in head diameter caused by compete with weeds there is the spirit of the reduction of the volume of the sink. Reduce the volume of the sink because of the amount of production in the source (the leaves) can be that this is due to weed competition with Herb farm for water, nutrients, light and That ultimately reduce the yield [10].

But the effect of nitrogen application levels did not significant effects on the head diameter, of course, though with create increased levels of nitrogen, The head diameter was also increased. This would be because more weeds used than added nitrogen, in order to avoid increasing the head diameter of sunflower with increasing levels of nitrogen.

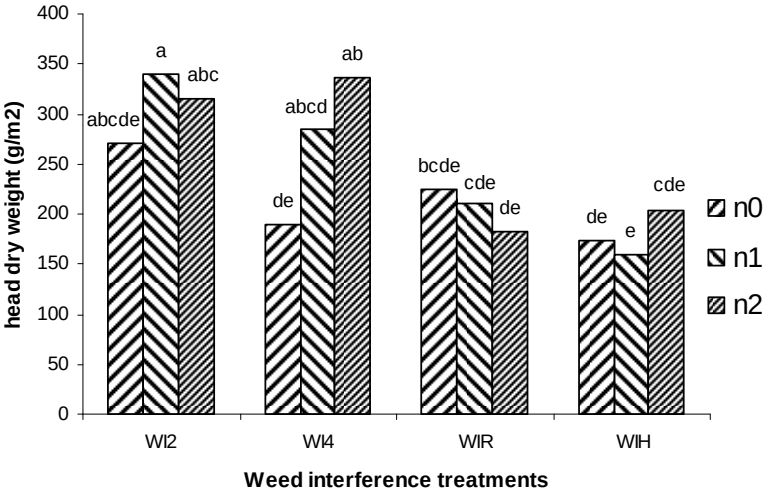

Figure 6:The influence of weed interference treatments on the nitrogen levels of n0, n1 and n2, on head dry weight of sunflower. The columns contain the same letters was not statistically significant differences in the level of level 5% Possibility together. (n0, n1 and n2, respectively application 0, 100 and 200 kg/ha^{-1} of pure nitrogen)

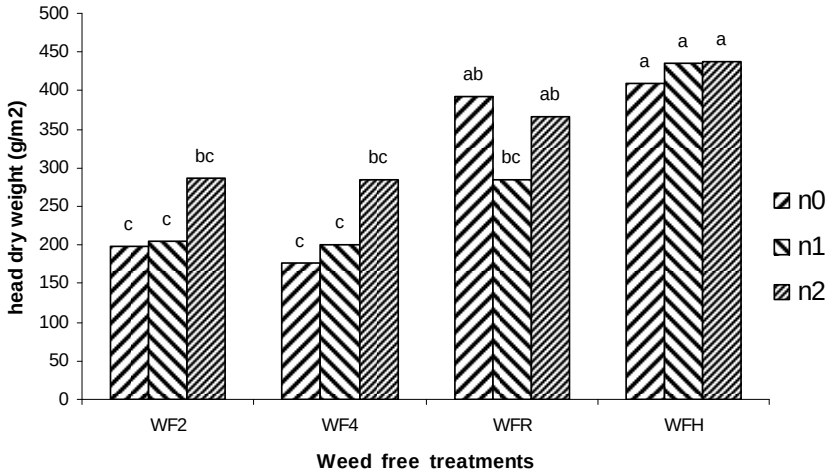

Figure 7: The influence of weed control treatments on the nitrogen levels of n0, n1 and n2, on head dry weight of sunflower. The columns contain the same letters was not statistically significant differences in the level of level 5% Possibility together. (n0, n1 and n2, respectively application 0, 100 and 200 kg/ha^{-1} of pure nitrogen)

Head dry weight of sunflower

The result indicated that the head dry weight is also under the influence of weeds competing and there was a significant difference between the weed control and weed interference treatments. So most of the head dry weight in the fertilizer levels relates to all season control treatments (for levels of nitrogen n0, n1 and n2, respectively 409.3, 434.5 and 438.2 g/m^2). There was lowest head dry weight for the levels of nitrogen on n0 and n1 in all season weed interference treatments were 173.6 and 158.8 g/m^2 respectively and head dry weight in Level n2 in the fertilizer interference until the head visible stage were182.7 g/m^2.

The percentage of Dry weight decreasing related to the control treatments for the levels of nitrogen n0, n1 and n2 were 57.7, 63.8 and 58.4% respectively (Figures 6 and 7). Kumara (2007), as well as on their results get that with increasing the duration of weed interference stage, the head dry weight of the sunflower be decreasing. In his tests, all season weed interference treatments in all nitrogen levels, the head dry weight was 75% reduced compared to the all seasons control treatments. But nitrogen fertilizers in most of the treatments impact on increasing the head dry weight, but this effect was not statistically significant, except in the treatments of control to the head visibility stage. In addition, all season interference treatments that the treatments of level n0 rated highest head dry weight and were as well as the weed interference treatment overlapping two leaf (V2) stage in the nitrogen level of n1. So to the most treatments, the highest head dry weight Related to the nitrogen level n2.

CONCLUSION

The how weed competition management and nitrogen is one of the key points in crop management to optimizing productivity. The results of this test showed that the power of weeds competition with sunflower at the application of nitrogen fertilizer increase until the level of 100 Kg/ha^{-1}of nitrogen fertilizer consumption, but increases more nitrogen is favor of sunflower to competed with weed plants. Application of nitrogen fertilizer also have a significant increase of biological yield, height and head diameter of sunflower, but the severity was of the increased under the influence of competing weeds.

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