Indian Journal of Fundamental and Applied Life Sciences ISSN: 2231– 6345 (Online)
An Open Access, Online International Journal Available at www.cibtech.org/sp.ed/jls/2015/01/jls.htm
2015 Vol.5 (S1), pp. 2928-2938/Hosseini et al.
Research Article

THE IMPACTS OF INTERFERENCE AND CONTROL OF WEEDS ON THE PERFORMANCE AND COMPONENTS OF SOYBEAN IN DEZFUL WEATHER CONDITIONS

***Farzaneh Makvand Hosseini[1], Nazer Aryan Nia[2] and Shapour Lorzadeh[2]**
[1]*Graduate student in Agricultural Engineering - identifying and combating with weeds*
[2]*Faculty member at Islamic Azad University, Shoushtar Branch*
**Author for Correspondence*

ABSTRACT
In order to review the impact of interference and control of weeds on the performance and components of Safiabadi soybean in 2012, an experiment was performed in Dezful pre-province in a randomized complete block design with three replications and 16 treatments. Treatments consisted of two control treatments (free of weeds) to 15, 30, 45, 60, 75, 90 and 105 days, after soybean cultivation and management control in the growing season and weed interference treatments until 15, 30, 45, 60, 75, 90 and 105 days after planting and controlling soybean, weeds interference in all growing seasons were divided. In the first batch of weeds, the plots were weeded during the mentioned period and the weeds were made possible for competition until the end of the growing season and development of crops. In the second batch, the weeds were allowed to grow from the beginning of growing period to the mentioned times. Two treatments of competition control and the one of devoid of weeds has also been considered to compare the impacts of weeds on soybean. The highest number of pods per plant was control treatment without weeds with 75.77 pods and the lowest number was competition control treatment with weeds of 8.97 pods per plant. Also, the biological yield, grain yield and number of branches per plant significantly decreased with increasing periods of weed interference so that the performance of seed in control treatment without weeds has been reached from 275 grams per square meter to 125 grams per square meter in control competition of weeds. According to the results of this study, it can be concluded that a weed-free period between 23 and 61 days after planting to prevent acceptable yield loss of 10 percent of the soybean is sufficient and weed control outside of this range is not necessary.

***Keywords**: Critical Period, Weeds, Soybeans, Interference, Control*

INTRODUCTION
Improper use of chemical pesticides over the years has caused environmental damages and problems such as groundwater pollution and the emergence of resistant bio-types of weeds (Martin *et al.*, 2001 and Acer *et al.*, 1993). Increased knowledge in this respect leads to the spreading of integrated weed management with the purpose of reducing damages to the environment. On the other hand, establishing integrated management system require adequate information about the mutual relations of the weeds and crop that includes crop’s competitive ability against weeds during early development and growth (Tolner *et al.*, 1994). In the life cycle of the crop, there is a certain time period that if a field free from weeds is kept, yield reduction is not occurred and after completing the course, weed control is not necessary. This particular range is called the critical period of weed control. The critical period of weed control as the best time to fight weeds with minimal yield loss is a key part of integrated weed management, including effective steps for the development of sustainable agriculture (Hamzeie *et al.*, 2007, Pan *et al.*, 1998).
With an awareness of the critical period of weed control for each product at each location, it is possible to determine the exact timing of herbicide (Hamzeie, *et al.*, 2007) and the high and inopportune consumption of them that causes environmental pollution is prevented (Halford *et al.*, 2001). The mechanical weed control operations, such as plowing and weeding has also been reached the lowest level and will result in the reduction of soil erosion. By determining the critical period of weed control due to the reduced use of herbicides and other methods of struggle, related costs will reach to its lowest level (Eftekhari *et al.*, 2005).

During their studies, Hall *et al.,* (1996) concluded that the critical period of weed is the intervals during the life of the crop that would be kept weed-free to prevent yield loss (Hall *et al.,* 1992).
During his research, Van Acker *et al.,* (1993) concluded that if weeds is involved during the critical period of weed control in the field and be removed before or after it, they major do their major damage and yield will be significantly reduced. However, if they exist the before the start of the crisis and also after the end of in in the field as well as be removed during the critical period, not significant damage will be caused. Damages of weeds in soybean leads to decreased performance of soybean so that per one weed crop in square meter, 30% reduced performance is reported and this performance reduction is reached to 80% in high density of weeds (Khajeh, 2007). Zimdahel (1993) determined the critical period of weed control in soybeans between 2 to 6 weeks after emergence. Rashing and Elior (1998) stated that congestion and interference time has no impact on the height and stem nodules of soybean (Ross *et al.,* 1983). Eftekhari *et al.,* (2005) reported that the biological actions of soybean at the 5% probability level was influenced by interaction treatments. They also reported that Grain yield, number of hollow pods per plant, the number of pods per plant and number of sub-branches per plant in soybean were affected by weed interference at the 5% level. The report states that the dry weight of weed was impressed by interference at the level of 1% (Honorary *et al.,* 2005). They reported that by the reduction of weed-free period (free of weed control in the growing season) to R_1 (blooming), weed dry weight did not change significantly. But when the control period or stage V11 was reduced, dry weight of weeds was significantly reduced and this trend continued until the end (Eftekhari *et al.,* 2005).
In the study conducted by Eftekhari *et al.,* (2005) stated that in control treatments, reducing the number of pods per plant compared to the control treatment (no weeds in the growing season) to R1 treatment (blooming) were not significant, but when the control period was decreased to V11, the number of pods per plant was significantly reduced. Hadizadeh (1986) reported that in the interference treatment, the number of hollow pods per plant was increased with the increase of in competition periods that its cause is the competition for the use of sources, especially light and food materials will also increase. With increasing intensity of competition and allocating smaller amounts of resources to the pods, this leads to more hollow (Eftekhari *et al.,* 2005). In the study conducted by Eftekhari *et al.,* (2005), it has been reported that the number of sub-branches per plant in interference treatment was decreased by increasing the competition periods and is reached to its lowest amount in control treatment (existing weeds in all growing periods).

MATERIALS AND METHODS

This research was conducted in the agricultural year of 2012-2013 in the fields of Sibily area of Dezful pre-province located in Khouzestan province. Dezful city is extended in the east longitude of 48 degrees and 24 minutes north and northern latitude of 32 degrees and 22 minutes and its height is 140 meters above the sea. Like most cities in Khuzestan, Dezful has a warm and humid weather and hot summer and Mediterranean winter. The average annual rainfall is 250 mm and the minimum temperature is 3 ° C in winter and the maximum temperature is 49 ° C in summer. This experiment was done in a randomized complete block design with 16 treatments and 3 replications. Each plot consists of six cultivation lines to a length of 7 meters, two side lines and the fourth line as a margin, lines 2 and 3 for the final harvest and line 5 for destructive sampling. The distance between the blocks was 2 meters and the pod density was considered 35 plants per square meter. Weeding the weeds in interference and control treatments were performed in accordance with a schedule of 15 days. Between every two plot, one line was considered as non-cultivated and the distance between the blocks was considered 2 meters and the distance of plants on the row was also 6 cm.
This experiment have 2 treatment groups consisted of weed interference in 8 levels (interference until 15 days after sowing, 30 days, 45 days, 60 days, 75 days, 90 days, 105 days and interference control to maturity) and control treatment of weeds in 8 levels including control until 15 days after cultivation, 30 day, 45 day, 60 day, 75 day, 90 day, 105 days and control-experiment treatment throughout the growth period.

Phenological stages of initiation and completion of weed control include:
V1: (first emergence of the leaflet)
V3: (third leaf emergence)
V7: (seventh leaf emergence)
V11: (eleventh leaflet emergence)
R1: (blooming)
R3: (beginning pod casting)
R5: (start of seed filling)
R 7: (experiment)
CH: (control)
In interference treatments, after reaching the desired phenological stage, weeding was done and this weeding was continued until the end of the growing season. In control-experiment treatments, no control of weeds was done. But control treatments were done in contrast to interference treatments. Thus the weed control was first performed based on phenological stages and after reaching the specified steps, no control (weeding) was performed until end of season. Also in control-experiment treatment, weeds control was done completely from the beginning to the end of the growing season.

Regarded Features Include

Number of nodes per stem, number of pods per plant, number of pods per square meter, hollow pods per plant, number of sub-branches per plant, grain weight, biological yield, grain yield and harvest index.
For sampling, after removal of half a meter from the beginning and end of each plot and removing the two lateral line as the border, sampling from an area of one meter square quadrat was done. After the harvest, samples were put for 48 h at 75 ° C in an oven to determine the dry weight and then were weighed.
To analyze the data and mean comparisons based on Duncan's multiple range test, MSTSTC statistical software was used.
Drawing diagrams and graphs was done using Excel 2007 and the amount of 5% yield loss for each of the two sets of treatment for calculating the maximum period of weed competition during planting and the minimum weed-free period at the beginning of the planting without significant yield loss was used in logistic and Gampertz curve using SIGMA Plot statistical program (to achieve the critical period of weed control in soybean from the difference between the two periods).

CONCLUSION

Discussion and Conclusion

Table

Harvest index	**Biological function**	**Seed function**	**Hundred-seed weight**	**The number of pods per square meter**	**The number of pods per plant**	**Number of sub-branches per plant**	**Number of node in stem**	**Degree of freedom**	**Changing resources**
62/69	18259/31	105/93	0/0322	1445/53	1/19	0/021	/00035 0	2	**Repetition**
/08** 590	/32** 134681	/37** 87061	24/79**	/35** 2163194	/9** 1765	4/45**	^{ns} 0/0063	15	**Treatment**
3/52	1891/67	48/53	0/049	1370/73	1/11	0/129	00009 0/4	30	**Error**
5/06	5/98	2/38	1/53	2/77	2/77	12/18	0/11	----	**CV**

** And ** significance at the five and one percent respectively.*
Ns non-significant
Cv: coefficient of variation

Indian Journal of Fundamental and Applied Life Sciences ISSN: 2231– 6345 (Online)
An Open Access, Online International Journal Available at www.cibtech.org/sp.ed/jls/2015/01/jls.htm
2015 Vol.5 (S1), pp. 2928-2938/Hosseini et al.
Research Article

The Effect of Control and Interaction Periods on the Number of Pods in Soybean Plant

Results of variance analysis showed that control and interference periods have a significant effects in the probability level of one percent on the number of pods per plant (Table 1). Averages comparison showed that the highest number of pods per plant in the complete control-experiment treatment and then control treatments until 105 and 90 days with 75.77, 73.25 and 71.31 pods was obtained, respectively. The minimum number of pods per plant also obtained from experiments treatments without control and interaction to 105 and 90 days and with 8.97, 9.29 and 12.94 pods per plant was obtained, respectively (Figure 1).

These results are consistent with findings of Eftekhari, *et al.*, (2005). They announced that the number of pods per plant at the 5% level were affected by weed interference. It seems that many more flowers become the pods and subsequently more pods have been produced by reducing competition for nutrients and moisture. Also, increasing the number of pods per plant can be due to increasing the number of sub-branches. In their study, Hagoud *et al.*, (1980) found in their study that the density of 1.4 to 40 cows cotton plant per square meter will decrease the number of pods per plant. In interference treatments, the number of hollow pods in the plant is increased by increasing the competition periods, because in interference treatments, the competition to use resources, especially light and nutrients will increase and this issue will lead to more hollow with increasing the intensity of competition and allocating lower amounts of resources to the pods. In control treatments, reducing the number of pods per plant compared to the control treatment (without weeds in the growing season) to treatment R1 (blooming) i.e. until 75 days after planting, it was not significant (Figure 1). But when the control period was decreased to V11 (control up to 60 days after planting), the number of pods per plant was significantly reduced from 76 pods per plant in experiment treatment to 57 pods per plant. Therefore, to prevent the reduction of the number of pods per plant, until R1 stage cultivation stage should be done and there is no need to control weeds is from this point onwards; because soybean plants are grown enough and its canopy was extended and weeds are no longer able to compete with soybean. In interference treatment, when the interference period continue to stage V7 (interference up to 45 days), the number of pods per plant showed a significant decrease. Therefore, to prevent a significant reduction in the number of pods per plant, the competition period should not exceed from stage V3 (interference up to 30 days).

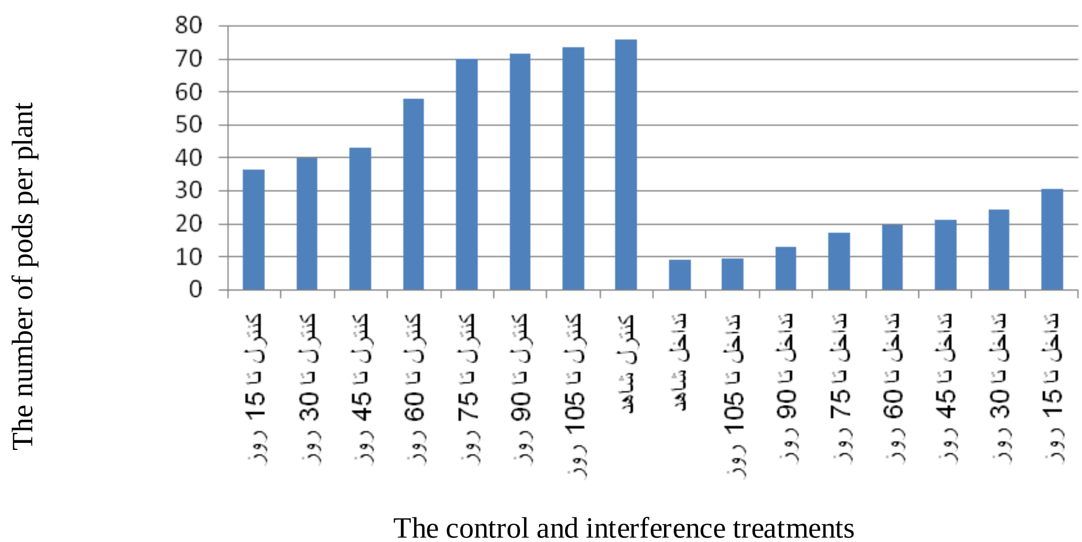


Figure 1: The effect of control and interaction periods on soybean pods per plant

The Effects of Interference and Control Treatments on the Number of Hollow Pods

Data from this study indicate that the number of hollow pods at the probability level of 1% was influenced by interference and control treatments (Figure 1). Based on the results of mean comparison, the highest number of hollow pods from experiment treatments without weeding and interference until 105 days was 3.53 and 3.46 pods, respectively and its lowest amount from complete control experiment treatment until 15 days and control to 105 days after planting with 1.33, 1.33 and 1.36 hollow pods, respectively (Figure 2). Due to competition for resources, particularly light and nutrients, the number of hollow pods increase and with increased competition and lower allocation of resources to the pods, this leads to further deterioration (Eftekhari, 2005).

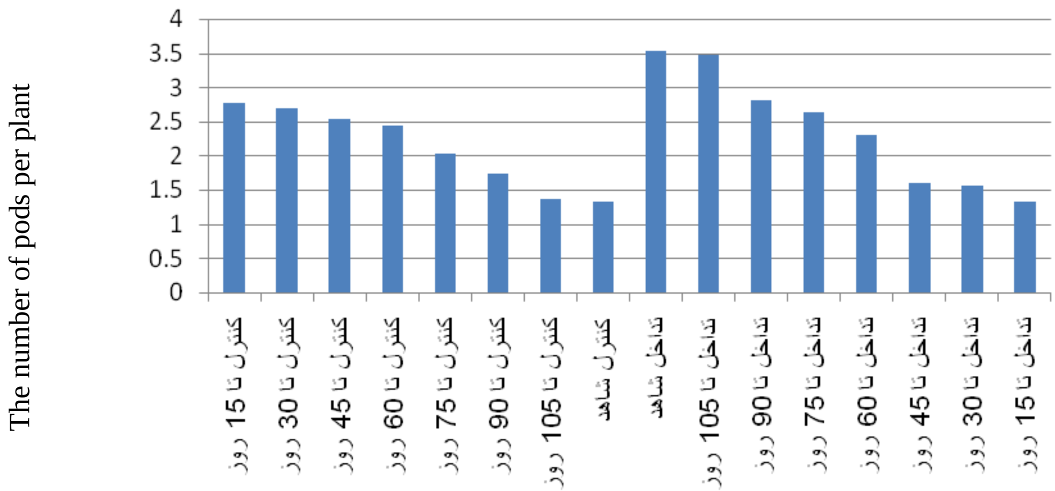


Figure 2: Effects of interference and control treatments on the hollow pods

The Effects of Interference and Control Treatments on the Number of Pods per Square Meter

Interference and control treatments had a significant effect on the probability level of one percent on the number of pods per square meter (Table 1). As can be seen in Figure 3, the highest number of pods per square meter was obtained from complete control treatments and then controls treatments up to 105 days control to 90 days after planting with 2652.07, 2563.75 and 2495.97, respectively. However, the minimum number of pods per square meter was obtained from complete interference treatments, interference up to 105 days and interference up to 90 days after planting, with 314.18, 325.38 and 453.02 pods, respectively. These obtained results are consistent with the ones obtained by Hagoud *et al.,* (1980) and Rezvanimoghadam (2011).

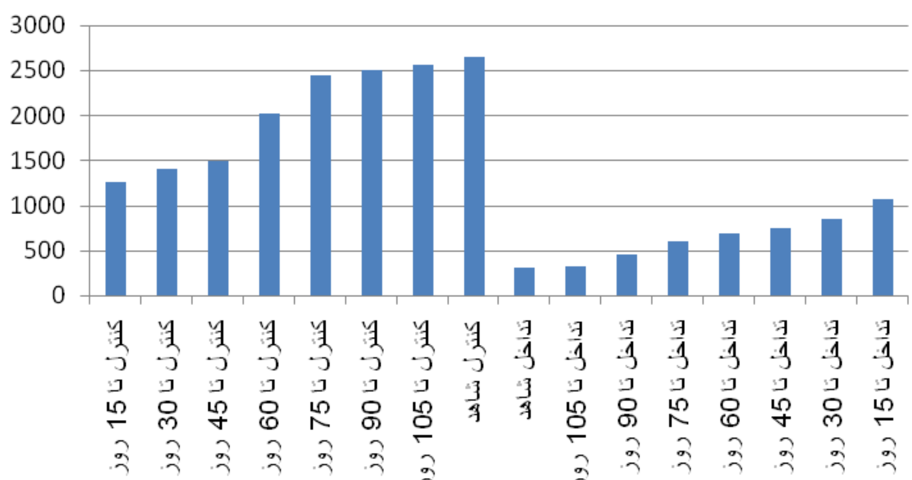


Figure 3: Effects of interference and control treatments on the number of pods per square meter

The Effects of Interference and Control Treatments on the Number of Node per Stem

The numbers of nod per stem in this study were not affected by interference and control treatment (Table 1). These findings are consistent with the experiments done by Oliver (1988) and Eftekhari *et al.*, (2005) (see Figure 4). Van Acker *et al.*, (1993) also concluded that if weeds are present during the critical period in the field, they do their own damage and cause reduces performance.

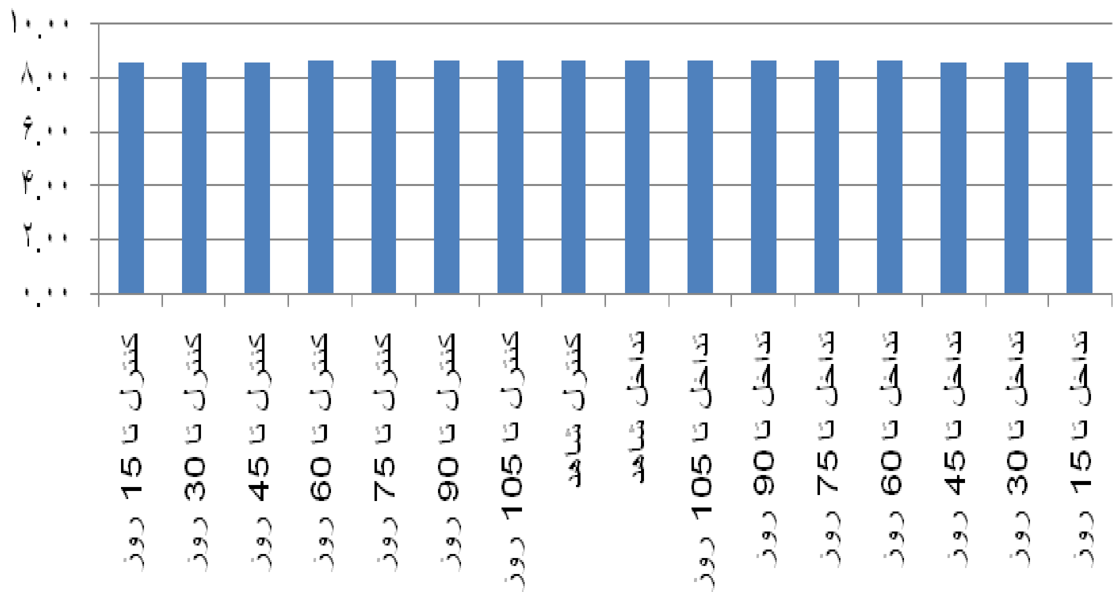


Figure 4: The effects of interference and control treatments on the node number per stem

The Effects of Interference and Control Treatments on the Number of Sub-Branches

As can be seen in Table 1, the number of sub-branches at the probability level of 1% was influenced by interference and control treatments. The results of mean comparisons showed that the maximum number of sub-branches of the complete control treatments and then control up to 105 and 90 days were obtained 5.93, 4.73 and 4.13 sub-branches, respectively (Figure 5). The lowest number of sub-branches was also related to experiment treatments without control, interference up to 105 days with 1.3 and 1.4, respectively. These results are consistent with the findings Eftekhrai *et al.*

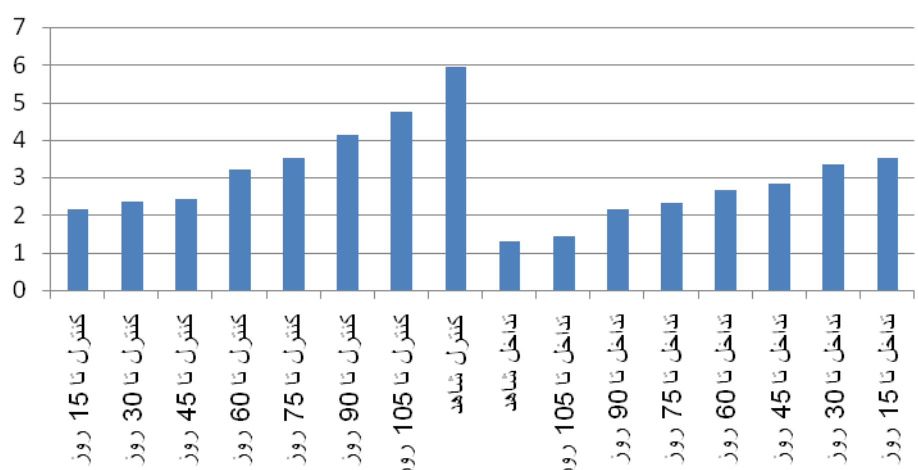


Figure 5: The effects of interference and control treatments on the number of sub-branches

Indian Journal of Fundamental and Applied Life Sciences ISSN: 2231– 6345 (Online)
An Open Access, Online International Journal Available at www.cibtech.org/sp.ed/jls/2015/01/jls.htm
2015 Vol.5 (S1), pp. 2928-2938/Hosseini et al.
Research Article

Taylor *et al.*, (1980) reported that product recovery in each plant in a low density is caused by increasing the number of sub-branches and the number of pods per plant. The number of sub-branches per plant in interference treatments was reduced by increasing the competition periods and was achieved to its lowest value in experiment treatment (existing weeds in all growth period) (Figure 5). With the increase in competition period, the amount of environmental resources allocated to lateral vegetative buds was reduced and the growth capability of sub-branches was not significant, but after reducing the control periods to V11, a significant decrease was observed in the number of branches per plant (Figure 5). Taylor (1980) found in their study that product recovery in each plant in low density is due to an increase in the number of sub-branches and the number of pods per plant. In the weed-free treatment until stage R_1 (blooming), no significant reduction was observed compared to control treatment (without weeds in the growing season) in the soybean yield. But when the weed-free period decreased to stage V11 compared to the control treatment (weeds free) Soybean yield was significantly reduced.

Effects of Interference and Control Treatments on the Weight of Hundred Seeds

Analysis of data obtained from this study showed that seed weight was influenced by experiment treatments at the probability statistical level of 1% (Table 1). The mean comparison showed that the highest seed weight from complete control-experiment treatments until 105 days, 90-day control are 18.7, 17.85 and 17.8 g, respectively and its lowest amount are from complete interference-experiment treatments up to 105 days and interference up to 90 days are obtained 11.04, 11.38 and 11.63 g, respectively (Figure 6).

The results obtained are not consistent with the experiments of Eftekhari *et al.*, (2005). In the mentioned results, the seed weight showed no significant difference in various treatments due to lower grain and as a result, the distribution of photosynthetic materials between less grains. However, it seems that although the number of seeds per plant was decreased as well as due to higher competitive pressures in treatments having more weeds, less photosynthetic materials were also produced and less grain is moved to the seeds and had made a significant difference. Since according to the analysis conducted in this study, interference increase in seed weight due to weed competition over resources with soybean plant and reducing the proportion of photosynthetic to seeds, it causes reducing seed weight in the seed and finally dry seed weight in interference treatment showed a significant difference with experiment treatment (without weeds).

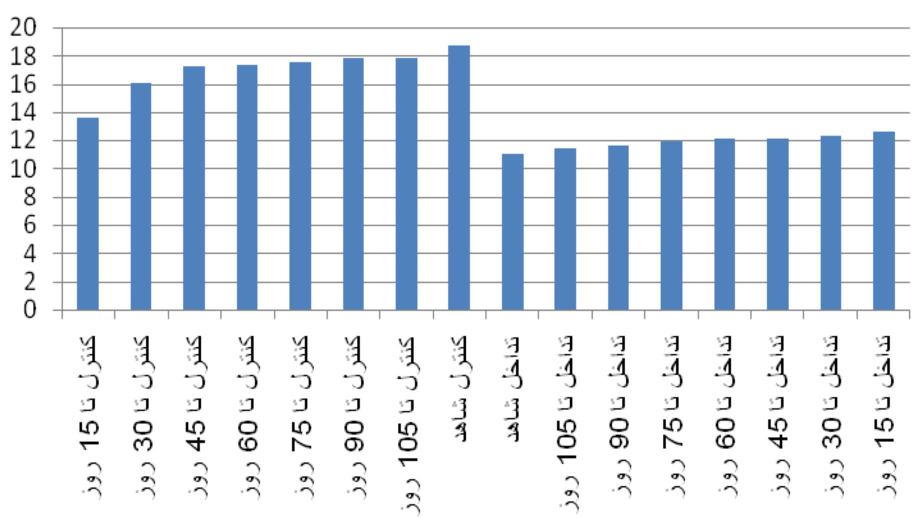


Figure 6: the effects of interference and control treatments on the seed weight

The Effects of Interference and Control Treatments on the Seed Weight in the Plant

Analysis of data obtained from this study showed that the effects of regarded treatments have a significant influence at the probability level of 1% on the seed weight in the plant (Table 1).

According to the mean comparison, complete control treatments and control treatment up to 105 days after planting and control up to 90 days after planting were 14.44, 14.3 and 14.28 g, respectively of the highest seed weight in the plant and complete interference treatments, interference up to 105 days and interference up to 90 days after planting allocates 2.36, 2.57 and 2.92 g of the least seed weight (Figure 7). In their studies, Hamzei *et al*., (2005) stated that grain weight loss occurred by increasing the duration of weed interference relates slower accumulation of materials in the seed and shortening the duration of grain filling.

In weed-free treatment period of up to stage R1 (75 days after sowing) (blooming stage), no significant decrease in grain yield compared to the control treatment (no weeds in all growing season) were observed, but when the weed-free period in the V11 (60 DAP) was decreased, seed weight was also significantly reduced (Figure 7).

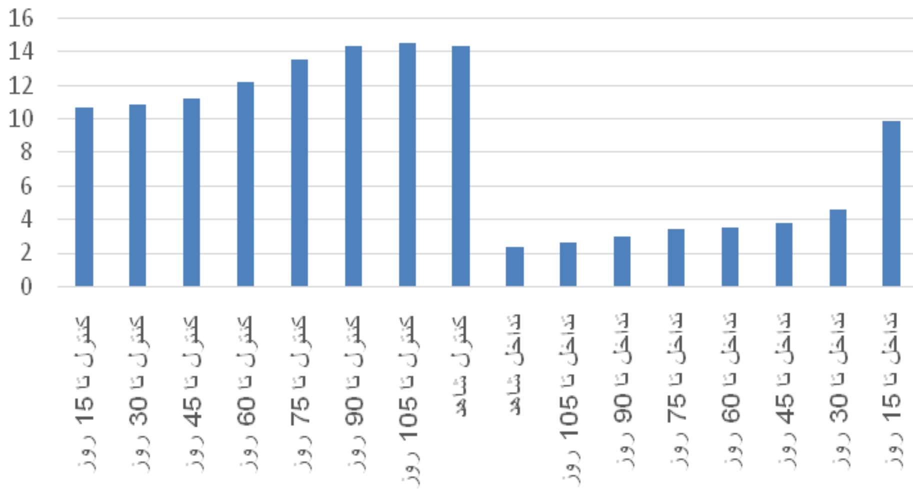


Figure 7: Effects of interference and control treatments on seed weight in the plant

The Effects of Interference and Control Treatments on the HI

Based on the analysis of data obtained, HI was influenced by experiment treatments at the probability level of 1%.

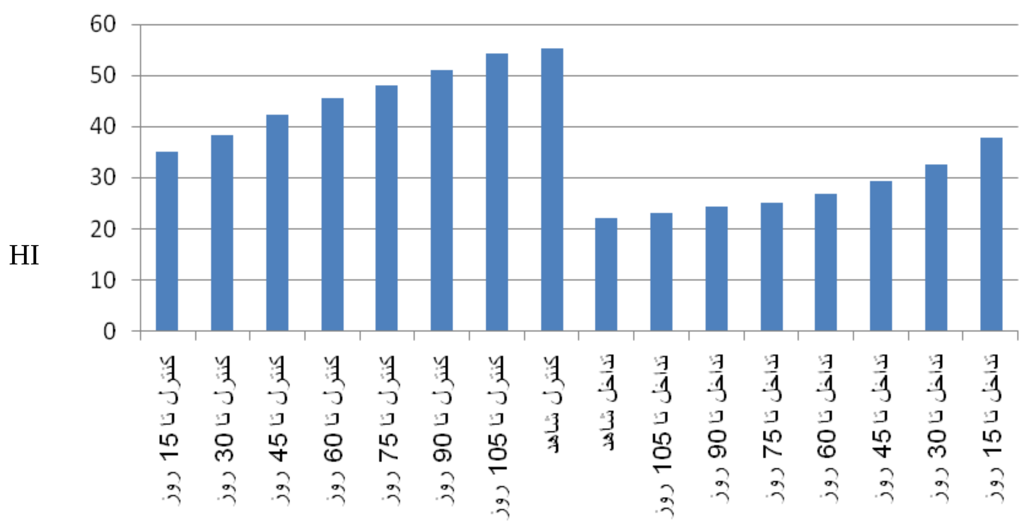


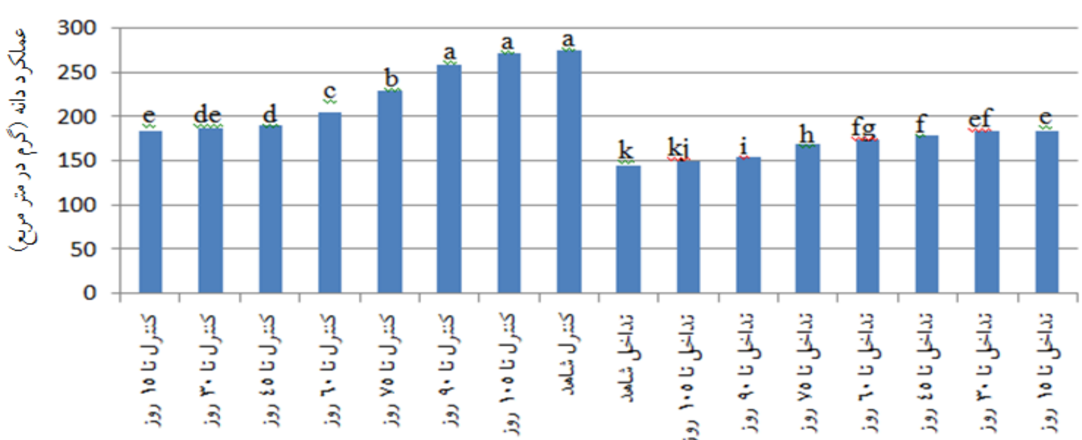
Figure 8: Effects of interference and control treatments on HI

Mean comparisons showed that the highest HI was from complete control treatment and control treatment up to 105 days after planting in 55.23% and 54.26%, respectively and its least amount from complete control and interference treatment up to 105 days after planting in 22.23% and 23.24% (Figure 8). Increased harvest index due to high levels of biological performance is in control-experiment treatment.

The Effects of Interference and Control Treatments on Grain Yield

The results from the experiment showed that seed performance was influenced by interference and control treatments (Table 1). Based on the results of mean comparison of control treatments in all growing season, control up to 105 and 90 days after planting was 257.73, 256.52 and 254.92 g per square meter produced the highest performance and interference treatments in all growing season and interference up to 105 and 90 days after planting was 120.83, 125.94 and 128.42 g per square meters produced the least performance of seed (Figure 9).

During a research over 3 years, Burmar *et al.,* (1999) reported that there is an inverse relationship between product yield and weed biomass. No significant decrease was observed in soybean performance in weed-free treatments between control and treatment R1 (75 days after planting), that is, until the beginning of blooming. But when weed-free period was reduced, soybean yield was significantly decreased (Figure 9). Thus, it can be concluded that the reduction in weed-free period in all growing season to R1 (blooming) is provided, without a significant decrease in the yield of soybean, i.e. it does not need that the field is weed-free in all growing season. It seems that soybean plant is grown enough until the blooming stage and has a good competitive power so that the conditions for growth and development of weeds is difficult, and they are not able to compete with soybean due to locating weeds in soybean canopy and their existence at the end of growing season will not be led to a significant reduction in product yield. With the increase of interference period until stage V3 (30 days after planting) compared to control treatment (weed free throughout the growing season), a significant decrease occurred in the soybean yield (Figure 9). It can be concluded that the weeds can be present in the field until stage V1; however, approximately 20 days after planting that approaches to the stage V3 (30 days after planting) seed yield was reduced due to weed competition over environmental resources. However, before the V3 stage because of competition between weeds and soybeans on the light, water and nutrient is poor, since they are less interfered with each other and their roots and aerial parts still do not interfere in the operation environment, it has no effect on soybean yield. The number of sub-branches per plant and the number of pods per plant is decreased with increasing competition between weeds and crops and increase in interference periods that leads to a decrease in the yield of soybean.



Figure

Also, Hagoud *et al.,* (1981) found in their study that the density of 2.5-0.7 plants in square meter causes 18-54% of soybean yield.

Research Article

The Effects of Interference and Control Treatments on Biological Function

Information obtained from this study showed that interference and control treatments had significant effects at the probability level of one percent on the biological function (Table 1). Among the treatments surveyed, experiment control treatments, control up to 105 days and control up to 90 days after planting, with 599.56, 597.94 and 596.85 g in square meter have the highest biological performance and interference treatments until the end of growing season, interference up to 105 days and interference up to 90 days have 400.5, 410.42 and 415.63g in square meters have the least amount of biological performance (Figure 10).

These results are consistent with the results of other investigators. Mahmoudi *et al.*, (1989) reported that increasing the interference duration of weeds reduce production biomass by reducing the accumulation of dry matter and the number of branches in the plant.

Eftekhari *et al.*, (2005) also stated that the impacts of interference and control treatments of weeds on the biological function was significant, so that by increasing the competition duration, biological function will be reduced and is reached to its minimum amount in experiment treatment without control. By increasing the competition period of weeds, the number of sub-branches per plant and the number of pods per plant is reduced and finally the biological function is also reduced. In weed control treatments, with reducing the control period from the experiment (without weeds in the growing season) to stage R1, (blooming, 75 days after planting) there was no significant reduction in yield. But when the control duration has reduced to stage V11, loss of biological function becomes significant. Harrison *et al.*, (1985) found that the foxtail intervention since 15 days after soybean emergence in optimum growing conditions (insufficient rainfall) causes the reduction of dry matter accumulation.

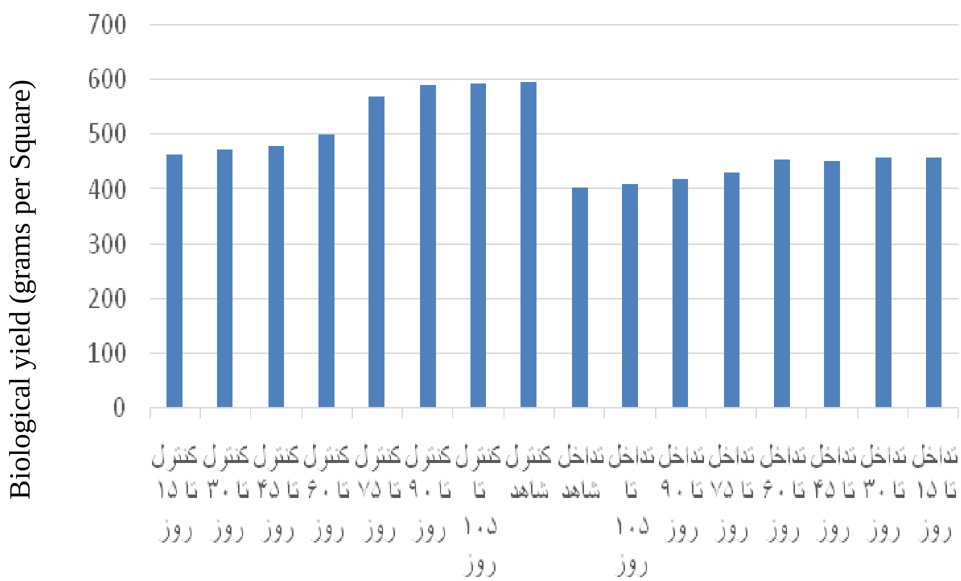


Figure 10: effects of interference and control treatments on biological function

REFERENCES

Bedmar F, Manetti P and Monterubbiaesl G (1999). Determination of the critical period of weed control in corn using a thermal basis. *Pesquisa Agropecuária Brasileira* 34-187-19.

Eftekhari A, Shiran Rad A, Rezaie A, Salehian H and Ardakani M (2005). Determining the critical period of weed control in sari. *Journal of Iran Agricultural Sciences* **7**(4) 346-347.

Hadizadeh MH (1986). The critical period of weed control in soybean. MA thesis of Agriculture, College of Agriculture, Ferdowsi University of Mashhad, 104.

Hagood ESJ, Bauman TT, Williams JL and Schreiber MM (1980). Growth analysis of soybeans (Glycine max) in competition with velvetleaf (Abutilon theophrasti). *Weed Science* **28** 729-734.

Halfod C, Hamill AS, Zhang J and Doucet C (2001). Critical period of weed control in no- till soybean and corn. *Weed Technology* **15** 737-744.

Hall MR, Swanton CJ and Anderson GW (1992). The critical period of weed control in grain corn (Zea mays). *Weed Science* **40** 68-93.

Hamzei J, Dabbagh Mohammady Nasab A, Rahimzaseh Khoie F, Javanshir A and Moghaddam M (2007). Critical period of weed control in three winter oilseed rape(Beassica napus L.) cultivars. *Turkish Journal of Agriculture* **31** 83-90.

Khajehpour MR (2007). Industrial plants, University Jihad, Industrial Unit of Isfahan, 580.

Mahmoudi S, Hejazi AH and Rahimian Mashhadi (1989). Determining the critical period of weed control in cotton (L. Gossypium hirsutum) in Varamin region. *Agricultural Science and Technology* **13**(2).

Martin SG, Van Acker RC and Friesen F (2001). Critical period of weed control in spring canola. *Weed Science* **49** 326-333

Pane H and Mansour M (1998). The critical period of competition of red sprangletop, Leptochloa chinensis, in direct seeded rice. *Journal of Plant Protection in the Tropics* **11**(1) 1-14.

Rezvani M, Rafaryan F and Juwayni M (2011). Response of soybean varieties canopy structure (Glycing max (L.) Merr.) Competition with weeds. *Journal of Weeds Knowledge*.

Ross SJ, Burnside OC, Specht JE and Swisher BA (1983). Comperirion and allelopathy between soybeans and weeds. *Agronomy Journal* **76** 523-528.

Tollenaar M, Dibo AA, Guilera AA, Weise SF and Swanton CJ (1994). Intergrated pest management: Effect of crop density on weed interference in maize. *Agronomy Journal* **86** 594-595.

Van Acker RC, Swanton CJ and Weise SF (1993). The critical period of weed control in soybean [Glycine max L. Merr.]. *Weed Science* **41** 194-200.

Zimdahl RL (1993). *Fundamentals of Weed Science* (Acaemic press, Inc. San l. Diago) California 128.