Available online at www.scholarsresearchlibrary.com

Scholars Research Library

Annals of Biological Research, 2013, 4 (3):180-182
(http://scholarsresearchlibrary.com/archive.html)

ISSN 0976-1233
CODEN (USA): ABRNBW

Effect of Drought stress Application of Biological Nitrogen Fertilizers on the Yield and Yield Components of Safflower (*Carthamus tinctorius* L.)

[1]Mostafa Eskandari[*], [2]Mohammad Nasri, [3]Behzad sani

[1]Faculty of Agricultural Engineering, Varamin-Pishva Branch,Iran
[2]Faculty of Agricultural Engineering, Varamin-Pishva Branch,Iran
[3]Faculty of Agricultural Engineering, Shahre ghods Branch,Iran

Abstract

Crop plants are usually affected by environmental stresses. Among different possible stresses, irrigation and available nitrogen supply are two of most important stresses for crop plants. Surveys of draught and nitrogen bio-fertilizer on yield and element of yield of && were conducted through a farm test in form split plot and in block frame. The experiment was conducted randomly with four replications in 2012. The surveys were on three levels of draught stress (control, no irrigation during stem development, no irrigation during flowering) and four level of nitrogen bio-fertilizer (control, 25%, 50%, azeto bacter + nitroxyn). The traits under consideration were yield, 1000 grain, total number of seeds in tray, total number of trays, and length of plant. The results showed significant differences of traits between draught stress samples and nitrogen bio-fertilizer stress samples. However, no significant difference was found regarding reciprocal effects. Results concerning agricultural traits showed that complete drought after stem formation negatively affected the sample. The best grain yield was obtained for ordinary irrigation sample (control group) and nitrogen bio-fertilizer of 25% and 50% with 6787 and 7215kg/ha yields.

Keywords: Safflower, Draught stress, Nitrogen, Yield, Yield Components

INTRODUCTION

Carthamus tinctorius L. is one of the ancient safflower, which is mainly used as oil gains in Iran. The species is one of the promising options for production of oil grain (MC Pherson et al. 2004). Safflower is resistive to draught and salt stresses and can be cultivated in lands susceptible to abiotic stresses (Bassiland Kaffka, 2002; Esendel 1992). Global safflower production is 800000MT. (MC Pherson et al., 2004)

Kumar (2000) concluded, after comparative assessment on potentials for development of safflower and sunflower farming in India, that safflower is more profitable (Helianthus Anmuus L). The reason stated for the difference in profitability was higher resistivity of safflower to water shortage. In another study on 10 spring genotypes of safflower, Koutroubas *et al*. (2004) pointed out role of non-structural photosynthesis products reserved in safflower plant before flowering on supporting grain yield during water shortage experienced during seeds development. They reported significant differences between the genotypes. In general, 64.7% to 92.2% of seed yield was supplied by reservoirs prepared before pollination. There are reports on salt stress (up to 7.2 ds/m) with no significant effect on grain and oil yields. However, trivial reduction in 1000 grain weight was effective. (Bassiland Kaffka, 2002)

Steer and Harrigan (1986) reported that number of head is the dominant element of yield in safflower, so that there is linear relation between number of grains and number of heads in each plant. Moreover, they found that the optimum use of nitrogen fertilizer for safflower is during stem development.

MATERIALS AND METHODS

The experiment was conducted in research farm, Islamic Azad University, Ghale Sien Village, Pishva, Varamin, at longitude 51º,31' east, latitude 35º,20', and 1050m height from sea level with an area of 1280m2. The experiment was conducted through split plot in block frame selected randomly for 4 replications. The safflower cultivar was Isfehani. The main factor under consideration was draught stress at three levels (control, no irrigation during stem development, no irrigation during germination) and secondary factor was amount of nitrogen bio-fertilizer at four levels (control, 50 nitrogen, 25 nitrogen, and nitroxyne + Azeto bacter). Each experiment unit (block) constituted 5 stacks each for 7m; the stacks were prepared at 60cm interval; and seeds were planted at 20cm intervals. Samples were planted in 19 May 2012 – 3 seeds aggregated in depth 3-5cm. Samples were watered at 7 days periods until inducing stress.

RESULTS AND DISCUSSION

Grain yield

Table (1) represents results of variance analysis regarding grain yield. Draught stress treatments show significant difference (1% level) on grain yield. Comparison meanlevel using Duncan's Multiple Range test showed significant differences between draught stress treatments. Based on table 2, maximum yield is obtained from control group (5955 kg/ha) and the minimum yield is obtained from flowering stage stress treatment (3475kg/ha). Nitrogen bio-fertilizer treatment showed significant effect of stress (1% level) on grain performance (table 1). Comparison between average yields obtained for different level of nitrogen bio-fertilizer (table 2) showed that nitrogen bio-fertilizer treatment (50% and 25%) had maximum yield. The results are consistent with majority of works including Osborne *et al*. (2002).

Retrospective result concerning irrigation and nitrogen fertilizer was not significant (table 1). In spite of insignificant retrospective effect, maximum yield was obtained from control, and nitrogen bio-fertilizer treatments (50% and 25%). The results are consistent with those by Tarighaleslami on maize (2012).

Weight of 1000 grains

In general, weight of 1000 grain is an element of yield which is affected by environmental and genetic factors. Except for causes subject to shortage or late plantation or when majority of yield is a factor of vegetable growth (resulted in small grains), there is an insignificant relation between the yield and weight of 1000 grains.

Table 1 tabulates results of variance analyses on weight of 1000 grains. According to the results, there is a significant difference between changes of weight of 1000 grains among nitrogen bio-fertilizer at 1% and 5% levels, while reciprocal effect of the treatment is significant at 5%.

According to table 2, maximum weight of 1000 grains (48.40gr) was obtained for control group and the minimum figure was for no irrigation during flowering stage (38.01gr). Moreover, regarding nitrogen bio-fertilizer treatments maximum yield was for 50% and 25% nitrogen bio-fertilizers with 49.26gr and 38.50gr respectively. Higher weight of 1000 grains by using nitrogen bio-fertilizer was also reported by Tarigalslami *et al*. (2012). Increase in nitrogen fertilizer to a specific level increases weight of 1000 grains. About reciprocal effect of nitrogen bio-fertilizer we also found that maximum weight of 1000 grain was for control group with 50% and 25% nitrogen fertilizer with 52.3gr and 53.15gr respectively.

Number of heads

According to variance analyses on number of heads (table 1) it is clear that there is a significant relation between draught stress and nitrogen bio-fertilizer treatments at 1% level. However, no significant relation was found between reciprocal effects of bio-fertilizer and the stresses. Based on table 2, maximum number of head was observed for control group (no stress) with 6.750 heads and for bio-fertilizer (50% and 25%) with 7 and 6.417 heads respectively. Regarding reciprocal effect of draught stress and bio-fertilizer, no significant relation was found and maximum number of heads was found for control group with 50% and 25% nitrogen bio-fertilizer and also for no-irrigation at flowering treatment with 50% and 25% nitrogen bio-fertilizer.

Total number of grain in heads

Variance analyses on total number of grains in heads (table 1) showed a significant relation between draught stress and nitrogen bio-fertilizer treatment at 5% level. However, no significant relation was found between reciprocal effect of the stress and bio-fertilizer. Results of comparison on average effect (table 2) showed that maximum number of grains in headها was found in control group with total number of 243.3 grain per head and this figure for bio-fertilizer treatments 50% and 25% were 260.8 and 243.3. Regarding reciprocal effect of draught stress and bio-fertilizer, no significant relation was found. However, comparisons on mean points of reciprocal effects showed that maximum number of head was for control groups with 50% and 25% fertilizer supply and also for draught stress at flowering treatment with 50% and 25% fertilizer supply.

Height of samples

There was no significant difference between simple and reciprocal relations of draught stress and nitrogen bio-fertilizer treatment. However, maximum height of sample was observed for control group (45.49cm) and minimum observed height was 42.21cm. As presented in table 2, mean point comparison demonstrate that maximum height was observed in samples received 50% nitrogen bio-fertilizer (45.53%). Regarding reciprocal effect (table 2), increase in nitrogen bio-fertilizer and no stress resulted in increase in height of the samples. Maximum height of 46cm was observed for samples supplied with 50% nitrogen bio-fertilizer per hectare.

Table 1: mean square variance analyses for some of agricultural traits

Source of changes (SOV)	df	Grain yield	Weight of 1000 grains	Number of head	Total number of grain in head	Height
Replication	3	562736.257 ns	10.373 ns	0.243 ns	549.076 ns	147.191 ns
Draught stress (factor A)	2	24927730.118 **	436.233 *	7.646 **	16366.146 *	46.941 ns
error A	6	918872.866	24.690	0.368	2240.118	64.544
N bio-fertilizer (factor B)	3	13145148.201 **	293.058 **	6.576 **	6498.632 *	16.143 ns
Drought stress * bio-fertilizer (AB)	6	377563.915 ns	12.889 *	0.868 ns	362.174 ns	6.774 ns
Error	27	1094470.270	14.502	0.863	1924.178	33.868
CV%	-	14.81	8.76	10.22	14.26	13.12

*ns , *, **: insignificant, significant at 5% and 1% respectively*

Table 2: comparison of mean main and secondary effects level (Duncan's method)

Treatment	Grain yield (kg/h)	Weight of 1000 grains (g)	Number of head	Total number of grain in head	Height (cm)
S_1	5955 a	48.40 a	6.750 a	243.3 a	45.49 a
S_2	4962 b	44.08 b	6.188 b	225.1 a	42.39 a
S_3	3475 c	38.01 c	5.375 c	181.1 b	42.21 a
N_1	3846 b	38.50 c	5.417 b	198.8 b	43.59 a
N_2	5283 a	45.83 b	6.417 a	228.6 ab	45.17 a
N_3	6039 a	49.26 a	7.000 a	243.3 a	45.53 a
N_4	4020 b	40. 39 c	5.583 b	195.3 b	43.17 a

S1, S2, S3: control, no irrigation during stem development, and flowering respectively

N1, N2, N3, N4: nitrogen bio-fertilizer, no fertilizer (use of nitrogen based on soil tests results), bio-fertilizer + 50% nitrogen recommended, bio-fertilizer + 25% nitrogen recommended, only bio-fertilizer (nitroxyn + azeto bacter)

REFERENCES

[1] Mc Pherson, M.A., A. G. Good, A. K. C. Topinka, & L. M. Hall. **2004**. *Canadian J. of Plant Sci*. 48: 923-934.

[2] Bassil, B.S. & S. R. Kaffka. **2002**. *Agricultural Water Management*. 54: 81-92.

[3] Esendel, E., K. Kevesoglu, N. Ulsa, & S. Aytac. **1992**. Performance of late autumn and spring plantedsafflower under limited environment. Proceeding of the Third International Safflower Conference.China. P.221-280.

[4] Kumar, H. **2000**. Development potential of safflower in comparision to sunflower. Sesame and safflower newsletter. Institute of sustainable agriculture. Spain. No. 15:86-89.

[5] Koutroubas, S.D., D. K. Papakosta, & A. Doitsinis. **2004**. *Field Crops Res.* 90: 263–274.

[6] Bassil, B.S. & S. R. Kaffka. **2002**. *Agricultural Water Management*. 54: 81-92.

[7] Steer, B.T. & E. K. S. Harrigan. **1986**. *Field Crops Res*.14: 221-231.

[8] Osborne, S.L., J.S. schepers, D.D. Francis, and M. R. schlemmer **2002**. *Cropsci* 42:165-171.

[9] Tarighaleslami,M., R. Zarghami, M.Mashadi Akbar Boojar, M. Oveysi . **2012**. *American-Eurasian Journal of Agricultural& Environmental Sciences .Sci*., 12 (1): 49-56.