Available online at www.scholarsresearchlibrary.com

Scholars Research Library

Annals of Biological Research, 2013, 4 (7):200-203
(http://scholarsresearchlibrary.com/archive.html)

ISSN 0976-1233
CODEN (USA): ABRNBW

Effect of zinc and iron under the influence of drought on prolin, protein and nitrogen leaf of rapeseed (*Brassica napus*)

[1]Mohsen Pourgholam[*], [1]Nabiollah Nemati and [2]Meysam Oveysi

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

ABSTRACT

To evaluate the beneficial Effect of zinc and iron under the influence of drought on Prolin, Protein and Nitrogen Leaf of rapeseed (Brassica napus) . This experiment was conducted in Varamin zone at Iran during 2011-2012. In this respect, the experimental unit had designed by achieved treatments in split plot on the basis completely randomized block design with three replications. Certain factors including three levels of irrigation (I_1: normal (control) I_2: Irrigation at stem elongation I_3: Irrigation at flowering stage) and zinc and iron foliar application (S_1: control, S_2: zinc spraying, S_3: spraying iron S_4: iron and zinc spraying) were studied. The results showed that the treatment effects are not significant, but the most effective treatment for dry, drought has bloom. The foliar application of zinc and iron, said to be sprayed simultaneously improve both protein and nitrogen content was noteworthy.

Key words: Nitrogen, Zinc, Iron, Prolin, Protein

INTRODUCTION

Among the different abiotic stresses like heat, salinity and freezing, drought stress is a more severe constraint that limits growth and productivity of crop plants [17]. Drought is a world spread problem seriously reducing the yield and quality of crop plants [11]. It affects every aspect of plant physiology, biochemistry and diminishes yields [11]. Canola (Brassica napus L.) is considered as an economically important crop of Iran. But erratic rainfall and scarcity of water for irrigation during the growing season significantly lowers its yield and quality. Water stress affects both vegetative and reproductive stages in canola. The effects of water stress were more severe during reproductive growth than vegetative growth in rapeseed [10]. Previous studies showed that drought stress significantly decreased the seed oil content of canola [14]. Similarly, Pham-Thi et al., (1985) reported that water deficiency decreased the degree of fatty acids unsaturation which was attributed to the inhibition in the biosynthesis of polyunsaturated fatty acids and suppression in the activities of desaturases[12]. Prolin accumulation is one of the most widespread metabolic responses of plants to osmotic stress [3] , and is thought to play positive roles under stressful conditions such as a component of antioxidative defense system [4], stabilizer of subcellular structures and macromolecular [6], regulator of cellular redox potential [7], or component of signal transduction pathways that regulate stress responsive genes [9]. Canola (*Brassica napus* L.) is grown in different agro-climatic zones of the world, differing in soil nutrient status. The use of foliar fertilizing in agriculture has been a popular practice with farmers since the 1950s, when it was learned that foliar fertilization was effective and economic. Recent research has shown that a small amount of nutrients, particularly Zn, Fe and Mn applied by foliar spraying increases significantly the yield of crops [13, 16]. Also, foliar nutrition is an option when nutrient deficiencies cannot be corrected by applications of nutrients to the soil [1, 2 ,13]. It is likely therefore, in open-field conditions, where the factors that influence the uptake of the nutrients are very changeable, foliar fertilization can get considerable importance. Among the micro-nutrients, Zn and Fe nutrition can affect the susceptibility of plants to drought stress [1, 8 ,15].

MATERIALS AND METHODS

The experiment was conducted in Azad Islamic University-Varamin, Pishva Unit Researching Farm located in Ghale Sin Varamin, in 51°31' East Longitude and 35°20' North Latitude and 1050m higher that sea level in an area of 1250 square meter in 2011-2012 farming year. The experiment was laid out in split plot experiment in frame of accidental complete block design with 4 repetitions. Tension levels and Sprayed zinc and iron additive levels were main and secondary factors respectively. Irrigations water is equal to the (I_1: normal (control) I_2: Irrigation at stem elongation I_3: Irrigation at flowering stage). After conducting tests on soil and determining nutritious material, Sprayed zinc and iron additive, zinc and iron was added to in three levels of (S_1: control, S_2: zinc spraying, S_3: spraying iron S_4: iron and zinc spraying). Each replication consisted of 12 treatments and each treatment plant consists of seven lines (lines between planting 25 cm) long, 6 meters. Lanes 7 and one half feet from each side of the border, lanes 2 and 6 for the surface area of the sample lanes 3 to 5 2.5 m was considered for the area.

RESULTS AND DISCUSSION

Prolin

Drought stress as well as the interaction between treatment and foliar application of zinc and iron was no significant difference However, foliar application of zinc and iron are significantly different at the 1% level. (Table 1). The irrigation treatments at flowering stage had the highest amount of prolin with 86.51 mol g fresh tissue, respectively. Control foliar application at a rate of 101.5 micromoles per gram fresh tissue accounted for the highest concentration (Table 2). With irrigation at flowering and foliar rate of 110.6 micromoles per gram fresh tissue yielded the highest concentration (Table 3). Most researchers reported that drought stress increased levels of amino acids is reduced, but some amino acids such as prolin increases.

Protein Leaf

Results of analysis of variance table (Table 1) indicate that the effects of drought treatments were not significant in relation to the protein content of the leaves. Irrigation treatments at flowering stage than optimum irrigation has decreased leaf protein (Table 2). The study showed that foliar treatments are significantly different at the 1% level (Table 1). Simultaneous treatment with foliar application of zinc and iron, 4.038 per cent and the highest level of control with 2.721 percent, has the lowest protein content (Table 2). The effects of water stress and foliar determined that there is no significant difference between the two treatments (Table 1). Also according to the comparison table was found out that the highest percentage of protein interactions in plant control and irrigation at stem elongation and the spraying of zinc and iron 4.095, 4.090 obtained .

Protein Seed

There was no significant effect of drought treatment but the effect of the interaction between stress and foliar application and foliar application on seed protein content was significant at 5 and 1%. And the results of the comparison of simple effects of drought can be seen The irrigation treatments at flowering stage than optimum irrigation has reduced grain protein (Table 1, 2). Simultaneous treatment with foliar application of zinc and iron, 22.40 percent, the highest level of control with 18.87 percent, the lowest seed protein has, the highest protein content of the treatment plant and spray irrigation at the flowering stage, and iron, respectively protein (Table 2, 3).

Nitrogen Leaf

View the table of analysis of variance with nitrogen (Table 1, 2), it was found that the effect of drought stress and stress interactions and sprayed a significant impact. But the effect of foliar application of 1% there is no significant impact. The average comparison nitrogen (Table, 2) effect of drought was found that the lowest levels of leaf N 946.6 irrigation at flowering stage is related to stress. Most foliar spray at a rate of Zn and Fe in 1281 and the lowest rate of nitrogen application to control the rate of 790.9 is. Most nitrogen in the foliar application of zinc and iron tension control rate is 1315 and increased stress levels are reduced.

Table1. Analysis Variance of agronomical characteristic

S.O.V	df	Prolin	Protein Leaf	Protein Seed	Nitrogen Leaf
Replication	3	55.962 ^{ns}	0.073 ^{ns}	3.484 ^{ns}	10338.083 ^{ns}
Factor A	2	746.468 ^{ns}	0.429 ^{ns}	6.848 ^{ns}	66810.646 ^{ns}
Error	6	3268.156	2.383	15.515	282252.229
Factor B	3	5326.457**	3.698**	27.096 *	534457.472 **
AB	6	38.351 ^{ns}	0.114 ^{ns}	22.679 **	5771/785 ^{ns}
Error	27	51.002	0.157	6.319	19320/662
C.V %	-	9.08	11.71	9.40	10.48

ns,,**: Non- significant and significant at in 0.05 and 0.01 level of probability respectively.*

Table2. Means comparison of agronomical characteristic

Treatment	Prolin	Protein Leaf	Protein Seed	Nitrogen Leaf
I1	75.32 a	3.448 a	20.98 a	1035 a
I2	74.12 a	3.501 a	20.16 a	1094 a
I3	86.51 a	3.194 a	19.68 a	964.6 a
S1	101.5 a	2.721 d	18.87 b	790.9 d
S2	88.74 b	3.214 c	19.88 b	943.7 c
S3	71.18 c	3.551 b	19.94 b	1109 b
S4	53.15 d	4.038 a	22.40 a	1281 a

Means with the same letter in each column have not statistically significant difference.

(I_1, I_2, I_3) Respectively, the normal irrigation (control), Irrigation at stem elongation, cessation of irrigation at flowering stage. (S_1, S_2, S_3, S_4) Respectively, is sprayed with distilled water (control), zinc spraying, spraying iron, iron and zinc spraying.

Table3. Means comparison of agronomical characteristic

Treatment		Prolin	Protein Leaf	Protein Seed	Nitrogen Leaf
	S1	101.3 ab	2.628 d	18.22 bc	788 de
I1	S2	85.30 cd	3.188 cd	21.85 abc	909.5 cde
	S3	65.72 f	3.82 ab	21.80 abc	1127 abc
	S4	48.97 h	4.095 a	22.05 ab	1315 a
	S1	92.75 bc	2.945 cd	20.48 bc	825.3 de
I2	S2	83.05 cd	3.398 bc	20.17 bc	1010 bcd
	S3	70.43 ef	3.570 abc	20.24 bc	1192 ab
	S4	50.25 gh	4.090 a	19.75bc	1347 a
	S1	110.6 a	2.590 d	17.91 bc	759.5 e
I3	S2	97.88 b	3.057 cd	17.62 c	911.3 cde
	S3	77.38 de	3.200 cd	17.79 c	1009 bcd
	S4	60.22 fg	3.930 ab	25.42 a	1179 ab

Means with the same letter in each column have not statistically significant difference.

(I_1, I_2, I_3) Respectively, the normal irrigation (control), Irrigation at stem elongation, cessation of irrigation at flowering stage (S_1, S_2, S_3, S_4) Respectively, is sprayed with distilled water (control), zinc spraying, spraying iron, iron and zinc spraying

REFERENCES

[1] Cakmak, I. (**2008**). *Plant Soil*. 302: 1-17.
[2] Crabtree, W. L. (**1999**). *Plant Soil*. 214:9-14.
[3] Delauney, A. J. and Verma, D. P. S. (**1993**) *Plant J*. **4**, 215-223.
[4] Molinaria, H., Marura, C., Darosb, E., Camposa, M., Carvalhoa, J., Filhob, J., Pereirac, L. and Vieiraa, L. (**2007**)
[5] Evaluation of the stress-inducible production of proline in transgenic sugarcane (Saccharum spp.): osmotic adjustment, chlorophyll fluorescence and oxidative stress. *Physiol. Plant* **130**, 218-229.
[6] Rajendrakumar, C. S., Reddy, B. V. and Reddy, A. R. (**1994**) *Biochem. Biophys. Res. Commun*. **201**, 957-963.
[7] Hare, P. D. and Cress, W. A. (**1997**) *Plant Growth Regul*. **21**, 79-102.
[8] Khan, H. R., G. K. McDonald and Z. Rengel (**2003**). *Plant Soil* , 249:389-400.
[9] Khedr, A. H. A., Abbas, M. A., Wahid, A. A. A., Quick, W. P. and Abogadallah, G. M. (**2003**) *J. Exp. Bot*. **54**, 2553-2562

[10] Ghobadi, M., M. Bakhshandeh, G. Fathi, M.H. Gharineh, K. Alamisaeed, A. Naderi and V. Ghobadi. **2006**. *Agron. J.*, 5: 336-341.
[11] Moghadam, H. R. T., H. Zahedi and F. Ghooshchi. **2011**. *Pesq. Agropec. Trop., Goiânia*., 41: 579-586.
[12] Pham-Thi, A.T., C. Borrel-Flood, J. Vieira da Sila, A.M. Justin and P. Mazliak. **1986**. *Photochem*., 24 : 723-727.
[13] Sarkar, D., B. Mandal and M. C. Kundu (**2007**). *Plant Soil* 301: 77-85.
[14] Sinaki, J.M., E.M. Heravan, A.H.S. Ra., G. Noormohammadi and G. Zarei. **2007**. *Americaneurasian J. Agri. Environ. Sci.*, 4: 417-422.
[15] Sultana, N., T. Ikeda and M. A. Kashem (**2001**). *Environ. Exp. Bot*. 46:129-140.
[16] Wissuwa, M., A. M. Ismail and R. D. Graham (**2008**). *Plant Soil*. 306:37-48.
[17] Yamaguchi-Shinozaki, K., M. Kasuga, Q. Liu, K. Nakashima, Y. Sakuma, H. Abe, Z.K. Shinwary, M. Seki and K. Shinozaki. **2002**. Biological mechanisms of drought stress response, JIRCAS Working Report, pp. 1-8.