Response of Two Wheat Varieties to Irrigation Blocking and Ethephon Foliar Application

Zeboon[1], N.H., S. A. Al. Hassan[2] and H. A. Bager[1]
Department of field crops, college of Agriculture, university of Baghdad

Received on: 3/1/2017 *Accepted: 28/2/2017*

ABSTRACT

A filed experiment was carried-out during the winter season of 2010-2011 and 2011-2012 at the experimental farm of Baghdad University. The main objectives were to asses the role of irrigation blocking and ethephon spraying on growth of wheat cultivars. Two bread wheat cultivars were included. These were IPA-99 and Abu-ghraib-3. Ethephon foliar application and irrigation blocking was applied at elongation and booting developmental stages. A split-plot design with four replicates was used. Main plots were assigned to irrigation blocking-ethephon spraying treatment, whereas, cultivars assigned to sub-plots. Data presented as an average of the two seasons since the interaction of season treatments was not significant. over irrigation blocking-ethephon spr aying treatment the wheat cultivar IPA-99 was significantly superior to Abu-Ghraib-3 in plant height, flag leaf area, dry weight of flag leaf, specific weight of flag leaf, chlorophyll content, tillers number and dry weight of above ground plant parts after 95 and 155 days of sowing. Meanwhile, the difference between the two cultivars had not reached the level of significance in crop growth rate and relative growth rate. Irrigation blocking and ethephon spraying at elongation stage, although significantly increased plant height, flag leaf area, dry weight of flag leaf, specific weight of flag leaf, chlorophyll content, tillers number/plant and dry weight of plant after 95 and 155 days, the difference in crop growth rate and relative growth rate between elongation and booting stages was insignificant. It might be concluded that ethephon foliar application might compensate the suppressing effect of irrigation blocking through modifying plant physiology and regulate the transmission of auxins that lead to reduction in water need and an increase in wheat plant growth.

Keywords: Irrigation blocking, wheat varieties, ethephon.

INTRODUCTION

Food security is a principle request for many areas of the world. The need for increasing food allowances comes on the expense of available water. In arid and semi-arid regions of the world, water availability is the major limiting Factor for grain production (zwart and *Bastiaanssen* (2004) and Kashiani *et.al*,(2011)). Also, water deficiency retard physiological processes and consequently, reduces growth and yield, where, a significant correlation was noticed between sub-optimal level of water and yield of wheat especially at critical growth stages Including booting and grain filling (Anonymas, (2007), Weldearegay *et.al*, (2012). Meanwhile, Allahverdiyer (2015), pointed out that, stem elongation, flowering and grain filling stages are the most affected by Increased drought. In the meantime, Shamsi *et.al*,(2011), Mushtagh et.al, (2011), Mansour(2013), Abd El-Ghany *et.al*,(2012), Lgbal and Liyas (2012), Farhood (2014) and Magbool et.al,(2015) reached that, blocking Irrigation in any of wheat development stages, causes decrease in most growth traits.

Different strategies were proposed to cope with the adverse impact of drought in wheat productivity and development. These include development of irrigation systems, choose of drought tolerant varieties (Shanmigam *et.al*,2013). Amer (2004) reached that, Iraq and IPA cultivars were the most sensitive to drought expressed by drought sensitivity index in booting, flowering, milk and dough grain filling stages. Meanwhile, Abu Ghraib-3 and Adanah1 were sensitive to drought in all growth stages specially grain filling period. Growth regulators were proposed by Hamada (2000) as a method to reduce plant water use at the beginning of growth season through reducing leaf area index (LAI) and crop growth rate (CGR)that might reduce the risk of drought during flowering and seed filling which result in yield increase, irrespective of drought. Ethephon is among the tested growth regulators for that concern, along with, the choice of drought tolerant varieties. (Andria, 1997 and Shekoofa and Emam 2008). The main objectives of the recent study were to asses the response of two wheat varieties to irrigation blocking and ethephon foliar application at different growth stages.

MATERIALS AND METHODS

Two field experiments were conducted at the experimental farm of college of Agriculture, university of Baghdad, during the two successive winter seasons of 2011 and 2012. The main objectives of the study were to asses the effect of irrigation blocking and foliar application of ethephon on wheat. IPA99 and Abu Ghraib-3. A split-plot design was used. Cultivars occupied the main plots, while, sub-plots were represent by two growth stages at which irrigation was blocked.

These were elongation and booting stages. Ethephon was applied at the rate of 100 ppm at each stage. Plot area was 7.5m^2 (3×2.5m). Seeds were drilled in rows ay 0.2 m apart at the rate of 120 kg.ha^{-1}. Nitrogen was applied at 200 kg.ha^{-1} at three successive settlements. Phosphate fertilizer in form of super-phosphate was applied before sowing. The following characters were measured at full flowering stage:

- Plant height (cm); measured from plant base up to the base of the main culum spike and recorded as average of ten plants.
- Total number of tillers: recorded at harvest for one square meter area in each experimental unit.
- Flag leaf area: ten main culum flag leaves were used according to the following equation:
- Flag leaf area = length x width at middle x 0.95 (Thomas, 1975).
- Specific weight of flag leaf: calculated as dry weight of flag leaf / flag leaf area.
- Chlorophyll content: determined in ten flag leaves using SPAd-502 device.
- Plant dry weight: a sample of 0.3m^2 in each experimental unit included above ground mass (above coronary roots region) was taken after 55 then 95 days from sowing. Samples were oven dried at 65°c until weight constancy.
- Crop growth rate (CGR) (g.m^{-2}.day^{-1}): calculated after 55 and 95 days from sowing according to the following equation:

CGR=1/A. W_2-W_1 / T_2-T_1 (Hunt,1982)

Where;

CGR: Crop growth rate.

A: land area occupied by the sample (m^2).

W_1: dry weight of sample at time T_1 (sowing date).

W_2: dry weight of sample at time T_2.

Relative growth rate (RGR) (g.m^{-2}.day^{-1}): estimated according to the following equation:

RGR= (Ln W_2-Ln W_1) / T_2-T_1 (Hunt,1982).

Where;

RGR: relative growth rate.

Ln W_1: natural logarithm of sample's dry weight at time T_1.

Ln W_2: natural logarithm of sample's dry weight at time T_2.

Data were statistically analyzed according to steel and Torrie (1962).

RESULTS AND DISCUSSION

Data of plant height in Table 1 illustrate the interaction of wheat cultivars with irrigation blocking and ethephon application stages. IPA99 cultivar significantly enjoyed taller plants (95.53 vs. 93.10 cm for IPA99 and Abu-Ghoails3, respectively). Over the studied cultivars, the highest significant reduction in plant height was expressed when water blocking and ethephon application took place at elongation stage (7.30% reduction relative to control). Also significant plant height reduction was noticed when irrigation blocking and ethephon application practiced at booting stage (2.78%relative to control). Al-Hassan (2011) and Kadom (2015) reported that, cultivars vary in their susceptibility to drought. Also, plant height is controlled by additive gene action that controls all quantitative characters. In the mean time, it was expected that, stem elongation stage would be the most sensitive, since, it encounter rapid growth of stem which badly require water for biological processes. The fact that ethephon application in stem elongation stage resulted in shorter stem goes to the regulator effect of ethephon as a growth detrimental, that mostly shorter stem internodes. This is simply because of the effect of ethylene that results from the degradation of ethephon which block the auxin transmission in stem tissue ending to suppressing the elongation of meristems (Sachs and Hackelt (1972) and Thomas (1980). The interaction between the two Factors had not reached the level of significance. These results agree with the findings of Hashim (2014) and Shekoat and Emam(2008).

Flag leaf area:

Table (2) showed the response of flag leaf area to irrigation blocking and ethephon spraying. IPA99 variety significantly exhibited larger flag leaf area (44.59 vs. 41.49 cm^2 for IPA99 and Abu-Ghraib-3 cultivars, respectively). The superiority of IPA99 in flag leaf area reached 7.47% over the other cultivar this might due to difference among the two cultivars in the time required from sowing to 50% spike emergence. That time period included the growth and expansion of flag leaf (Evans and Wardlow, 1976).

Table 1: plant height (cm) as affected by the interaction between wheat cultivars and irrigation blocking ethephon application stages

Cultivars	Irrigation blocking- ethephon application stages			Mean
	Control	Elongation	Booting	
IPA99	98.68	91.94	95.98	95.53
Abu-Ghraib-3	96.74	89.21	96.74	93.10
Mean	97.71	90.57	94.99	
L.S.D cultivars			2.27	
L.S.D stags		1.75		
L.S.D interaction		not significant		

Table 2: Flag leaf area (cm^2) as affected by the interaction between wheat cultivars and irrigation blocking-ethephon application stages.

Cultivars	Irrigation blocking-ethephon application stages			Mean
	Control	Elongation	Booting	
IPA99	40.12	49.53	44.12	44.59
Abu-Ghraib-3	38.57	44.63	41.28	44.49
Mean	39.35	47.08	42.70	
L.S.D cultivars			0.82	
L.S.D stags		0.87		

Over cultivars, irrigation blocking beside ethephon spraying gave the largest flag leaf area when applied at elongation stage. The superiority of flag leaf area at that stages reached 19.64 and 10.25% over the obtained figures at control treatment (no irrigation blocking) and blocking at booting stage. Ethephon application at elongation stage cause dwarfness of stem (Table 1) consequently, reduce development period and elongates the development of leaves resulting in larger leaves area (Evans and wardlaw, 1976). The response of flag leaf area to irrigation blocking treatments, significantly respond differently between the two studied cultivars. On another words although the two cultivars showed similar trend of response, the magnitude of response for each separate cultivar was obviously different. These results agree with those reported by Al-Hassan (2011) and kadom (2015).

Dry weight of flag leaf (g.):

Results in Table 3 indicated a significant difference between the two studied wheat cultivars in dry weight of flag leaf. IPA99 had heavier flag leaf (0.712 g.) relative to the other variety Abu-Ghraib-3 (0.667 g.). This might due to the influence of flag leaf area (Table 2), that contributes to the process of photosynthesis and dry matter accumulation. In the meantime, blocking of irrigation and ethephon spraying at elongation stage gave the heaviest flag leaf (0.811 g.) relative to both booting stage (0.639 g.) and the control treatment (0.519g.). This might due to the influence of leaf area at stages of treatments along with its effect on dry matter accumulation (Evans and wardlaw,1976). The interaction between the two studied factors was not significant.

Specific weight of flag leaf (g.cm^{-2}):

This character reflects leaf thickness, since, its related to leaf efficiency with regard to photosynthesis. Results in Table (4) showed insignificant difference between the two studied wheat varieties. Also, the interaction between cultivars and irrigation blocking- ethephon spraying stages was insignificant. In the meantime, spraying of ethephon to compensate the effect of irrigation blocking, recorded significant differences among stages. The heaviest flag leaf specific weight was expressed when irrigation blocking- ethephon spraying was applied at elongation stage (0.0193g.cm^{-2}). This response was significantly superior to the control treatment by 46.21% and to booting stage by 29.53%. This might be affected by that treatment superiority in flag leaf area (Table 2). These results are general agreement with Al-Hasaan, 2011.

Table 3: Dry weight of flag leaf (g.) as affected by the interaction between wheat cultivars and irrigation blocking-ethephon application stages

Cultivars	Irrigation blocking-ethephon application stages			Mean
	Control	Elongation	Booting	
IPA99	0.527	0.951	0.659	0.712
Abu-Ghraib-3	0.511	0.871	0.871	0.667
L.S.D$_{0.05}$				0.008
Mean	0.519	0.911	0.639	
L.S.D $_{0.05}$		0.048		

Table 4: Specific weight of flag leaf (g.cm^{-2}) as affected by the interaction between wheat cultivars and irrigation blocking-ethephon application stages

Cultivars	Irrigation blocking-ethephon application stages			Mean
	Control	Elongation	Booting	
IPA99	0.0131	0.0192	0.0149	0.0157
Abu-Ghraib-3	0.0132	0.0195	0.0149	0.0159
L.S.D$_{0.05}$				
Mean	0.0132	0.0193	0.0149	
L.S.D$_{0.05}$		0.0011		

Chlorophyll content:

Significant differences between the two tested wheat varieties and among irrigation blocking-ethephon spraying stages were detected in chlorophyll content (Table 5). IPA-99 cultivar significantly enjoyed higher chlorophyll content. Also, significantly higher chlorophyll content in flag leaf (46.36). This might due to its larger flag leaf area which indicates number of green cells and higher chlorophyll content in flag leaf was noticed when irrigation blocking-ethephon application was carried-out in elongation stage (48.29) rather than unblocking (44.73) or blocking at booting stage (41.91). The superiority of elongation stage blocking amount to about 15.22 and 7.95% relative the control and blocking at booting stage, respectively. This might reflect the fact that, irrigation blocking-ethephon spraying at elongation stage resulted in the largest flag leaf area (Table 2), which influences the chlorophyll content. In the meantime, the interaction between the two studied factors was significant. That significant interaction simply because of the magnitude of response of each tested variety that was different, although it had similar trend of response. Chlorophyll content of IPA99 variety was larger by 2.90, 8.57 and 7.29% than the respective values of Abu-Ghraib-3 variety under each of the three tested irrigation blocking-ethephon spraying treatments, respectively. These finding match true with those reported by Evans and Wardlow, 1976; Alhassan, 2011 and Kadom, 2015.

Tillers number (tiller.m^{-2})

Results in Table 6 showed that, the two tested varieties significantly varied in number of tillers over irrigation blocking treatments, where, IPA-99 variety significantly produced higher number of tillers (409.9 tiller.m^{-2}). This superiority, amount to 6.27% over the other variety (Abu-Ghraib-3). Irrigation blocking at elongation stage with foliar application of ethephon significantly encouraged the tillering capacity over the two tested cultivars (448.1 tillers.m^{-2}). That increase in tillering capacity amounted to 134.2 and 108.9% of the respective tillers numbers obtained at each of control treatment and irrigation blocking-ethephon spraying at booting stage, respectively. Prolifeciety of tillering at elongation stages might due to the effect of ethephon on auxins transmission through stem, consequently auxins accumulates at stem base buds and encourage tillering (Sachs and Hackett, 1972). The interaction between the two studied factors was not significant. The recent results are in agreement with those reported by Al-Tabbal *et,al*. 2006 and Hashim, 2006 and 2014.

Dry weight of plant after 95 days from sowing(g.)

Date in Table 7 illustrate that cultivars differed significantly in dry weight of plant after 95 days from sowing over irrigation blocking-ethephon spraying treatments. IPA-99 variety had significantly heavier plants (844.5 g.) relative to Abu-Ghraib-3 (798.6 g.). The superiority of IPA-99 variety in plant height, flag leaf area, dry weight of flag leaf and number of tillers might contribute to its superiority in above ground plant dry weight after 95 days from sowing (Tables 1,2,3,5 and 6). Also, irrigation blocking and ethephon foliar application at elongation stage, resulted in the heaviest above ground plant dry weight (878.0 g.) which surpassed the obtained figures from control and blocking-ethephon spraying at booting stage by 15.04 and 6.63%, respectively. This might be explained through the value of plant height, flag leaf area, flag leaf weight and number of tillers associated with this stages. The interaction between the tested cultivars and irrigation blocking treatment had not reached the level of significance. These results match with the finding of Al-Tabbal *et,al.* 2006 and Hashim, 2006 and 2014.

Table 5: Chlorophyll content as affected by the interaction between wheat cultivars and irrigation blocking-ethephon application stages.

Cultivars	Irrigation blocking-ethephon application stages			Mean
	Control	Elongation	Booting	
IPA99	42.51	50.28	46.31	46.36
Abu-Ghraib-3	41.31	46.31	43.16	43.54
Mean	44.73	48.29	41.91	
L.S.D$_{0.05}$				2.57
L.S.D$_{0.05}$		1.03		

Table 6: Tillers number (tiller.m^{-2}) as affected by the interaction between wheat cultivars and irrigation blocking-ethephon application stages

Cultivars	Irrigation blocking-ethephon application stages			Mean
	Control	Elongation	Booting	
IPA99	350.0	462.1	417.6	409.9
Abu-Ghraib-3	317.6	434.1	405.2	385.7
Mean	333.8	448.1	411.4	
L.S.D$_{0.05}$			7.92	
L.S.D$_{0.05}$		16.64		

Table 7: Dry weight of plant (g.) after 95 days from sowing as affected by the interaction between wheat cultivars and irrigation blocking-ethephon application stages

Cultivars	Irrigation blocking-ethephon application stages			Mean
	Control	Elongation	Booting	
IPA99	784.8	903.9	844.9	844.5
Abu-Ghraib-3	741.6	852.2	801.9	798.6
Mean	763.2	878.0	823.4	
$L.S.D_{0.05}$			30.23	
$L.S.D_{0.05}$	24.25			

Dry weight of plant after155 days from sowing (g.)

Data in Table 8 showed that, above ground plant dry weight after 155 days from sowing followed similar trend to the weight after 95 days from sowing, since, IPA-99 cultivar significantly enjoyed heavier dry weight. plant^{-1} (1819.0 g.) relative to Abu-Ghraib-3 (1726.0 g.), over irrigation blocking treatments. Also, over the two cultivars, irrigation blocking and ethephon foliar application at elongation stage significantly gave heavier dry weight of plant after 155 days from sowing (1973.0 g.). The interaction between the two studied factors had not reached the level of significance. These finding match true with those reported by Al-Tabbal *et,al.* 2006 and Hashim, 2014.

Crop growth rate (g.m^{-2}.day^{-1})

Table 9 summarizes the results of crop growth rate (g.m^{-2}.day^{-1}) as affected by wheat cultivar and irrigation blocking-ethephon foliar spraying treatments. Although, the difference between the two tested varieties in crop growth rate was limited (0.79 g.m^{-2}.day^{-1}), it had reached the level of significance. This value might be affected by the results of plant dry weight after 95 and 155 days from sowing, in which IPA-99 variety was superior. These results are in harmony with those reported by Hashim, 2014. Blocking irrigation at any of the studied growth stages was significantly superior to the control treatment over the two tested cultivars. In the meantime, the difference in crop growth rate values that obtained at elongation or booting stages was not significant. This might be affected by the results obtained for plant dry weight after 95 and 155 days from sowing. The interaction between the studied factors had not reached the level of significance. These findings agree with the results reported by Hashim,2014.

Relative growth rate (g. day^{-1}):

Results in Table 10 illustrated that neither cultivars nor the interaction between cultivars and irrigation blocking- ethephon spraying stages had reached the level of significance. The only significantly effects was recorded for the difference among irrigation blocking stages, where, blocking and ethephon spraying at elongation stage gave superior relative growth rate reached 124.07% of the respective value of control treatment. Meanwhile, irrigation blocking and ethephon spraying at booting stage was superior to the control by 126.9%. In the meantime, the difference in relative growth rate between blocking and elongation or booting stages was not significant. These results match with the finding of Andria,1997, Hashim,2014 and Kadom, 2015.

Table 8: Dry weight of plant after 155 days (g.) from sowing as affected by the interaction between wheat cultivars and irrigation blocking-ethephon application stages

Cultivars	Irrigation blocking-ethephon application stages			Mean
	Control	Elongation	Booting	
IPA99	1489.0	2045.0	1923.0	1819.0
Abu-Ghraib-3	1432.0	1901.0	1844.0	1726.0
Mean	1461.0	1973.0	1883.0	
$L.S.D_{0.05}$			76.90	
$L.S.D_{0.05}$		60.50		

Table 9: Crop growth rate (g.m^{-2}.day^{-1}) as affected by the interaction between wheat cultivars and irrigation blocking-ethephon application stages

Cultivars	Irrigation blocking-ethephon application stages			Mean
	Control	Elongation	Booting	
IPA99	11.74	19.4	17.96	16.25
Abu-Ghraib-3	11.51	17.48	17.37	15.46
Mean	11.63	18.26	17.67	
$L.S.D_{0.05}$			0.78	
$L.S.D_{0.05}$		1.14		

Table 10: Relative growth rate (g.m.day^{-1}) as affected by the Interaction between wheat cultivars and irrigation blocking-ethephon application stages

Cultivars	Irrigation blocking-ethephon application stages			Mean
	Control	Elongation	Booting	
IPA99	0.0106	0.0136	0.0137	0.0126
Abu-Ghraib-3	0.0109	0.0133	0.0138	0.0127
L.S.D$_{0.05}$				
Mean	0.0108	0.0134	0.0137	
L.S.D$_{0.05}$		0.0007		

In summary: over irrigation blocking-ethephon spraying treatment the wheat cultivar IPA-99 was significantly superior to Abu-Ghraib-3 in plant height, flag leaf area, dry weight of flag leaf, specific weight of flag leaf, chlorophyll content, tillers number and dry weight of above ground plant parts after 95 and 155 days of sowing. Meanwhile, the difference between the two cultivars had not reached the level of significance in crop growth rate and relative growth rate. Irrigation blocking and ethephon spraying at elongation stage, although significantly increased plant height, flag leaf area, dry weight of flag leaf, specific weight of flag leaf, chlorophyll content, tillers number/plant and dry weight of plant after 95 and 155 days, the difference in crop growth rate and relative growth rate between elongation and booting stages was insignificant. In conclusion, it might be concluded that ethephon foliar application might compensate the suppressing effect of irrigation blocking through modifying plant physiology and regulate the transmission of auxins that lead to reduction in water need and an increase in wheat plant growth.

REFERENCES

Abd EL-Ghany ,H.;M.Abd EL-Salam; M.Hozyen and M.Afifi.**2012**. Effect of deficit irrigation on some growth stages of wheat. Journal of Applied Sci.Res. **8(5)**:2776-2784.

AL-Hassan,M.F.H. **2011**. Understanding of tilleringIn different wheat cultivars as influenced by seeding rats and nitrogen levels and its relationship to grain yield and its components.Ph,D. dissertation .Field crops dept college of Agriculture, Baghdad Univ. .pp143.

Allahverdiyer, T. **2015**. Effect of drought stress on some physiological traits of durum (*Triticum durum*) and bread (*Triticum aestivum*,L.) wheat genotypes. J. Stress Physio. & Bioche,**11(1):** 29-38.

AL-Tabbal, J.,O.M.Kafawin, and J.Y.Ayad. **2006**. Influence of water stress and plant growth regulator on yield and development of two durum wheat "*Triticum tirgidum,* L. var.durum" cultivars. Jordan J.Agric.Sci.**2(2):**28-37.

Amer,S.A.A. **2004**. Response of some bread wheat varieties to water stress under field conditions. Ph. D. dissertation, Field Crops Dept., College of Agriculture, Baghdad Univ.

Andria, R.; F.Q. Chiaranda; A. Lavini and M. Mori. **1997**. Grain yield and water consumption of ethephon- treated corn under different irrigation regimes. Agron. J.

Anonymous. **2007**. National coordinated wheat programme. http://www.parc.gov.pk/wheat .html. Pakistan Agriculture Research Council.

Evans, L.T. and I.F. Wardlaw. 1976. Aspects of the comparative physiology of grain yield in cereals. Aust.J. Agron.,**28**: 301-359.

Farhood ,A.N. **2014**. Effect of phosphorus fertilizer, water stress and method of sowing on growth and yield of wheat *"Triticum aestivum*,L.". MSc. thesis, College of Agriculture, Babylon Univ.

Hamada, A.M. **2000**. Amelioration of drought stress by ascorbic acid, thiamin or aspirin in wheat plants .Indian Journal of Plant Physiology, **5(4)**: 358-364.

Hashim, M.A. **2006**. Effect of ethephon and nitrogen on growth, yield and quality of different soft wheat varieties "*Triticum aestivum,*L." MSc. thesis, Field Crops Dept., College of Agriculture, Baghdad Univ.

Hashim,M.A. **2014**. Response of wheat "*Triticum aestivum*,L". to the ethephon and boron. Ph. Dissertation, .Field Crops Dept, College of Agriculture , Baghdad Univ.

Hunt, R. **1982**. Plant Growth Curves: The Functional Approach to Plant Growth Analysis. London, Edward Arnold. PP: 284.

Kadom, M.N. **2015**. Effect of regulation of source – sink relationship on the accumulation of assimilates and grain filing of some bread wheat cultivars. Ph D. Dissertation, Field Crops Dept, College of Agriculture, Baghdad. Univ.

Kashiani, P,G. Saleh; M.Osman, and D.Habibi. **2011**. Sweet corn yield response to alternate furrow irrigation methods under different planting densities in a semi-arid climatic condition.Afr. J.Agric.Res.**6** **(4)**:1032-1040.

Iqbal,S.A.Bano, and N.Liyas. 2010. Drought and abscisic acid (ABA) induced changes in protein and pigment contents of four wheat "*Triticum aestivum*,L." accessions .J. Agric. Res. **48(1)**:1-12.

Mansour, H.N. **2013**. Response of barly "*Hordeum vulgar*, L." to water stress. MSc. thesis, College of Agriculture Babylon. Univ.

Maqbool; M.M.; A. Ali, T. Ulhag; M.N.Majeed and D.J.Lee. **2015**. Response of spring wheat *"Triticum aestivum,*L" to induced wheat stress at critical growth stages .Research Article. Sarhad .J. of Agric. **31(10)** :53-58

Mushtaq, T; S. Hussain; M. Bukhash,J.Iqbal and T.Khaliq.2011. Evaluation of two wheat genotypes performance under drought conditions at different growth stages .Crop &Environment. **2 (2)**: 301-314.

Sachs,R.M. and W.P. Hackett. **1972**. Chemical inhibition of plant height. Hort.Sci.**7**:440-447.

Shamsi, K; S. Kobraee and B.Rasekhi .**2011**. Variation of yield components and some morphological traits in bread wheat grown under drought stress. Annals of Biological Research **2(2)**:372-377.

Shanmugam,S., K.H.Kjaer, C.O.Ottosen ,E.Rosengvist, D.Kumarishama and B.Wollen Weber. **2013**. The alleviating effects of elevated CO_2 on heat stress susceptibility of two wheat "*Triticum aestivum*, L." cultivars. .Journal of Agron&Crop Sci.**199**:340-350.

Shekoof, A. and Y. Emam. **2008**. Plant growth regulator (Ethephon) alters Maize (*Zea mays*, L.) growth, water use and grain yield under water stress. Journal of Agron.**7 (1):** 41-48.

Steel, R.G.D. and J.H. Torrie. Principles and Procedures of Statistics. Mc Graw-Hill book company, New York, Toronto, London.

Thomas,H. **1975**. The growth response to weather of simulator vegetation swards of a single genotype of "*lolium perenne*" J.Agric.Sci.Camb. **84**: 333-343.

Thomas,R.J. **1980**. Cell elongation in hepatics: the seta system. Bulletin of the Torrey botanical club **107**: 339-345.

Weldearegay,D.F., F.Yan, D.Jiang ,and F.Liu. **2012** .Independent and combined effect of soil warming and drought stress during anthesis on seed- set and grain yield in two spring wheat varieties .J.Agron&Crop Sci. **198** :245-253.

Zwart, S.J.andG.M.Bastiaanssen. **2004**. Review of measured crop wheat productivity values for irrigated wheat, rice, cotton and maize .Agric. and Water Manage. **69**:115-133.

الملخص العربي

إستجابة صنفان من القمح لمنع الري والرش بالإيثافون

نجاة حسين زبون، شذى عبد الحسن أحمد وحيدر عبد الرازق باقر
قسم المحاصيل - كلية الزراعة - جامعة بغداد

نفذت تجربة حقلية خلال مواسم الشتاء ٢٠١٠/٢٠١١ و٢٠١١/٢٠١٢ في المزرعة التجريبية لجامعة بغداد. كانت أهداف الدراسة تقدير دور كل من منع الري وتعويضه بالرش بمنظم النمو الإيثافون على نمو اصناف القمح. شملت الدراسة صنفان من القمح وهما IPA-99 وابو غريب-٣. تمت معاملات منع الري وتعويضه بالرش بالإيثافون في مراحل الاستطالة والحبل. استخدم تصميم القطع المنشقة حيث خصصت القطع الرئيسية لمعاملات منع الري ورش الايثافون، بينما خصصت القطع الفرعية للأصناف. تم عرض البيانات كمتوسط موسمي الزراعة حيث ان التفاعل بين المعاملات المدروسة والسنوات لم يكن معنوياً. كمتوسط لمعاملات منع الري والرش الإيثافون أمتاز صنف القمح IPA-99 بتفوقه على الصنف أبو غريب-٣ في صفات إرتفاع النبات ومساحة الورقة العلم والوزن الجاف للورقة العلم والوزن النسبي للورقة العلم ومحتوي الكلوروفيل وعدد الخلفات والوزن الجاف للعرش بعد ٩٥ يوم وبعد ١٥٥ يوم من الزراعة. بينما لم يصل الفرق بين الصنفين إلى مستوي المعنوية في صفات معدل النمو المحصولي والمعدل النسبي لنمو المحصول. وقد نتج عن منع الري ورش الإيثافون في مرحلة الإستطالة زيادة معنوية في أرتفاع النبات و مساحة ورقة العلم والوزن الجاف للورق العلم والوزن النسبي للورقة العلم والمحتوي من الكلوروفيل وعدد الخلفات للنبات والوزن الجاف بعد ٩٥ و ١٥٥ يوم من الزراعة الا أن الفرق في كل من معدل النمو المحصولي والمعدل النسبي لنمو المحصول بين كل من مرحلتى الإستطالة والحبل لم تصل لمستوي المعنوية .ومن الممكن استنتاج ان الرش بالإيثافون يعوض التأثير الضار لمنع الري من خلال تعديل فسيولوجيا النبات وتنظيم أنتقال الاوكسينات مما ينتج عنه خفض في إحتياج النبات للماء وزيادة نمو القمح.