Response of some vegetative growth, yield and yield components characters of cotton for Absicic acid spraying under effect of water stress

Jassim J. Jader [1] **Haider T. Hussein[1]** **Zaid J. Hahem[2]**
Assistant Professor **Lecturer** **Assistant Lecturer**
[1]Al-Musaib Technical college / Al-Furat al-awsat Technical University
[2] AL-Musayyib Technical Institute / AL-Furat AL-Awast Technical University
Email: jasimalnuaimi11@gmail.com

Abstract:

Field experiment was carried out in Babylon / AL-Musseib during (2017) season to study the effect of leaves spraying with Multiple ABA concentrations on some characters of vegetative growth and yield of Lashata cotton cultivar under the effect of water stress.

Randomized Complete Block Design was used with three replicates according to split plot arrangement. The study included four irrigation periods (10,15, 20, 25 days) between each irrigation time (Main Plots) while ABA spray concentrations (0,40,80,120) µM occupy the (Sub plots). The results showed presence of significant differences in studied characters with ABA spray, So 80 µM of ABA predominate and gave the highest plant height 93.07 cm and vegetative branches number 4.12 branches.plant^{-1}, total boll number 13.35 bolls. Plant^{-1} , seed cotton yield 34.02 gm. Plant^{-1}, also there is significant differences among irrigation periods, as irrigation treatment each 10 days gave the highest average plant height 91.54 cm , number of sympodial branches 12.77 branch.plant^{-1} , number of open bolls 12.74 bolls . plant^{-1}, seed number per bolls 24.95 seed.bolls^{-1} and seed cotton yield 33.75 gm.plant^{-1}. Interaction between irrigation periods and ABA spray concentration had a significant effect on the studied characters whereas irrigation treatment of every 10 days with ABA sprays of 80 micromole concentration.

Key words : Cotton , Irrigation periods , ABA spray , plant height , cotton yield

استجابة بعض صفات النمو الخضري وحاصل القطن ومكوناته لحامض الابسسيك تحت تأثير الاجهاد المائي

جاسم جواد جادر[1] حيدر طالب حسين[1] زيد هاشم جاسم[2]

استاذ مساعد مدرس مدرس مساعد

قسم الانتاج النباتي/المعهد التقني المسيب/ جامعة الفرات الاوسط التقنية

البريد الالكتروني:jasimalnuaimi11@gmail.com

المستخلص:

نفذت تجربة حقلية في منطقة مشروع المسيب محافظة بابل خلال الموسم (2017) لمعرفة تأثير الرش الورقي لعدة تراكيز من حامض ABA في بعض صفات النمو الخضري وحاصل القطن بتأثير الاجهاد المائي للصنف لاشاتا استعمل تصميم القطاعات العشوائية الكاملة RCBD وبثلاث مكررات وفق ترتيب الالواح المنشقة. تضمنت التجربة اربعة مدد للري (10 و 15 و 20 و 25) يوم بين رية واخرى ومثلت الالواح الرئيسة، بينما احتلت تراكيز رش حامض ABA (0 و 40 و 80 و 120) مايكرو مول الالواح الثانوية. اظهرت النتائج وجود فروق معنوية عند رش حامض ABA في الصفات المدروسة اذ تفوق تركيز الرش 80 مايكرو مول واعطى اعلى ارتفاع للنبات 93.07 سم وعدد افرع خضرية 4.12 فرع.نبات$^{-1}$ وعدد جوز كلي 13.35 جوزة . نبات$^{-1}$ وحاصل القطن الزهر34.02 غم . نبات$^{-1}$ كذلك اظهرت النتائج وجود فروق معنوية بين مدد الري واعطت معاملة الري كل 10 ايام اعلى متوسط لارتفاع النبات 91.54 سم وعدد افرع ثمرية 12.77 فرع . نبات$^{-1}$ وعدد جوز متفتح 12.74 جوزة نبات $^{-1}$ وعدد بذور لكل جوزة 24.95 بذرة جوزة$^{-1}$ وحاصل قطن الزهر 33.75 غم . نبات$^{-1}$ كان لتداخل مدد الري وتراكيز رش حامض ABA تأثير معنوي في الصفات المدروسة وتفوقت معاملة الري كل **10** ايام مع رش الحامض بتركيز 80 مايكرو مول.

كلمات مفتاحية :- القطن ، مدد الري ، رش ABA ، ارتفاع النبات ، حاصل القطن

Introduction:

Cotton crop is one of the important industrial crops which is used in several industries for example yarn ,woven fabric , soap and papers , it contains fiber ranged from (35-42%) and its seeds contain vegetable oil of about (16-24%). Cotton crops also used as cows forage, mixed with other forage materials and its protein content is about (28-34%). Water stress is considered as a biotic stress which has passive effect on plant growth and developments, and may reduce yields more than 60% [1]. Cotton plant is one of indeterminate growth plants which give abundant vegetative growth on expense of fiber yields. This result from a number of environmental factors such as : soil moisture rate which sometimes cause lodging state and increasing flowers fall down and new bolls .This problem can be overcome by using spray of Absicic

acid (ABA) which play an important role in modification of plant shape and organize the physiological balance between vegetative growth and flowering increase the plant resistance to drought condition , reduce the percentage of flowering fall down bolls ,and increase fiber yield (13). It has an important role in stoma closure control when there is water deficiency so reduced losses from transpiration and lead to increase antioxidant enzymes efficiency, increase roots diffusion and water and nutrients elements absorption efficiency (5) . (9) referred the significant effect of water stress on total bolls number per plant for cotton yield , as grown plants gave highest boll (13.07) bolls. $Plant^{-1}$ when irrigated every 10 days while the number dropped to (11.35) bolls. $Plant^{-1}$ under every 20 day and he explain that by reduction in humidity of levels for less than 50% in field capacity. (8) showed reduction in boll weight and seed cotton yield by increasing irrigation abstinence periods from 7 days on 14 day explain this by water stress level from 100% to 50% in field capacity. Study results of (11) showed that increase ABA concentration from 0 to 40 and 80 $mg.l^{-1}$ under water stress condition lead to increase in vegetative branches number from 2.73 to 3.17 and 3.75 $branch.plant^{-1}$, increase in boll number from 10.38 to 12.79 and 12.86 boll. $Plant^{-1}$, and increase in cotton yield fiber per plant from 6.36 to 7.83 and 7.52 gm. $Plant^{-1}$. The results of (10) study clarified the presence of significant increase in boll weight by 15.62% by using ABA spray at concentration of 10^{-6} M when compared by non-sprayed plant. The aim objectives of this study is to known the effect of ABA spray concentration and irrigation periods in some cotton growth characters and yield for Lashata cultivar.

Materials and Methods :

Field experiment was carried out in Babylon / AL-Musseib during (2017) season to study the effect of leaves spray with Multiple ABA concentrations on some characters of vegetative growth and yield of cotton cultivar Lashata under effect of water stress.

Randomized Complete Block Design had been used with three replicates according to split plot arrangement. The study included 4 irrigation periods (10,15,20,25 day) between irrigate and another (Main Plots) , while ABA spray concentra and tions and (0,40,80,120) micromole occupy the (Sub plots).

Field soil was ploughed two times by the locale plow , softening and dividing it into plots at an area (4 X5) m . seeds had been implanted in 16/4 / 2017, by putting (4-5) seeds in each hole , at a depth of 3-5 cm , and the distance between one hole & other was 25 cm , and between one line and other was 75 cm , then it was reduced into one plant after 10 days of emergence (1). Then Urea fertilizer (N% 46) of about 280 $kg.ha^{-1}$ was added at 2 times , the first was added after thinning directly and the second was added at the beginning of flowering, superphosphate of 160 $kg.ha^{-1}$ was also added all at once at planting (2). The total number of experimental units was (48) unit and a distance of 1.5 meter between one plot and other was left to prevent interaction of irrigation periods and ABA concentrations among plots. Field soil

analysis had been done before planting and the physiological & chemical characters are shown in the following Table (1):

Table 1: some of physicals and chemicals characters of soil pre planting

Measurement unit	Value	Character
%	43.7	sand
%	24.2	Silt
%	32.1	clay
Clayey mixture	مزيجية طينية	texture
gm.kg soil^{-1}	14.3	Organic mater
-------	7.81	PH
dc semis. m^{-1}	4.43	EC
%	20.7	Lime
mg.kg soil^{-1}	12	Available phosphor
mg.kg soil^{-1}	34	Available nitrogen
mmole.L^{-1}	12.1	Calcium
mmole.L^{-1}	4.5	Carbonate
mmole.L^{-1}	1.2	Sulfur

ABA spray solution was prepared according to the needed concentrations and they were dissolved in 2.5 ml of ethyl alcohol (50%). ABA was sprayed on the vegetative part (at the beginning of bolls emergence stage and after 60 days of planting) at early morning , until full wetting and falling a first drop from plant. Small amount of wetted material (wash powder) was added to the solution to minimized water surface tension and ensured full irrigation. Spraying solutions were prepared as following :-

1- pray with 0 concentration Mmole (only distill water).

2- spray with 40 Mmole concentration (10 mg of ABA dissolved in 1 L of distill water) .

3- spray with 80 Mmole concentration (20 mg of ABA dissolved in 1 L of distill water) .

4- spray with 120 Mmole concentration .(30 mg of ABA dissolved in 1 L of distill water) .

Then plants were taken each plot and from the middle lines randomly, to study the vegetative growth characters and yield , and each plot was harvested alone when the percentage of opened bolls reach (50 - 60%) firstly in (4-5 /10) and secondly in (23-24 / 11) . The samples were ginning in ginnery universal company of industrial crops.

The studied characters :

1- plant height (cm): measurement was done after the last harvest by taking 10 plants from ground level till the highest point of main stem of plant then the average was calculated. **2-** Number of vegetative growth(branch.Plant^{-1}) the number was calculated for 10 plants then the average for each plant.

3- Number of sympodial branches . plant^{-1} : they were calculated for 10 plants then the average for each plant.
4- Number of opened bolls. plant^{-1}: it was calculated by summation of opened & unopened bolls of 10 plants randomly, the result was divided on plant number.
5- Total number of bolls. plant^{-1}: it was calculated by addition of total number of closed & opened bolls per plant of 10 plants then dividing the result on plant number.
6- Boll weight (gm): is the weight of cotton flower in gms per one boll, calculated from flowering cotton yield of 20 closed and opened boll dividing it on bolls number.
7- Number of seed. boll^{-1}: is the number of seeds in each one boll , and it was calculated by dividing seeds number of 20 closed & opened bolls on bolls number.
8- Seed cotton yield.plant^{-1} (gm): it represent seed cotton yield for the first & second harvest for 10 plants and it was selected randomly from middle lines for each experiment unit then divided on plant number.
9- lint cotton yield . plant^{-1} (gm): it represent cotton hair yield for the first and second harvest for 10 plants and it was selected randomly from middle lines for each experimental unit then dividing yield on plant number.
Analysis of data was done by using Genestat program and Means was compared according to least significant differences 0.05 (15).

Results and discussion:

1- Plant height (cm)

The data in table 2, refer to presence of significant difference among ABA concentrations and irrigation periods , and their interaction with plant height. ABA concentration of 80 Mmol (C_2) gave highest average 93.07 cm which is not differ significantly from a concentration of 120 Mmol , while the treatment of distill water spray (C_0) gave the least average which reach 79.38 cm . this difference may belong to the effect of ABA on increase in Gibberellin formation and stimulation of some enzymes that help in Gibberellin formation in site the plant (11) and increase cell division in sub apical meristem area which in turn lead to increase stem height (12) This result agree with what was related by Mohammedi et al. (2014) so they referred to preponderance of ABA concentration of 80 mg.L^{-1} when compared with non spraying.
The study, also showed predominance of irrigation treatment each 10 days (I_0) and gave highest average of 91.54 cm while irrigation treatment each 25 day gave least average which reach 81.59 cm . This difference is belong to the essential role of water in absorption and transport of the main nutritional factors, such as nitrogen and phosphor which are important in amino acid and protein formation , the essential component in cell synthesis , this result agree with (8) study so they refer to reduction in plant height of cotton crop by increasing irrigation periods from 7 days to 14 days between one irrigate and other.

Regarding the interaction , spray with ABA concentration of 80 M mol & irrigation every 10 day gave highest average 99.00 cm while distill water spray and every 25 days irrigation gave least average 74.11 cm.

Table2: Effect of ABA concentrations and irrigation periods and their interaction in plant height (cm)

Irrigation periods(day) / ABA concentration	10 I_0	15 I_1	20 I_2	25 I_3	Average (C)
C_0(0)	83.15	81.07	79.18	74.11	79.38
C_1(40)	86.67	85.95	85.21	78.25	84.02
C_2(80)	99.00	95.58	91.17	86.51	93.07
C_3(120)	97.33	94.61	92.64	87.47	93.01
LSD 0.05	2.59				1.31
Average (I)	91.54	89.30	87.05	81.59	
LSD 0.05	1.52				

2- Vegetative branches number. plant $^{-1}$:

The data in table 3, refer to presence of significant difference among ABA concentrations and irrigation periods, and their interaction on this character. ABA concentration of 80 Mmol (C_2) gave highest average 4.12 branch which is not differ significantly from a concentration of 120 Mmol , while the treatment of distill water spray (C_0) gave the least average which reach 2.50 branch. Plant^{-1}. This may be explained by the role of ABA in vegetative growth increase due to betters allowance of sun light to enter cotton plant and for longer period. It may also decrease bolls falling and reduce mold effect on boll. These results agree with (10) study as refer to ABA effect in increasing vegetative branches at concentration of 10^{-6} molar when compared with non spraying.

The table , also showed predominance of irrigation treatment each 10 days (I_0) and gave highest average reach 4.40 branch while irrigation treatment each 25 day gave least average which reach 2.62 branch .reduction in vegetative branches number is due to that water stress lead to reduction in photosynthesis products as a result of reduction in plant height and branches number, and this cause reduction in assimilates materials of newly formed branches so there will be less chance for its survival. This result agree with that of (12) as they found that cotton plants exposure to water stress for 15 days between one irrigation and other led to vegetative branches number reduction.

Regarding the interaction , spray with ABA concentration of 80 M mol & irrigation every 10 day (C_2I_O) gave highest average 5.29 branch while distill water spray and every 25 days irrigation gave least average 1.97 branch.

Table 3: Effect of ABA concentrations and irrigation periods and their interaction in vegetative branches number. plant^{-1}

Irrigation periods (day) / ABA concentration	10 I_0	15 I_1	20 I_2	25 I_3	Average (C)
C_0(0)	3.01	2.87	2.17	1.97	2.50
C_1(40)	4.50	3.48	3.00	2.93	3.48
C_2(80)	5.29	4.59	3.67	2.88	4.11
C_3(120)	4.80	4.11	3.20	2.72	3.71
LSD 0.05	0.37				0.21
Average (I)	4.40	3.76	3.01	2.62	
LSD 0.05	0.09				

3- Number of sympodial branches (branch. Plant^{-1})

The data in table 4, refer to presence of significant difference among ABA concentrations and irrigation periods, and their interaction on this character. ABA concentration of 80 Mmol (C_2) gave highest average 12.76 branch. plant^{-1} which is not different significantly from a concentration of 120 Mmol , while the treatment distill water spray (C_0) gave the least average which reach 10.40 branch.Plant^{-1}. Increase in sympodial branches may belong to the role of ABA in reduction of auxin levels , which lead to apical dominance , and prevent side branches formation , so ABA increase sides branches activity by stimulation of some internal hormones in plant (3), and by provision of assimilate materials which support growth and production sympodial branches . his result agree with that of (18) as they showed that spraying with ABA of 60 mg.L^{-1}concentration lead to increase sympodial branches number of cotton crop when compared with non-spraying.

The study, also showed predominance of irrigation treatment each 10 days (I_0) and gave highest average reach 12.77 branch while irrigation treatment each 25 day gave least average which reach 10.33 branch. This reduction in sympodial branches number with reduced in irrigation water quantities may be due to shortening of the period from planting to 100% flowering. Also reduction in dry matter accumulation (due to water stress) as a result of reduction in photosynthesis products will increase the competition between the stem (which go in rapid elongation) and side branches this is negatively reflected on their number.These findings agreed with (9).

Regarding the interaction , spray with ABA concentration of 80 M mol & irrigation every 15 day (C_2I_1) gave highest average 13.85 branch while distill water spray and every 25 days irrigation (C_0I_3) gave least average 8.78 branch.plant^{-1}.

Table 4: Effect of ABA concentrations and irrigation periods and their interaction in number of sympodial branches . plant^{-1}.

Irrigation periods (day) / ABA concentration	10 I_0	15 I_1	20 I_2	25 I_3	Average (C)
C_0(0)	12.25	10.82	9.74	8.78	10.40
C_1(40)	12.81	12.25	11.10	10.04	11.55
C_2(80)	13.26	13.85	12.37	11.58	12.76
C_3(120)	12.77	13.29	12.00	10.91	12.24
LSD 0.05	0.90				0.44
	12.77	12.55	11.30	10.33	
LSD 0.05	0.58				

4- Number of open bolls (bolls . plant^{-1}) :

The data in table 5, refer to presence of ignificant difference among ABA concentrations and irrigation periods, and their interaction on this character. ABA concentration of 80 Mmol (C_2) gave highest average 11.91 boll.plant^{-1}, while the treatment distill water spray (C_0) gave the least average which reach 8.85 boll.plant^{-1} The cause of increase in opened bolls number can be due to ABA effect as it increase the number of both sympodial & vegetative branches (Table 3 and 4) so the vegetative growth allow to direct the metabolism toward sympodial branches & supplying bolls with artificial nutrients and this is reflected on increase in opened bolls number.

The study , also showed predominance of irrigation treatment each 10 days (I_0) and gave highest average reach 12.74 boll.plant^{-1} while irrigation treatment each 25 day gave least average which reach 8.75 boll.plant^{-1} . This difference is belong to the essential role of water in absorption and transport of the main nutritional factors, such as nitrogen and phosphor which are important in amino acid and protein formation , which is essential for sympodial branches formation & flowering, as a result opened bolls number increase , this result agree with the (14) as they found that water stress during flowering lead to reduction in opened bolls number.

Regarding the interaction , spray with ABA concentration of 80 M mol & irrigation every 10 day (C_2I_0) gave highest average 14.04 boll.plant^{-1} while distill water spray and every 25 days irrigation (C_0I_3) gave least average 7.36 boll.plant^{-1}.

Table 5: Effect of ABA concentrations and irrigation periods and their interaction in number of open bolls . plant^{-1}

Irrigation periods (day) / ABA concentration	10 I_0	15 I_1	20 I_2	25 I_3	Average (C)
C_0(0)	10.57	9.63	7.82	7.36	8.85
C_1(40)	12.89	10.66	9.43	8.40	10.35
C_2(80)	14.04	12.36	11.23	10.01	11.91
C_3(120)	13.46	11.88	11.01	9.23	11.40
LSD 0.05	0.84				0.43
Average (I)	12.74	11.14	9.88	8.75	
LSD 0.05	0.48				

5- Number of total bolls (bolls . plant^{-1}) :

The data in table 6, refer to presence of significant difference among ABA concentrations and irrigation periods, and their interaction on this character. ABA concentration of 80 Mmol (C_2) gave highest average 13.35 boll.plant^{-1}, while the treatment distill water spray (C_0) gave the least average which reach 10.27 boll .plant^{-1}. This may belong to ABA effect as it increase sympodial branches number (Table 4) and supply the growing bolls with artificial nutrients which reduce its falling. This result agree with that of (17) who refer to increase in total number of bolls in plant by spraying it with ABA of 40 mg.L^{-1} concentration when compared with abstinence of spray.

The table, also showed predominance of irrigation treatment each 10 days (I_0) and gave highest average reach 14.14 boll.plant^{-1} while irrigation treatment each 25 day gave least average which reach 10.36 boll.plant^{-1} . The cause may be the positive role of water in increasing the total dry matter and this obvious through increase in sympodial branches number(Table 4) , as a result , the total number of bolls is increased. this result agree with Saeidi and Abdoli (2016) study as they found that water stress during flowering stage can lead to reduction in total bolls number. Regarding the interaction , spray with ABA concentration of 80 M mol and irrigation every 10 day (C_2I_0) gave highest average 15.58 boll.plant^{-1} while distill water spray and every 25 days irrigation (C_0I_3) gave least average 8.90 boll.plant^{-1}.

Table 6: Effect of ABA concentrations and irrigation periods and their interaction in number of total bolls . plant^{-1}

Irrigation periods (day) / ABA concentration	10 I_0	15 I_1	20 I_2	25 I_3	Average (C)
C_0(0)	12.18	10.62	9.36	8.90	10.27
C_1(40)	14.04	11.90	10.85	9.99	11.69

C_2(80)	15.58	13.46	12.73	11.63	13.35
C_3(120)	14.76	12.83	12.77	10.92	12.82
LSD 0.05	0.78				0.44
Average (I)	14.14	12.20	11.43	10.36	
LSD 0.05	0.22				

6- Boll weight (gm) :

The data in table 7 , refer to presence of significant difference among ABA concentrations and irrigation periods , and their interaction on this character. ABA concentration of 120 Mmol (C_3) gave highest average 3.31 gm, while the treatment distill water spray (C_0) gave the least average which reach 2.92 gm . This may be due to ABA role in improvement of engineering shaped plant leaf and increase in its exposure to light as this is reflected to positively on increase chlorophyll synthesis, which increase the efficiency of photosynthesis. This character is positively corrected with dry matter increment. This result agree with that of (10) who refer to effect ABA 10^{-6} M concentration in increasing boll weight significantly by 15.62% compared with non spraying.

The table, also showed predominance of irrigation treatment each 10 days (I_0) and gave highest average reach 3.59 gm while irrigation treatment each 25 day gave least average which reach 2.74 gm . The cause may be in reduce boll weight is due to that water stress lead to reduction water arrival and nutrients to boll throw duration period this cause reduction in assimilates materials from source to sink because reduce leaf area so there will be boll weight. This result agree with that of Hassanpour et al (8) study as they found reduction boll weight by increasing irrigation periods from 7 to 14 days between irrigation and other.

Regarding the interaction , spray with ABA concentration of 120 M mol and irrigation every 10 day (C_3I_0) gave highest average 3.99 gm while distill water spray and every 25 days irrigation (C_0I_3) gave least average 2.63 gm.

Table 7: Effect of ABA concentrations and irrigation periods and their interaction in boll weight (gm)

Irrigation periods (day) / ABA concentration	10 I_0	15 I_1	20 I_2	25 I_3	Average (C)
C_0(0)	3.03	3.24	2.75	2.64	2.92
C_1(40)	3.53	3.44	2.87	2.78	3.15
C_2(80)	3.80	3.42	3.02	2.91	3.29
C_3(120)	3.99	3.57	3.05	2.63	3.31
LSD 0.05	0.60				0.30
Average (I)	3.59	3.42	2.92	2.74	
LSD 0.05	0.36				

7- number of seeds . boll^{-1}

The data in table 8, refer to presence of significant difference among ABA concentrations and irrigation periods , and their interaction on this character. ABA concentration of 80 Mmol (C_2) gave highest average 23.89 seed. boll^{-1}, while the treatment of distill water spray (C_0) gave the least average which reach 21.12 seed . boll^{-1}. this increase may be explained by ABA role in increase of sympodial brabches (Table 4) and total bolls number (Table 6) in addition to photosynthesis products transport from the source to the sink due to increase of plant leaf surface area. These findings are compatible with results of Khan et al. (2016) as they showed that ABA spray with 10^{-6} molar concentration lead to significant increase in seeds noumber per boll when compared with absence of spray.

The table , also showed predominance of irrigation treatment each 10 days (I_0) and gave highest average reach 24.95 seed.boll^{-1} while irrigation treatment each 25 day gave least average which reach 20.88 seed.boll^{-1} ., in this result agree with Hasanpour et al. (2015) study so they refer to reduction in seeds number for ball of cotton crop by increasing irrigation periods from 7 days to 14 days between one irrigate & other.

Regarding the interaction , spray with ABA concentration of 80 M mol & irrigation every 10 day (C_3I_0) gave highest average 26.58 seed.boll^{-1} while distill water spray and every 25 days irrigation (C_0I_3) gave least average 19.78 seed.boll^{-1}.

Table 8: Effect of ABA concentrations and irrigation periods and their interaction in number of seeds.boll^{-1} .

Irrigation periods (day) / ABA concentration	10 I_0	15 I_1	20 I_2	25 I_3	Average (C)
C_0(0)	22.74	21.51	20.45	19.78	21.12
C_1(40)	23.96	22.90	21.55	20.51	22.23
C_2(80)	26.58	24.94	22.27	21.75	23.89
C_3(120)	26.52	24.88	21.93	21.48	23.70
LSD 0.05	0.76				0.42
Average (I)	24.95	23.56	21.55	20.88	
LSD 0.05	0.24				

8- seed cotton yield (gm.plant^{-1}) :

The data in table 9 , refer to presence of significant difference among ABA concentrations and irrigation periods , and their interaction on this character. ABA concentration of 80 Mmol (C_2) gave highest average 34.02 gm , while the treatment distill water spray (C_0) gave the least average which reach 26.80 gm . flower cotton yield increment can be due to ABA effect in yield component increase such as total boll number (Table 6) and boll weight (Table 7) , and this is reflected positively on flowering cotton yield. Then findings are compatible with these of (11) as they refered to increase in flowering cotton yield by spraying with 80 mg.L^{-1} ABA concentration when compared with non spraying.

The result , also showed predominance of irrigation treatment each 10 days (I_0) and gave highest average reach 33.75 gm while irrigation treatment each 25 day gave least average which reach 27.74 gm . this reduction in seeds cotton yield with reduced irrigation water quantities may be due to one or more in yields components , such as opened bolls number reduced (Table 5) and boll weight (Table 7) referd to reduced seed cotton yield., in this result agree with (17) study so they referand to reduction in seed cotton yield by increasing irrigation periods from 7 days to 14 days between one irrigate and other.

Regarding the interaction , spray with ABA concentration of 80 M mol & irrigation every 10 day (C_3I_0) gave highest average 37.10 gm while distill water spray and every 25 days irrigation (C_0I_3) gave least average 22.93 gm.plant^{-1}.

Table 9: Effect of ABA concentrations and irrigation periods and their interaction in seed cotton yield (gm.plant^{-1})

Irrigation periods (day) / ABA concentration	10 I_0	15 I_1	20 I_2	25 I_3	Average (C)
C_0(0)	29.26	28.73	26.27	22.93	26.80
C_1(40)	32.01	31.88	31.03	25.64	30.14
C_2(80)	37.10	35.59	32.82	30.59	34.02
C_3(120)	36.65	34.59	31.94	31.81	33.75
LSD 0.05	2.01				1.09
Average (I)	33.75	32.70	30.51	27.74	
LSD 0.05	0.90				

9- lint cotton yield (gm . plant^{-1}):

The data in table 10 , refer to presence of significant difference among ABA concentrations and irrigation periods , and their interaction on this character. ABA concentration of 80 Mmol (C_2) gave highest average 7.12 gm.plant^{-1} , while the treatment distill water spray (C_0) gave the least average which reach 6.13 gm.plant^{-1} , this increment in lint cotton yield may belong to ABA role in yield components increase including total bolls number (Table 6) and boll weight (Table 7) and this lead to increase in lint cotton yield . these results agree with (11) study as they refered to increase in lint cotton yield on spraying with 80 mg.L^{-1}ABA , when compared with spray abstinence.

The result , also showed predominance of irrigation treatment each 10 days (I_0) and gave highest average reach 7.26 gm while irrigation treatment each 25 day gave least average which reach 5.88 gm . this reduction in lint cotton yield with reduced irrigation water quantities may be due to one or more in yields components , such as opened bolls number reduced (Table 5) and boll weight (Table 7) referd to reduced lint cotton yield. , in this result agree with (17) study so they referand to reduction in lint cotton yield by increasing irrigation periods from 7 days to 14 days between one irrigate & other.

Regarding the interaction , spray with ABA concentration of 80 M mol & irrigation every 15 day (C_2I_1) gave highest average 7.82 gm while distill water spray & every 25 days irrigation (C_0I_3) gave least average 5.21 gm.plant^{-1}.

Table 10: Effect of ABA concentrations and irrigation periods and their interaction in lint cotton yield (gm.plant^{-1})

Irrigation periods (day) / ABA concentration	10 I_0	15 I_1	20 I_2	25 I_3	Average (C)
C_0(0)	6.64	6.85	5.82	5.21	6.13
C_1(40)	7.12	7.29	6.86	5.85	6.78
C_2(80)	7.47	7.83	6.80	6.37	7.12
C_3(120)	7.37	7.11	6.36	6.08	6.73
LSD 0.05	0.76				0.33
Average (I)	7.15	7.27	6.46	5.88	
LSD 0.05	0.58				

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