

Effect of Some Plant Growth Regulators on Growth and Yield Components of Wheat – Plants CV. Bakrajo



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Abstract

*An investigation was conducted to study the effects of IAA, GA and cytokinin on the growth, yield components and % of protein content of wheat plants *Triticum durum* cv. Bakrajo. Results indicate that the growth regulators caused in significant increase in plant height, number of tillers / plant, number of kernels / spike and 1000 grain weight.*

Significant differences were found among the concentration of growth regulators through height, number of leaves / plant, number of spike / plant, the length of spike and number of kernels / spike. Also the time of application has significant affected on the length of spike and protein content percentage.

As well as the interaction between growth regulators, concentration and time of application showed significant differences.

Key words : Plant growth regulators (Auxin, Gibberellin and Cytokinin).
Triticum durum (Seedling).

Introduction

Triticum aestivum and *T. durum* are the two most dominant species of wheat in comerial cultivation. In general, the present semidwarf varieties of durum wheat are late in maturity, which makes them unfit for multiple cropping in tropical and sub-tropical countries (1).

In Iraq the spring types are grown as winter-crop in the northern region, the most cultivated type in Kurdistan-region are belong to winter-wheat in regard to growth and branch formation (2).

T. durum which are higher protein content than the soft-one, the protein-content which is mainly glutinin (of wheat) ranged between 11-17% (3).

Several classes of growth regulators have been indentified including auxin, gibberellins and cytokinins to be used as plant-growth regulators, these growth regulators control plant-growth and development by affecting cell- expansion, elongation, cell-division, differentiation and cell-metabolism involving starch-hydrolysis and protein-biosynthesis through stimulating RNA transcription. Each growth regulators has multiplicity effect of development on it's site of action depending on the development stage of the plant and the concentration of the growth regulators (4,5,6).

The plant-hormone activities differs depending on the age and species. Two methods of hormonal treatment have been proposed which are either, according to morphological-stage of the plant or according to chronical method. In which different concentrations, method of applications, time of treatment, age of the plant organ, temperature during the post-application have resulted in a distinguished results (5,7).

The role of growth regulators in seed growth are development and maturation accumulation of storage reserves, growth and development of extraseminal tissues, storage for later use during germination and various physiological effects on tissues during the development of fruits (6).

ABA has been used to improve the uptake efficiency of water by wheat plants (8).

This investigation was conducted to evaluate the response of durum wheat, cv. Bakrajo local variety to several concentration of IAA, GA and Cytokinins and two different times of spray application, one at 4-leaf stage and the second spray is applied at complete maturation of the flag-leaf and their interaction. Yield – components were evaluated accordingly.

Material & Method

This experiment is conducted by cultivation of durum – wheat, (*Triticum durum*) cv. Bakrajo during the period from January till maturation on 1st of June 2000. Plant growth regulator solutions, Auxin, Gibberellin and cytokinins were prepared at the concentration of 0, 20, 40 and 80 PPM for each growth regulator treatment. Indol – acetic acid was first dissolved in 1 ml of

70% ethanol then brought the final volume into 100 ml by distilled water.

The 200 PPM concentration of Indol – 3 acetic – acid was prepared by dissolving 0.2gm of pure IAA first on 1ml of 70% ethanol then the final volume was completed into 100ml by distilled water (5).

The plants were sprayed with the growth regulator solutions twice, one at 4- leaf stage and the second spray was performed when the flage- leaf fully ripened.

The experiment was designed according to C.R.D with 4 replications. Comparisons among means were conducted using least significant difference test (L.S.D) at 5% level.

In this study the source of wheat seeds was obtained from Bakrajo research station, Sulaimani. Plastic pots of 20cm in diameter were used and filled with loamy soil in appropriate way then, 3 seeds were planted in each pots. After germination the number of seedling was reduced to one plant per pot. Appropriate NPK fertilizer was applied for each pots. Several growth characters, yield and yield-components were evaluated as following:-

A- Growth – characters

plant height (cm)

Number of leaves/plant.

The length of flag-leaves (cm).

The number of tillers/plant.

B- Yield components.

Number of spikes/plant.

The length of spike (cm).

The number of kernels/spike.

Thousand – grain – weight (gm).

C- The yield quality

The yield quality was estimated according to the total protein percentage which was estimated by means of Micro Kjeldahl method and using the following formula (9).

$$N\% = (\text{ml acid} - \text{ml acid of blank}) \times N \text{ of acid} \times 14/100 \times 50/0.2 \times 100/10$$

$$\text{Protein \%} = N\% \times 6.25$$

Results and Discussion

Usually many seeds of most crops are rich source of plant natural hormones, such as auxins, gibberellins, cytokinins and abscisic acid. These hormones play an important regulatory roles in seed growth and development (6).

Table (1) : Represents the influence of growth regulators (IAA,GA and CK) on plant growth. it shows that GA possess

higher significant influences on the plant height (cm) in comparison to IAA and CK in which GA affect on stem elongation (5,10). CK has significant influence on the number of tillers/ plant ,number of kernels / spike and 1000grain weight(g) in comparison to IAA and GA because CK has arole in cell division and cell metabolism involving protein biosynthesis through stimulating RNA transcription (5,7). The components of seeds per unit area of wheat is:

$$\text{Seeds/area} = \text{plants/area} \times \text{tillers/plant} \times \text{spikes/tiller} \times \text{spikelets/spike} \times \text{florets/spikelets} \times \text{SET} \quad (6).$$

Table 1 : The influence of growth regulators (IAA,GA and cytokinins) on the plant growth , yield components and protein content of wheat plant

Growth regulators	Plant-height (cm)	Number of Leaves/ plant	Flag_leaf Length (cm)	Number of tillers/plant	Number of spike/ plant	The length of spike (cm)	Number of kernels /spike	1000 grian_weight (g)	Protin content %
IAA	41.78	19.21	18.93	3.03	1.25	4.82	12.41	36.55	6.05
GA	50.46	17.21	19.23	2.40	1.25	5.01	13.23	40.21	6.72
C.K	45.31	15.68	17.54	4.00	1.28	4.93	18.24	40.98	6.41
L.S.D 0.05	3.78	N.S	N.S	0.82	N.S	N.S	2.70	4.22	N.S

Table (2): represents the influence of different concentration of IAA,GA and CK on plant growth and yield components.It shows that 20 PPM had produced significant plant height(cm),number of spike/plant ,the length of spike(cm) and the number of kernels/spike.

The same significant results has been recorded for 80 PPM for number of leaves/ plant,as shown in table (2). The site of action depends on the developmental stage of the plant and the concentration of the hormones as indicated prevously (5, 7).

Table 2 : The influence of different concentrations of (1AA,GA and cytokinins) on the plant growth ,yield components and protein content of plant wheat .

Concentration PPM	Plant-height (cm)	Number of Leaves / plant	Flag_leaf Length (cm)	Number of Tillers/ plant	Number of spike/ plant	The length of spike(cm)	Number of kernels / spike	1000 grain/weight (g)	(Protein content) %
0	38.68	13.50	17.62	2.75	1.00	4.62	8.87	42.24	7.81
20	49.00	19.37	18.79	3.41	1.54	5.12	16.07	40.11	5.51
40	48.33	13.95	18.56	3.29	1.12	4.93	16.81	39.99	6.07
80	47.39	22.66	19.31	3.12	1.37	4.97	16.76	34.66	6.18
L.S.D 0.05	4.36	4.23	N.S	N.S	0.30	0.34	3.23	4.87	0.79

Table (3) : represents the influence of time of application on the plant growth and yield components. It has produced non significant influences except the length of spike (cm)with the respect to the time of 4-leaf stage application had

significant influence than complete matured flag-leaf application but the influences of complete matured flag leaf application had significant influence on the protein content than 4 leaf stage application. (10).

Table (3) : The influence of time of application on the plant growth ,yield components and protein content of wheat plant

Time of application	Plant-height (cm)	Number of leaves/ plant	Flag_leaf Length (cm)	Number of Tillers/plant	Number of spike / plant	The length of spike(cm)	Number of kernels/ spike	1000 grian weight (g)	Protein content%
4- Leaf stage application	45.95	18.54	18.92	3.33	1.31	5.11	15.25	38.66	5.91
Complete matured flag_leaf application	45.75	16.20	18.21	2.95	1.20	4.73	14.01	39.84	6.80
L.S.D 0.05	N.S	N.S	N.S	N.S	N.S	0.24	N.S	N.S	0.56

Table (4) : represents the influence of the interaction of growth regulators, concentrations and application on plant growth and yield components .The interaction showed significant influences on the characters with the respect to the interaction within gibberellin, concentrations and application .GA gave

the maximum plant-height (cm) and number of leaves / plant at 80 PPM with 2nd application while the interaction within CK, concentrations and application .CK gave the maximum number of tillers / plant and number of kernels/ spike at 20 PPM with 1st application and 80 PPM with 2nd application respectively, growth

regulators control plant growth and starch hydrolysis and protein – development by affecting cell division biosynthesis through stimulating RNA ,elongation and cell metabolism involving transcription (7,10,11).

Table 4 : The influence of the interaction of growth regulators, concentration and the time of application on plant growth, yield component and protein content on wheat plant

Growth regulators	Concentration PPM	The time of application	Plant height (cm)	Number of leaves/	Flag_ leaf length (cm)	Number of Tillers/plant	Number of spike/plant	The length of spike (cm)	Number. of kernels/ spike	1000 grain weight (g)	Protein content %
IA A	0	1st	39.25	12.75	18.37	2.75	1.00	5.00	9.00	42.24	7.81
		2nd	38.12	14.25	16.87	2.75	1.00	4.25	8.75	42.24	7.81
	20	1st	46.00	22.75	18.37	3.25	1.00	5.37	16.75	40.12	5.45
		2nd	43.25	17.75	18.12	2.75	2.00	5.00	14.75	31.01	2.20
	40	1st	44.87	24.75	20.37	3.50	1.00	5.00	17.00	41.71	3.30
		2nd	46.12	13.50	19.25	2.75	1.25	5.25	12.75	38.49	6.84
	80	1st	45.87	23.50	21.87	2.75	2.00	5.25	9.32	32.26	5.77
		2nd	30.75	24.50	18.25	3.75	0.75	3.50	11.00	24.36	9.23
GA	0	1st	39.25	12.75	18.37	2.75	1.00	5.00	9.00	42.24	7.81
		2nd	38.12	14.25	16.87	2.75	1.00	4.25	8.75	42.24	7.81
	20	1st	52.25	21.75	18.0	3.25	1.25	5.37	19.37	43.65	6.82
		2nd	53.75	19.25	20.50	1.75	1.25	4.75	12.00	44.09	9.65
	40	1st	53.37	13.50	18.37	2.50	1.00	4.87	15.00	34.96	7.29
		2nd	55.37	9.50	18.25	1.50	1.00	5.37	13.75	42.54	5.52
	80	1st	51.00	22.00	22.12	3.00	2.50	5.50	9.75	29.09	2.2
		2nd	60.62	24.75	21.37	1.75	1.00	5.50	18.25	42.90	6.66
C.K	0	1st	34.25	12.75	18.37	2.75	1.00	5.00	9.00	42.24	7.81
		2nd	38.12	14.25	16.87	2.75	1.00	4.25	8.75	42.24	7.81
	20	1st	46.25	19.75	19.50	5.25	2.00	5.25	15.82	35.76	2.83
		2nd	52.50	15.00	18.25	4.25	1.75	5.25	17.75	46.02	6.13
	40	1st	46.00	15.50	17.75	4.50	1.00	5.00	29.00	40.65	7.71
		2nd	44.25	7.00	17.37	5.00	1.50	4.62	13.37	41.59	5.77
	80	1st	48.12	20.75	15.62	3.75	1.00	5.00	24.00	38.98	6.13
		2nd	48.00	20.50	16.62	3.75	1.00	5.12	28.25	40.37	6.08
L.S. D 0.05			10.70	10.37	5.83	2.33	0.73	0.85	7.91	11.94	1.95

Table (5) : represents the influence of the interaction of growth regulators and their concentrations on the yield components . The interaction showed significant influences with the respect to the interaction within GA and CK with 80 PPM and 20 PPM respectively ,20 PPM gave maximum number of spike / plant and length of the spike(cm) , while the interaction within CK with 80 PPM concentration gave maximum number of kernels / spike (5,7,10) .

Table (5) : The influence of the interaction of growth regulators and concentration on yield components of wheat plant.

Growth regulators	Concentration PPM	Number of spike/plant	The length of the spike(cm)	Number of kernels/spike
IAA	0	1.00	4.62	8.87
	20	1.50	5.18	15.75
	40	1.12	5.12	14.87
	80	1.37	4.37	10.16
GA	0	1.00	4.62	8.87
	20	1.25	4.93	15.68
	40	1.00	5.00	14.37
	80	1.75	5.50	14.00
CK	0	1.00	4.62	8.87
	20	1.87	5.25	16.78
	40	1.25	4.81	21.18
	80	1.00	5.06	26.12
L.S.D _{0.05}		0.52	0.60	5.59

maximum length of spike (cm) while 40 PPM concentrations with 1st application gave maximum number of kernels / spike ,each growth regulator has multiplicity effect of development on it's site of action depending on the developmental stage of the plant and the concentration of the growth regulator (7,11) .

Table (6) : shows the influences of the interaction of concentration and time of application on yield components which significantly influences the number of spike /plant , the length of spike (cm) and number of kernels/spike with respect that 80 PPM concentration with 1st application gave maximum number of spike /plant and with 2nd application gave the

Table (6) : The influence of the interaction of concentration and time of application on yield components of wheat plant.

Concentration PPM	Time of application	Number of spike/plant	The length of spike (cm)	Number of kernels/ spike
0	1st	1.00	5.00	9.00
	2nd	1.00	4.25	8.75
20	1st	1.41	5.25	17.31
	2nd	1.66	5.00	14.83
40	1st	1.00	4.95	20.33
	2nd	1.25	5.00	13.29
80	1st	1.83	5.25	14.35
	2nd	0.91	7.70	19.16
L.S.D _{0.05}		0.42	0.49	4.57

respect that cytokinin with 1st application gave maximum number of tillers / plant while gibberellin with 2nd application gave maximum weight of 1000 grain (10). Table (7) : represents the influence of interaction of growth regulators and time of applications on yield components with

Table (7) : The influence of the interaction of growth regulators and time of application on the tillering and weight of 1000grain of wheat plant .

Growth regulators	Time of application	Number of tillers/ plant	The weight of 1000 grain (g)
IAA	1st	3.06	39.08
	2nd	3.00	34.02
GA	1st	2.87	37.48
	2nd	1.93	42.94
C.K	1st	4.06	39.41
	2nd	3.93	42.56
L.S.D _{0.05}		1.16	5.97

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كارىگەرى ھەندى رىكخەرە گەشە رووھى يەكان لەسەر گەشەو پىكھىنەي

بەرھەمى رووھى گەنم لە جوړى بەكرە جو

فەيسەل عبدالقادر سەكرى

بەشى بايولۆجى / كۆليجى زانست / زانكۆي سەلاھەدين / ھەريمى كوردستان - عىراق

و نورى ھەسەن غەفور ، ھوشيار عبد اللہ عزيز

بەشى بايولۆجى / كۆليجى زانست / زانكۆي سلىمانى / ھەريمى كوردستان - عىراق

پىوختە

سروشنى كارىگەرىتى چەند رىكخەرىكى گەشە رووھى ۋەك ئىندول ئستىك ئسىد ، جبرلين لەگەل سايتوكاينين لەسەر گەشە و پىكھىنەي بەرھەمى رووھى گەنم لە جوړى بەكرە جو خرانە ژىر لىكۆلەينەو . نەجامى لىكۆلەينەو دەرى خست كە ھۆرمۆنە رووھى يەكان بونە ھۆى زيادكردنى بەرچەستەيى درىژى رووھى ، ژمارەى لىق لى بوونەو ھە / رووھى كىك ، ژمارەى دەنگە گەنم / گولە گەنمىك ھەروھە كىشى (۱۰۰۰) دەنگە گەنم .

جىاوازي بەرچەستەيى بىنرا لە نىوان چرىيە جىاوازيەكانى ھۆرمۆنەكان لەسەر درىژى رووھى ، ژمارەى گەلاكان / رووھى كىك ، ژمارەى گولە گەنمەكان / رووھى كىك ، درىژى گولە گەنمەكان ھەروھە ژمارەى دەنگە گەنمەكان / گولە گەنمىك سەرەراى كاتى پىرژاندن كە كارىگەرى بەرچەستەيى ھەبوو لەسەر درىژى گولە گەنمەكان و پىژەى سەدى پىكھانەي پىرۆتىنى .

لە ھەمان كاتدا بەيەكدا چوويى لە نىوان ھۆرمۆنە رووھى يەكان و چرى و پىرژاندن لە لايەك و لە لايەكى ترەو ھەو پەيوەندى ھۆرمۆن و چرى ، ھۆرمۆن و پىرژاندن ۋە ھەروھە چرى و پىرژاندن بوو ھۆى جىاوازي بەرچەستەيى لەو نىوانانەدا .

تأثير بعض منظمات النمو النباتية على النمو ومكونات الحاصل لنبات

الحنطة سلاله بكره جو

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قسم علوم الحياة / كلية العلوم / جامعة صلاح الدين / اقليم كردستان - العراق

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الخلاصة

تم دراسة تأثير منظمات النمو النباتية إندول حامض الخليك وحامض الجبرلين والسايوكاينين على النمو ومكونات الحاصل والنسبة المئوية للبروتين لنبات الحنطة سلاله بكره جو .

دللت النتائج بأن منظمات النمو النباتية المستخدمة سببت زيادة معنوية في طول النبات ، عدد التفرعات / نبات ، عدد الحبوب / سنبله ، وزن ألف حبة . وجدت فروقات معنوية بين منظمات النمو النباتية ، تراكين خلال طول النبات ، عدد الأوراق / نبات ، عدد السنابل / نبات ، طول السنابل ، عدد الحبوب / سنبله ، كذلك أظهرت مواعيد الرش تأثيرات معنوية على طول السنبله والنسبة المئوية للبروتين كما أن التداخل بين المعاملات مع بعضها البعض منظمات النمو النباتية/تراكين. مواعيد الرش أظهرت فروقات معنوية .