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COMBINED EFFECT OF GIBBERELLIC ACID AND PACLOBUTRAZOL ON WHEAT PLANTS GROWN IN NEWLY RECLAIMED LANDS

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ABSTRACT

Tow field experiments were conducted in alkaline saline soil of newly reclaimed lands at Abou-Mady region *"North of Delta"* during the two successive seasons of 2001/2002 & 2002/2003. This work aimed to study the effect of gibberellic acid "GA_3" at 30 ppm combined with paclobutrazol "PP_{333}"at 150 ppm to modify growth and yield parameters as well as some physiological effects of "PP_{333}"at heading and harvesting stages of wheat plants .The results showed that application of "GA_3" combined with "PP_{333}"increased most significantly all the studied growth and yield parameters as well as the contents of photosynthetic pigments, total carbohydrates and total soluble sugars. The treatments also improved the pictures of protein electrophoresis of wheat plants which grown in new reclaimed area.

INTRODUCTION

Wheat (*Triticum aestivaum*) is one of the most important cereal crops of high nutritive value in the world as well as in Egypt .The grains of wheat contain a large amounts of carbohydrates, proteins, in addition to some minerals and vitamins .The protein of wheat includes albumin globulins,glutein,glutenins and gladines. In Egypt, wheat is a main winter crop, it occupies over 27% of the total cultivated area .It,s production is about 7.1 million tons per year (Ministry of Agriculture Egypt, 2002).The balance between the production and the consumption of wheat which represented about 45% of the National demands imported from foreign markets .For this reasons efforts should be directed toward increasing and improving the wheat yield in order to fill the gap between production and consumption. Thus the cultivated area outside the Nile valley and the Delta could be increased by reclaiming new lands and devoting them for wheat production only. Increasing wheat production is one of the main targets in Egyptian agricultural policy, this could be achieved through fertilization and /or using growth regulators including promotors and retardants .

At wheat harvesting stage lodging problem arise from exposure of the plants to storms and tempests consider one of the most important factors that limiting the yield of wheat grains especially that grown in newly reclaimed lands (area with much rainfall) and in soils water logged during growing seasons. To avoid this problem application of growth retardants such as uniconazol and paclobutrazol are recommended because of their effects on the inhibitory internode elongation and shorting the plants height. These retardants must be applied before the stem begin elongate in the period of spiklat differentiation and extention of the three or four functional leaves (Komatsu 1988, Zhang *et. al.*,1992; Wang and Shoying, 1996 and Guoping 1997 and El-Kady 2002).

It was consider that the effect of growth retardants in reducing plant height was a result of their action in modifying gibberellic acid "GA"metabolism in the plants because the retardants and "GA"are generally antagonists (Treharne *et. al.*,1995). However ,Konanteng and Matthews (1982) and Hutleybull and Schwab (1982) suggested that the above mentioned plant growth regulators do not show simple antagonism in their effect on the morphology and development. The yield if low concentration of "GA"20 (ppm) and CCC or PP_{333} were applied simultaneously at early stage of barley or wheat development .

The present work was designed to study the application of gibberellic acid to ameliorate the harmful effects of paclobutrazol on the growth characters, yield components and some chemicals constituents (protein pattern, `photosynthetic pigments & total carbohydrates and total soluble sugars) of wheat plants grown in newly reclaimed lands (Abou-Mady region in North of Delta).

MATERIAL AND METHODS

Tow field experiments were carried out on reclaimed alkaline saline soil at Abou- Mady region "North of Delta" Egypt in 2001/2002 and 2002/2003 seasons to study the effect of gibberellic acid (GA_3) in ameliorating the harmful effects of growth retardant paclobutrazol (PP_{333}) on the growth characters, yield components and some physiological constituents such as photosynthetic pigments, carbohydrates as well as protein patterns.

Wheat (Triticum aestivum cv. *Gemeza "9")* grains obtained from Agriculture Research Center ,Ministry of Agriculture, Arab Republic of Egypt were sown at 19 and 20 of November in 2001/2002 and 2002/2003 seasons respectively.Superphosphate (P_2O_5 15.5 %) was added to the soil before sowing at 100 kg./Fed. While ammonium nitrate (33.5 %--N) at 100Kg./Fed. Was applied at two equal doses at the second and fifth irrigation.

The growth regulators treatments consisted of three concentrations : Gibberellic acid "GA_3" at the rate of 30ppm and Paclobutrazol at the rate of 150ppm each used alone and combined with each other (GA_3+PP_{333}) in addition to the control plants. It is necessary to mentioned here that the used concentrations were chosen according to the results obtained from the preliminary screening experiment The plants were sprayed twice after 30 and 45 days from sowing with freshly prepared solutions of the growth regulators . The volume of spraying solution was maintained to cover completely the plant foliage till drip. The plant samples were collected after one week from the second application of growth regulators. The roots removed and the shoot system was divided as follows:--

a) Some plants were used for estimation of photosynthetic pigments (chlorophyll a, b and carotenoids) using spectrophotometric method as developed by Metzzner *et. al.*,(1965).
b) Some plants were stored in deep freezer at –20C until used for estimation of electrophoretic protein using continuous polyacrylamide gel electrophoresis in the presence of sodium dodesyl sulfate (cont. SDS-PAGE) according to the method of Weber and Osborn (1969).

c) The rest of the plants were weighed and dried in an electric oven at 70 C till constant weight, ground to fine dry powder and then used for estimation of total carbohydrate and total soluble sugars according to the method described by Doubois et.al.,(1956).

At heading stage the following growth parameters were recorded :- Plant height, tillers number /m^2,spike number /m^2,spike length and spike dry weight. Wherease, at harvest stage only the following data were measured :-number of grains /spike, weight of 1000 grains, grain yield Kg /fed. Straw yield kg/fed. harvest index as well as the crop index.

A complete randomize blocks design (Coshran and Cox, 1950)was used with three replications in this work. The data were subjected to statistical analysis to calculate the significance between treatments according to Snedecor and Coshran (1969) .For comparison between means LSD at 5% level was used

Soil tests :-

-Texture hydrometic method (Bauyoucos, 1954)
-PH and EC (electric conductivity) :In 1 soil :2.5 water (Jackson, 1973)
-Organic matter : (Walkley and Black,1934)
-HCO_3- extractable– P: Vanadate-Molybdate method spectrophotometer (Olsen et.al.,1954)
-Magnesium (Mg) and Potassium (K): Flame photometer and atomic absorption (Chapman and Pratt,1978).
-Total-N:Semi-Micro-Kjeldahl method (Piper,1950).

Table (1):Physical and chemical properties of the soil at Abou-Mady region "North of Delta"

Characters	Main data of two seasons
Soil granules %:--	
Clay	43.9
Silt	38.3
Sand	17.5
Texture:--	Clay loam
PH 1 : 2.5	8.1`5
E. C. m mohs /cm	10.75
$CaCO_3$ %	2.13 %
SO4 -- "ppm"	34.20 ppm
Available – Na^+	542 ppm
Available ---K^+	500 ppm
Available—Mg^+	360 ppm
Total---Cl^-	3195 ppm
Available ---Ca^+	490 ppm
Available ---P	4.65 ppm
Available----N	23.95 ppm

RESULTS AND DISCUSSION

This investigation aims to study the effects of gibberellic acid (GA_3) at the rate of 30 ppm to allivate the harmful effects of paclobutrazol (PP_{333}) which is used at the concentration equal 150 ppm on growth parameters, yield components ,some biochemical and physiological changes as well as on the differences in protein electrophoresis pictures of wheat plant grown in newly reclaimed lands (Abou-Mady region at the North of Delta).

1- Growth parameters:-

Data presented in table (2) show that foliar application of GA_3 at the rate of 30 ppm combined with paclobutrazol at 150 ppm on wheat plants at heading and harvesting stages led to mostly significant increases in all the studied growth parameters (plant height in cm, tillers number / m^2, spikes number /m^2 spike length in cm and spike dry weight in g. as compared with those obtained from the untreated plants and with their respective control (plants treated with GA_3 alone or PP_{333} alone).

It is also evident from the same table (2) that spraying wheat plants with GA_3 or PP_{333} each alone at 30 and 150 ppm respectively caused mostly significant increases in all the studied growth parameters as compared with untreated plants .On the other hand, application of PP_{333} at 150 ppm led to significant reduction in the plant height (70 cm) as compared with control plants (75 cm) .These results may be attributed to the interference of PP_{333} (antigiberelline in nature) in gibberellic acid biosynthesis (i.e. prevent the formation of kauronic acid from ent-kurenol and then prevent the formation of GA_3) . This interaction caused promotion in the formation of lateral tillers which in turn led to increased number of ear-bearing tillers at the final harvest.

The results recorded in this work are in agreement with those obtained by many investigators using different triazole compounds at various concentrations (Fletcher and Hofstra,1990;Batts *et. al.*,1991; Bekheta,1992; Hathout, 1995; Wu *et. al.*,1996) In addition ,Gouping (1997) found that using GA_3 mixed with PP_{333} as a foliar application on wheat plants increased in the average number of tillers and yield components as compared with those obtained from the control plants. Recently ,Bekheta (2000) and El-Kady (2002) recorded that using uniconazol on Vicia faba and wheat plants caused significant increase in branches number or tillers /plants.

2-Yield and yield components

Data in table (3) represent the effect of GA_3 and PP_{333} at the concentrations 30 and 150 ppm used alone or in combination(GA_3+PP_{333})on the yield and its components of wheat plants grown in newly reclaimed land "Abou-Mady region in North of Delta :---

The results show that the used concentrations led to most significant increases in all the studied yield components including "grain numbers /spike,weight of 1000 grains (g), total grain yield (Kg/Fed.), straw weight (Kg/fed.) as well as the harvest and crop index as compared with untreated plants and with their respective control.

Table (2):Effects of gibberellic acid and /or paclobutrazole on the growth characters of wheat plants grown in newly reclaimed soil

Age of plant	Heading stage					Harvesting stage				
Characters Treatments.	Plant height (cm)	Number of tillers / (m^2)	Spikes number/ (m^2)	Spike length (cm)	Spike dry wt (g)	Plant Height (cm)	Number of tillers/ (m^2)	Spikes number/ (m^2)	Spike length (cm)	Spike dry wt (g)
Control	75.00	583.33	360.00	11.33	0.47	91.67	650.00	600.00	12.00	0.67
GA3 30 ppm	92.00	600.00	400.00	13.33	0.65	100.00	683.33	676.67	13.10	0.83
PP_{333}150 ppm	70.00	633.33	476.70	13.83	0.78	80.00	706.67	800.00	13.93	1.17
Interaction.	81.67	786.67	570.00	14.33	0.87	86.67	810.00	900.00	14.90	1.43
LSD 5%	4.66	54.60	30.94	0.22	0.05	N.S	41.88	50.61	0.27	0.08

It was also noticed from the same table that the highest mean values of yield components e. g grains yield "2619.2"kg/fed. and crop index "80.87"were obtained from the application of combined action (GA_3 + PP_{333}) as compared with the values obtained from the untreated plants "890.69 kg/ fed. and 51.09 respectively." and with those obtained from their respective control "plants treated with GA3 and PP333 each used alone,1196.84 kg / fed. & 46.12 and 1861.58kg / fed & 66.31 respectively.

The increments in the yield components recorded in this work could be a reflection of the effect of GA_3 mixed with PP_{333} on growth and development, it might be due to :-

1- marked increase in the average number of tillers (table 2) which gave a chance for the plant to carry more spikes.
2 -reduction in plant height, which was accompanied by increase in its cell wall thickness , gave a support to plant stem against lodging.
3 -increasing photosynthetic pigments (table 4) in wheat leaves which reflected on yield its compoents .

Table(3) : Effects of gibberellic acid and /or paclobutrazole on the yield and its components of wheat plants grown in new reclaimed area .

Characters / Treatments.	Grains number / spike	Wt .of 1000 grains (g)	Grain yield Kg/fed.	Straw Wt. Kg/fed.	Harvest index	Crop Index
Control	13.87	25.77	890.69	1723.73	32.99	51.87
GA_3 30ppm	14.87	28.67	1196.84	2603.50	31.44	46.12
PP_{333} 150ppm	16.67	33.17	1861.20	2802.00	39.80	66.31
Interaction	18.00	37.60	2619.20	3241.67	44.49	80.87
LSD at 5%	1.03	2.00	275.63	123.60	3.76	9.55

4-marked increases in protein electrophoresis bands, resulting in greater transfer of assimilates to grains and causing increase in their weight(table 5)

The above mentioned reasons could act to increase the number and weight of wheat grains (kg /fed.) from the plants treated with a mixture of "GA3 + PP333"as compared to the control plants.

The present data could be in a accordance with the results obtained by Zhang (1992) who reported that application of mixture of GA_3+Cycocel "CCC"or PP_{333} modified the effect of single retardant in inhibiting growth, dry matter accumulation and nitrogen metabolism of wheat plants, thus the development of yield components was favored.

In agreement with these results ,Oshio *et al.*,(1990) and Wang *et. al.*,(1994 & 1995) found that application of uniconazol increased rice and wheat grain yield .In addition Gouping (1997) indicated that application of GA_3 mixed with PP_{333}on wheat plants led to increase in the yield and its components. Recently, Bekheta (2000) and El-Kady (2002) they reported a highly significant increases in the yield of bean and wheat due to application of growth retardant uniconazole.

3-Biochemical measurements.

3.1-Photosynthetic pigments.

The data recorded in table (4) show that treating wheat plants grown in newly reclaimed lands (Abou-Mady) North of Delta with GA_3 at 30ppm and PP_{333} at 150 ppm each alone or in combination of each other (GA_3+PP_{333}) led to significant increases in the photosynthetic pigments content [chlorophyll a chlorophyll b and carotenoids] of the leaves of wheat plants collected at heading stage.

In the present work, it is obvious from the results recorded in table(4) that using of GA_3 and /or PP_{333} (used each alone or in combination) resulted in the highest contents of photosynthetic pigments as compared with their respective control. It should be mentioned here that carotenoids provide photosynthetic system with a method of photoprotection by prevent the formation of free radical oxygen ($1/2O_2$) by quenching the triple states of the chlorophyll molecules (Fyfe *et. al.* 1995)

These results are in agreement with those obtained by several investigators all used traizole compounds on different plants : (Buchenaver *et al.* 1984 on cereal seedlings; Flecher and Hofestra 1985; on wheat seedlings ;Wang *et al* 1994 and 1995 on rice & wheat seedlings respectively Bekheta 2000 *on Vicia faba* and El-kady 2002 on wheat plants) all stated that triazoles PP_{333} and /or uniconazole are able to increase significantly photosynthetic pigments content of many plants

Table (4):Effects of gibberellic acid and /or paclobutrazole on photosynthetic pigments and carbohydrate constituents of wheats plants grown in new reclaimed area .

Characters / Treatments	Chl." A" mg/g. F.wt.	Chl."B" mg/g F.wt	Total Chl.mg/g F.wt.	Carot. mg/g F.Wt	Total carbo.mg/100g F.wt	Total sol.sugar mg/100g F.wt
Control	8.00	3.10	11.10	5.40	2800	19500
GA330 Ppm	8.75	4.03	12.78	6.07	2931	19900
PP333150 ppm	10.00	4.82	14.82	6.77	2951	20050
Interaction	10.75	5.87	16.62	7.13	3201	21000
LSD 5%	0.60	0.24	----	0.40	150.9	1200.50

* Chl. = chlorophyll * Carot. = Carotenoids *carbo.=carbohydrates *sol.=soluble

3-2.Total carbohydrate and total soluble sugars

The data presented in table (4) revealed that spraying wheat plants grown in newly reclaimed area with solutions of GA_3 and /or PP333 at 30 ppm and /or 150 ppm respectively in combined with each other resulted in significant increases in the total carbohydrate and total soluble sugars (as mg /100 g dry weight)as compared with their respective control. These results are in agreement with those obtained by Munns *et al,* (1982) and Marschner (1995) who reported that organic acid and sugars are the main solutes involved in osmotic adjustment in glycophytic plants submitted to osmotic and alkaline stress. In addition Kim *et.al,* (1994); Bekheta (2000) ; El-kady (2002) and Bekheta *et. al,* (2003) all recorded that application of growth retardants

on various plants led to increases in the total carbohydrate and total soluble sugars contents of the treated plants these increments may be one of the methods which plants used its to increase its tolerance to salinity stress to adjust the osmotic potential .

3-3.Electrophoretic banding pattern of protein:

It is apparent from table (5) and fig (1) that the electrophorgram of the control of wheat plant grown in new reclaimed lands exhibited the presence of 20 protein bands having molecular weights ranging between 2.13—111.6 KDa. The scanning profile of such detected protein bands revealed that the band number 16 having the molecular weight of 28.63 KDa produced the highest intensity of protein which recorded 9.50 %.

The interaction effect between GA_3 at 30 and PP_{333} at 150 ppm on wheat plants at heading stage led to the appearance of 24 protein bands having molecular weights ranging between 1.75—111.61 KDa. On comparing with the features of protein banding pattern obtained from the control plants .It is evident that such treatment induced the appearance of 11 newly protein bands having the molecular weights of 98.41, 88.80, 57.51, 53.09, 38.09, 10.09, 9.00, 5.00, 3.97,2.5 and 1,75 KDa respectively.Simulatinously,7.0 protein bands were disappeared as a function of such treatment (combined action).The scanning profile of the detected protein bands revealed that the protein band number 33.0 having the molcular weight of 2.50 KDa produced the highest intensity of protein which recorded 6.10 %.

The electropherogram of the plants treated with PP_{333} alone at 150 ppm exhibited the presence of 21 protein bands having molecular weights ranging between 1.75—111.61 KDa. Compared to the protein banding pattern of the control plants, such this treatment induced vthe appearance of 9.0 newly protein bands having molecular weights of 98.41,83.41, 57.21, 32.50,10.09, 5.00,3.15, 2.90 and 1.75 KDa respectively. Manner of response which appeared to be accompanied by disappearance of 8.0 protein bands. Meanwhile, the scanning profile of the existed protein band number 35.0 having the molecular weight of 1.75 kDa produced the highest intensity of protein which recorded 5.0 %.

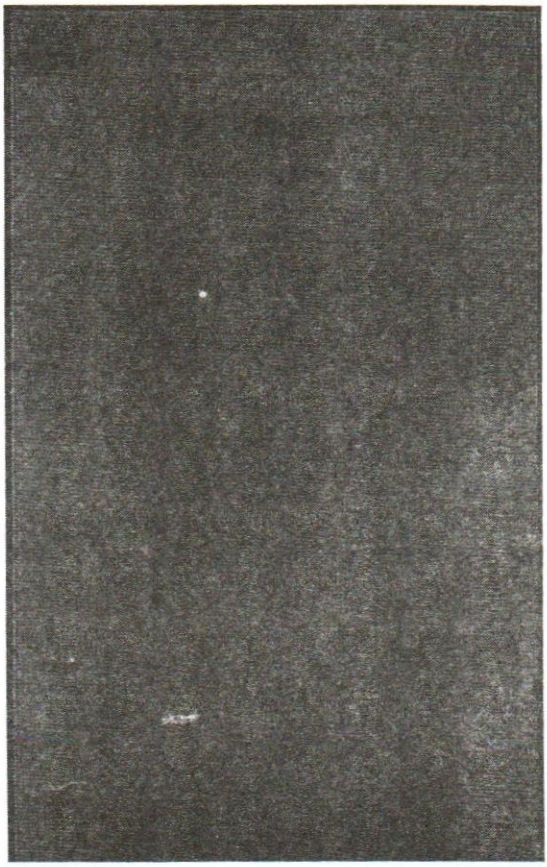
The electrophoretic pattern of wheat plant grown in newly reclaimed area and treated with GA_3 alone at 30 ppm showed the existed number of protein bands having molecular weights range is more or less comparable to that of the control plants. It is evident that such treatment induced appearance of 9 newly protein bands having the molecular weights of 98.41, 83.41, 68.74, 38.09, 10.09, 5.00, 3.15, 2.50, and 1.75 kDa respectively. Simultaneously, 12 protein bands were shown to be disappeared due to the same treatments. Moreover, the protein bands number 31.0 having the molecular weight of 3.15 kDa gave the highest intensity of protein which reached 4.20 %.

The outcome of the preceding obtained results clearly indicated that folair application of GA_3 in combination with PP_{333} on wheat plants grown in newly reclaimed lands led to the appearance of new protein bands which are varied according to the magnitude of the applied concentration. The intensity of such detected protein bands exhibited a marked increase.

Table (5): comparative analysis of molecular weight and relative concentrations of the different types of protein bands of wheat plants treated with PP_{333} and GA_3 grown in newly reclaimed lands

Number of bands	Molecular wt.	Control	Interaction PP_{333}+ GA_3	PP_{333} at150ppm	GA_3 at 30 ppm
1	111.6 1	1.5	2.0	1.5	1.1
2	103.02	1.3	1.1	_	1.8
3	100.08	1.2	1.0	0.7	0.9
4	98.41	-	1.2	0.9	3.3
5	97.52	1.1	_	_	_
6	88.80	-	1.5	_	_
7	83.41	-	_	1.1	1.0
8	76.18	0.9	_	0.9	_
9	68.74	-	_	_	0.7
10	57.21	-	1.2	1.1	_
11	55.33	0.9	_	_	1.2
12	53.09	_	1.1	_	_
13	51.69	0.8	_	0.9	_
14	38.09	_	3.5	_	2.1
15	32.50	_	_	2.4	_
16	28.63	9.5	_	_	_
17	15.22	1.3	1.7	0.8	_
18	12.91	2.4	1.5	0.8	2.2
19	11.30	1.6	0.8	0.7	_
20	10.09	_	1.2	1.5	2.0
21	9.65	3.6	1.3	_	-
22	9.00	_	1.6	_	-
23	8.57	1.6	1.3	1.0	1.8
24	7.69	2.3	2.2	1.4	1`.3
25	7.00	1.7	2.2	1.6	2.7
26	6.13	1.5	2.6	2.7	-
27	5.40	3.3	_	_	_
28	5.00	_	3.8	2.6	1.2
29	3.97	_	1.6	_	_
30	3.54	3.2	2.1	_	_
31	3.15	_	_	2.4	4.2
32	2.90	_	2.3	1.4	-
33	2.50	_	6.1	2.1	1.1
34	2.13	6.0	_	_	-
35	1.75	_	3.8	5.0	3.9
Total number of bands	—	20	24	21.0	17.0
Number of new bands	—	–	11	9.0	9.0

M 1 2 3 4



SDS – PAGE profile

Lane M : protein markers
Lane 1 : control plants
Lane 2 : plants treated with PP $_{333}$ at 150 ppm and GA_3 at 30 ppm
Lane 3 : plants treated with PP_{333} at 150 ppm
Lane 4 : planrts treated with GA_3 at 30 ppm

Fig (2): electrograph of soluble protein patterns by one –dimentional SDS-PAGE showing the changes of protein bands in response to gibberellic acid and or paclobutrazol treatments . Each lane contain equal amounts of protein extracted from wheat leaves . Protein bands in the gel were visualzied by coomassie blue stain

The existence of such specific protein bands in treated wheat plants grown in reclaimed lands might be explained based on the potentiality of PP_{333} and GA_3 to trigger the expression of specific genes a long DNA molecule in the target cells of the treated plants. A process which appears to play the key role in regulating a cascade of biochemical reactions which consequently might determined the altimate appearance growth pattern and yield of the produced plants accompanied by a persistent effect carrying over to the progeny via alteration of DNA—binding protein receptors mechanism which might amplify the signal-transduction pathway (Jacobsen and Beach ,1985 ; Hooley *et.al.*,1990 and Abd Elhamid , 2002).

In conclusion, the bulk of data obtained in the present work might pinpoint the high effectiveness of combined action between GA_3 and PP_{333} for creating high productivity of wheat plants grown in newly reclaimed lands that exceeds to a great extent, their vegetative growth characters . So, it is suggested that using GA_3 ameliorate the harmful effects of PP_{333} to manipulate plant growth in high –density production system with lowest degree of cost.

REFERENCES

Abd-Elhamid , M. (2002) : effect of seeds soaking in paclobutrazole on growth parameters , productivity ,photosynthetic pigments,ion content of faba bean. Chemical composition and protein profile of the harvested seeds.Egyptian,j.of biotechnology vol. 11,48--70

Batts,G.,R.;P.,D.,Hebblethwait and A.,D.,Baylis (1991): Effect of growth regulators J.F.10405 (Parlag c)on the development, yield components and yield of winter sown field bean *(Vicia faba)* . monograph British, Soci.,for plant growth regul.22, 33—51.

Bavyoucos, H.H.(1954): A recalibration of hydrometer for making mechanical analysis of soil. Agronomy. J.43, 343.

Bekheta,M.,A. (!992) :Studies on the physiological response of *Vicia faba* plants to uniconazol.M.Sc.Thesis ,Bot. Dept. Faculty of Science, Cairo Univ.

Bekheta,M.,A.(2000): Physiological studies on the effect of uniconazol on the growth and productivity of Vicia faba plants grown under different levels of salinity stress .Ph.D Thesis , Bot. Dept.. Faculty of Science, Cairo Univ.

Bekheta,M.,A. El-Ghourab,A.H.and M.H. Mahgoub(2003); Infeluence of stigmasterol and uniconazole on growth ,endogenous hormones,chemical composition and radical scavenging activity of thyme *(Thymus serpullum L)*. Egyptian ,J.Res.NRC-1 (3) 523—545.

Buchenaver,H.;B.Kutzner and Koths,T.(1984):Effect of various triazole fungicides on the growth of cereal ,barley . Research Reports of the Rural-Development-Administration,Upland-and Industrial Crops.34;2,68—72.

Chapman,H.D.and P.P.Pratt(1978) : Method of analysis for soils , plants , water. Univ.of California,Div.of Agricul.Sci.Priced.Pupl.4034

Coshran, W.G. and Cox, G.M.(1950): Experimental design , ed.Johan Wiley and Sons, New York.

Doubois, M. K. S.; Gilles, J. Hamibition, R. Rebers and F. Smith (1956): Colourimetric methods for determination of sugar and related substances .Annals. Chem. 28: 350.

El-Kady,F.M.A.(2002): Some studies on the effect of the growth regulator uniconazol on the growth, some metabolic changes, levels of endogenous hormones and productivity of wheat plants . M.Sc. Thesis, Bot. Dept. Faculty of Science Al-azhar University .

Fletcher,R.A. and G. . Hofstra (1985):Triadimefon :a plant multi- protectant . Plant Cell Physiol.26, 775—778.

---------- and ---------- (1990): Improvement of uniconazol induced production in wheat seedlings. J. of Plant Growth regulation 9;207—212.

Fyfe,P.;Cogdell, R.J.; Hunter, C.N. and Jones ,M .R.(1995): Study of the Carotenoid binding pocket of the photosynthetic reaction center from the purple bacterium *Rhodobacter sphaeroides P.Mathis*(ed), photosynthesis : from Light to Biosphere, Vol. IV:47—50: In proceeding of Xth International Photosynthesis Congress, Montpelleir, France, 20—25 August .

Gouping ,Z. (1997) : Gibberellic acid modified some growth and physiological effects of paclobutrazole(PP333) on wheat plants.J. plant Growth Regul.. 16: 21—25.

Hathout,T.A.(1995) : Diverse effects of uniconazol and nicotinamide on germination ,growth, endogenous hormones and some enzymatic activities of pea. Egypt. J. of plant physiol. Sci.19 (1---2)77---95.

Hooley,R.;Beale, M.H.; S.J.and Mac-Millan, J.(1990): Novel affinity probs. For gibberellin receptors in aleurone protoplasts of *Avena fatua* In: Plant Growth substances, S.B.eds, 145---153

Hutley-Bull.PO and Schwabe, W.W (1982): Some effects of low concentrations of GA3 during early growth on morphogenesis in wheat. In Mclaren JS (ed) Chemical manipulation of crop growth and development Butterworths London 329—342.

Jackson,M.L.(1973):Soil chemical analysis .Prentice Hall of Indian Private Limited ,New Delhi.

Jacobsen, J. V. and Beach,L.R. (1985) : Control of transcription of amylase and ribosomal RNA genes in barley aleurone protoplasts by gibberellin and abscisic acid. Nature :275—277

Kim, H. Y.;Choi,J.B. and Sang, K.C. (1994) : Effects of uniconazole on drought resistance .J. Korean Soc. for horticulture Sci. 35 : 493---498

Komatsu, Y.(1988) :The use and prospects of lodging reducers in rice plants. Research-Journal of food and Agriculture 11: 7, 3----8.

Konanteng, G.O.and Matthews, S. (1982): Modification of the development of spring barley by early application of CCC andGA3 and the subsequent effects on yield components and yield, In :Mclaren Js(ed)chemical manipulation of crop growth and development. Butterworths, London,343—357.

Marschner,H. (1995) : Mineral nutrition of higher plants 2nd ed, Academic Press, London pp. 596—680.

Mettzner,H.; Rava,H. and Senger, H. (1965): Unter shungen zur synchronis ieberkeity pigments mangel mutant von chlrella. Planta , 65: 186—190

Munns,R.; Greenway,H;Delane,R. and Gibb, J. (1982): Ion concentration carbohydrate status of the elongation leaf tissue of *Hordium vulgare* growing at high external NaCl J.Exp.Bot. (33) 574---583

Olsen,S.R.;C.V.Cole;F.S.Wataanable and L.A.Dean (1954): Estimation of available phosphours in soil by extration with sodium bicarbonate.USDA-Cricular,939:1.

Oshio,H.;S.Tanaka and K.Izumi (1990): The development of uniconazole as anew plant growth retardant and studies on its mechanism of action and practical uses .Chemical regular of plant 25(1), 8

Piper,C.S.(1950): Soils and plant analysis. Inter .Sci., Publ.Inc.New York

Snedecor, G.M.and W.G.Cochran (1969):Statistical methods (6thEd.)Iowa ,univ., Press, American, Iowa USA.

Treharne,K.J.;R.D.Child ;H. Anderson and G.H.Hoad (1985): Growth regulation of arable crops in Bopp, M(ed) plant growth substance .Springer-Verlag,Berlin, 368—374.

Walkley,A. and I.A.Black (1934):An examination of the degtjureff method for determining organic matter and a proposed modification of the chromic acid titration method. Soil ,Sci.,37.29.

Wang,X.I.;Y.Meiyu and T.Longxing (1994):The physiological effects of uniconazol on rice seedlings Chinese J. of Rice Sci., 8: (1), 15—20.

Wang , R and X. Shoying (1996) : study on uniconazole antilodging ability and its mechanizim in baraley J. of Zhegiany Agricultural university. 22.6 , 579-584.S

Wang,X.I.;Y.Meiyu and T.Longxing (1995):Controlling effect of uniconazol on growth of wheat seedlings. Acta. Agriculture Boreali-Sinica.10:(2) 50—56.

Weber,K. and Osborn,M. (1969): The reliability of molecular weight determination by sodium dodecyl sulphonate "SDS"polyacrelamide gel electrophoresis .J. Biol. Chemistry,244: 4406—4412.

Wu,C.;G.Jiaxin;T.Xiaoping;Wyiping and M.Hanwei (1996): The effect of seed treatment of parental lines with uniconazol on the production of hybrid rice seed. China-rice 3.24—52.

Zhang, G. P. (1992): The effect of GA3 and CCC or PP333 combined application on wheat growth and metabolism.Acta, Agric. Zhejiangensis (4) 15—19.

تأثير التفاعل المشترك بين حامض الجبريليك ومنظم النمو الباكلوبترازول على صفات النمو و المحصول وبعض الخصائص الفسيولوجية لنبات القمح النامى فى الأراضى المستصلحة حديثا

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أجريت تجربتان حقليتان على نبات القمح فى موسمى ٢٠٠٢/٢٠٠٣فى الأراضى المستصلحة حديثا فى منطقة أبوماضى بشمال الدلتا – بمحافظة الدقهليه . يهدف هذا البحث الى استخدام منظم النمو حامض الجبريليك عند تركيز٣٠جزء في المليون متحدا مع منظم النمو الباكلوبترازول عند تركيز ١٥٠جزء في المليون وذلك بهدف تعديل بعض أوجه القصور الناتجة عن استخدام الباكلوبترازول منفرد على صفات النمو والمحصول وذلك عند مرحلتى طرد السنابل والحصاد وكذلك التعديل فى بعض الخصائص الفسيولوجية لنبات القمح.

أوضحت الدراسة النتائج التالية :-

١- أدى التأ ثير المشترك بين منظمى النمو حامض الجبريليك والباكلوبترازول إلى حدوث زيادة معنوية فى صفات النمو وكذلك صفات المحصول قيد الدراسة.

٢- أدى التأ ثير المشترك بين حامض الجبريليك والباكلوبترازول الى زيادة معنوية فى محتوى أوراق النبات من صبغات البناء الضوئي و التي تشمل كلوروفيل أ؛ ب وكذلك صبغه الكاروتينويدات.

٣- أظهرت النتائج وجود زيادة معنوية في محتوي أوراق النبات من السكريات الكلية وكذلك السكريات الكلية الذائبة والتي تعد أحد أوجه مقاومة النبات للإجهادات البيئية التى يتعرض لها.

٤- إتضح من خلال نتائج التفريد الكهربي للبروتينات المستخلصة من أوراق النباتات المعاملة والغير معاملة وجود تغيرات واضحة في أعداد و تركيزات حزم البروتين فقد أدي التأثير المشترك بين منظمى النمو الى ظهور إحدى عشر حزمة بروتينية جديدة.